Guidelines for the Provision of Intensive Care Services

The Faculty of
Intensive Care Medicine
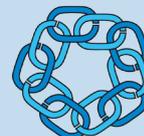
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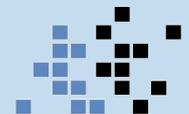
Critical Care Network Nurse Leads

British Association of Critical Care Nurses

UK Critical Care Nursing Alliance

Royal College of Speech & Language Therapists

Association of UK Dietitians

National Outreach Forum

ICU Steps

United Kingdom Clinical Pharmacy Association

NHS Blood and Transplant

Neuroanaesthesia Society of Great Britain and Ireland

Association of Cardiothoracic Anaesthetists

College of Occupational Therapists

Edition 1   **2015**

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OVERVIEW

On behalf of the Faculty of Intensive Care Medicine (FICM) and the Intensive Care Society (ICS), welcome to the first edition of *Guidelines for the Provision of Intensive Care Services,* otherwise known as GPICS. GPICS builds on *Core Standards for Intensive Care Units* (2013) and is the first step towards the development of a definitive reference source for the planning and delivery of UK Intensive Care Services. The need for GPICS is the result of the transformation of critical care into a stand-alone specialty in the UK. Amongst the many important milestones that underpin this evolution have been the establishment of the ICS in 1970, the formation of the FICM in 2010, and the approval by the General Medical Council of the ICM Certificate of Completion of Training in 2012.

GPICS will be of particular relevance to clinicians involved in management and the design of critical care services, hospital managers, commissioners, Adult Critical Care Operational Delivery Networks, and the NHS England Adult Critical Care Clinical Reference Group. However, GPICS also includes clinical chapters, and will therefore be of interest to those who undertake clinical audit to improve their practice and for revalidation. Currently the FICM and ICS are co-developing an Audit Recipe Book with recommended audits; future editions of GPICS will link Chapters to audit recommendations.

The publication of the first edition of GPICS is the start of a journey to build a comprehensive index of recommendations and standards for how UK Intensive Care Services should work. GPICS will be updated, and will grow with the addition of new chapters. The recommendations in GPICS are, where possible, based on strong evidence. However, we acknowledge that in a number of areas, particularly those dealing with service configuration, the evidence base is incomplete. The Faculty and Society are addressing this 'evidence gap' as a joint initiative by developing a portfolio of evidence-based guidelines. It is the intention of our organisations to obtain NICE guideline development accreditation to strengthen the authority of our recommendations.

GPICS is divided into six chapters which contain sections and subsections. Chapter One is an introduction which describes the service. Chapter Two describes in detail the structure of the service, including physical facilities and staffing. Chapter Three details the process of the service and focuses on the patient's pathway. Chapter Four describes the activity of the Critical Care service, including aspects of disease management and prevention as well as specialised critical care. Chapter Five contains other additional key components of the service, ranging from operational delivery networks to resilience planning. Finally, Chapter Six is a duplication of *Core Standards* 2013 in which the same numbering system used in the original document is retained to help avoid confusion.

GPICS has been designed so that its constituent chapters and sections are clear, concise and readable. The sections have been written by recognised UK experts in their respective fields, and after Chapter One, each will have the standard format of Introduction, Recommendations, Standards, Background, References and Relevant Ongoing Research (where appropriate). Some chapters also have an Additional Information section.

Recommendations will be statements that the authors feel **should** be routine practice in UK Intensive Care Medicine and which are endorsed by both the FICM and ICS. Stakeholder consultation is also important, and we have consulted with all major UK organisations linked to Intensive Care. GPICS has also undergone public consultation. For units where Recommendations are not currently met there should be a clear strategy to meet these as soon as possible. Relevant Standards can be quoted by authors only if they are already included in the Core Standards 2013 document. Standards **must** be followed by UK Intensive Care Units, and are the major resource for the Adult Critical Care Clinical Reference Group to make commissioning priorities in England. Both GPICS Recommendations and Standards will be key to peer-review processes by Operational Delivery Networks on behalf of commissioners and the Care Quality Commission. In time, and where appropriate,

some Recommendations will evolve into Standards depending on both available clinical evidence and the consensus opinion of the FICM/ICS Joint Standards Committee.

Although all of the Standards from *Core Standards for Intensive Care Units* appear throughout GPICS, the *Core Standards* 2013 document is retained as a stand-alone document as Chapter Six of GPICS. This will provide a rapid reference source for Standards when required.

Guidance documents of this type should be seen as work in progress. With regard to the clinical Recommendations and Standards, the material presented does not in any sense obviate the need for experienced clinical judgement exercised by individual practitioners acting in the best interest of their patients. Moreover, the guidance should not in any way inhibit the freedom of clinical staff to determine the most appropriate treatment for any patient they are asked to manage in a particular place at a particular time. The reader should take into account these qualifying comments when applying GPICS' Recommendations and Standards. Furthermore it is recognised that for some units (e.g. single-speciality and geographically isolated units) some of the Recommendations and Standards (particularly those describing staffing) may require a major reorganisation of healthcare delivery and will require time for implementation because of practical constraints such as workforce shortages. When such constraints exist, it is important that these units work closely with commissioners and their local Adult Critical Care Operational Delivery Networks to agree an appropriate action plan.

Terminology describing our speciality has yet to be standardised. The terms 'Critical Care', 'Intensive Care' and 'High Dependency Care' are all used interchangeably throughout this document where 'Intensive Care' is synonymous with 'Level 3 Critical Care' and 'High Dependency Care' is synonymous with 'Level 2 Critical Care'.

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ENDORSING ORGANISATIONS

These *Guidelines for the Provision of Intensive Care Services* have been endorsed by the following organisations:

Faculty of Intensive Care Medicine	FICM
Intensive Care Society	ICS
Royal College of Anaesthetists	RCoA
Royal College of Physicians	RCP
The Royal College of Surgeons of Edinburgh	RCSEd
College of Occupational Therapists	COT
Royal College of Speech and Language Therapists	RCSALT
Scottish Intensive Care Society	SICS
Welsh Intensive Care Society	WICS
Association of Cardiothoracic Anaesthetists	ACTA
British Association of Critical Care Nurses	BACCN
British Dietetic Association	BDA
Critical Care Networks – National Nurse Leads	CC3N
NHS Blood and Transplant	NHSBT
ICU Steps	
Neuroanaesthesia Society of Great Britain &Ireland	NASGBI
National Outreach Forum	NOrF
UK Clinical Pharmacy Association	UKCPA
UK Critical Care Nursing Alliance	UKCCNA

Chapter One

Description of Service

1.1   Levels of Critical Care

Author: Timothy Evans

Critical Care is provided within the continuum of primary, secondary and tertiary care, with the majority of services delivered in the secondary-care setting. The report Comprehensive Critical Care[1] recommended that a classification be employed that focused on the level of dependency that individual patients need, regardless of location.

The classification developed and now employed in the majority of NHS institutions is shown in Table 1.

Table 1: *Classification of Critical Care[1]*

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 and those 'stepping down' from higher levels of 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.

Whilst the system of classification described is not universally employed nor nationally validated, it is referred to by national authorities as a useful means of defining the varying needs of the critically ill[2,3]. These classifications of levels of care therefore underpin all the recommendations made in this Guideline.

A supplementary classification has been proposed to identify those patients requiring specialist investigation and treatment such as is usually provided at tertiary referral hospitals. Where patients are cared for by specialist services, one additional letter (reflecting the most significant disorder) is applied to a patient's level of acuteness as follows: N – patients requiring neurosurgical care; C – patients requiring cardiac surgical care; T – patients requiring thoracic surgical care; B – patients requiring burns or plastic surgery care; S – patients requiring spinal unit care; R – patients requiring renal care; L – patients requiring liver care, and A – patients requiring other specialist care.

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1.2 Clinical & Financial Burden

Author: Timothy Evans

Beds, clinical performance and costs of Critical Care in England & Wales

In December 2013, there were 3,829 adult Critical Care beds of all types in England, of which 77.1% were occupied. This figure is variable; thus in February of the same year there were 3,770 beds with an occupancy rate of 87.7%[1]. In Wales in 2014 there was an average of 3.2 (intensive care) beds per 100,000 people, lower than the number provided for the population in the rest of the UK. Patients requiring Critical Care were of relatively low volume (around 9,000 per annum). The Welsh government has indicated that units should run at an average occupancy of around 65-70%, but that all units in Wales report occupancy rates of greater than 80%, with many often operating at over 100% occupancy at times.

Data concerning the absolute healthcare expenditure on Critical Care is variable; more useful is perhaps the perspective that in England annual expenditure increased in real terms from £700m to over £1bn from the financial year 1999-2000 to that of 2005-6. This was associated with a 35% increase in the number of staffed beds in general Intensive Care units, with more of the increase in Level 2 (106%) than in Level 3 (23%). Over the period 1999-2006, the mean cost of an Intensive Care bed day rose slightly from £1,551 to £1,647 (2006-7 prices). According to the Consolidated Welsh Costing Return (WRCN1) 2011/12, a ward bed in Wales cost £413 per night, a Level 2 bed an average £857 per night, and a Level 3 bed £1,932 per night[2].

In England, early discharges because of a shortage of Critical Care beds declined from 7.1% in 1998 to 3.3% in 2006. Although there was no consistent change, either in the proportion of patients with at least one chronic condition, or in the mean physiology (severity of illness) score, the mean predicted risk of mortality rose from 30.5% in 1998 to 32.1% in 2000 but subsequently fell to 31.4% in 2006, indicating that less severe cases were being admitted. Analysis by 10ths of predicted risk of mortality in England showed no widening in the distribution of cases.

After 2000, unit-mortality adjusted for case-mix in England fell dramatically by 2.0% a year and hospital mortality by 2.4% a year (compared with no change between 1998 and 2000). This was accompanied by a decrease of 11.0% a year in transfers out (for the same level of care) to other units and a fall of 8.7% a year in transfers in, whereas previously both proportions had been rising. In addition, the proportion of unplanned night discharges declined by 7.7% a year. Despite small increases in average unit costs, the cost effectiveness of Critical Care improved after 2000, partly as a result of the improvements in outcome[3].

Demand for Intensive Care beds

The Intensive Care National Audit and Research Centre (ICNARC) has made projections concerning changes in demand for Level 2 and 3 beds, based upon assumptions emerging from available and occupied bed-days, and trends in age- and sex-specific bed utilisation rates. By extrapolating from data collected by the Case Mix Programme Database, the bed-days of Critical Care (levels 2 and 3) delivered in general (i.e. non-specialist) units has increased from 650,000 (2007) to 740,000 (2013). If these observed trends continue, the rise in demand for Critical Care bed-days is likely to be in the order of 4% per annum[4].

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1.3   Workforce projections

Author: Timothy Evans

Consultants

Historically there has been little or no workforce data published for Intensive Care Medicine in the UK. However, in 2011-12 the FICM ran a two-phase census of all Fellows. Phase 1 (response rate 80%) was sent to hospitals (England n=136, Scotland n=15, Wales n=10, N Ireland n=6).

The majority (31.1%) of hospitals have between 6 and 10 Intensive Care beds, 24.2% between 11 and 20, 14.9% between 16 and 20 and the remainder 21+ beds. Only 6 hospitals have fewer than 5 funded beds. There is an expectation amongst units over the next 12 months that some will increase their numbers of funded beds (by a total of 178) and some will see a decrease (by a total of 26).

Phase 2 of the survey (response rate 50%]) related to individual consultants (n=921, 16.9% female; England n=794, Scotland n=80, Wales n=39, N Ireland n=8). Some 35.6% of consultants cover ICU a week at a time, 36.2% undertake blocks of days and the remainder single days.

The average number of direct clinical care (DCC) sessions (programmed activities, PAs) devoted to ICM is 4.24; mean DCC PAs devoted to non-ICM practice is 3.82. The average number of supporting professional activity (SPA) is 2.89 sessions per consultant. Where there is a differential allocation of these, the average number for ICM is 1.19 and for non-ICM is 1.69.

Key messages from the survey of individual consultants are shown in Table 2:

Table 2: *Survey of Individual Consultants*

1	Current patterns of work are diverse and complicated but factors such as an increase in consultant delivered care and reductions in numbers of anaesthetists providing input to intensive care will mean more consultants required to provide the service.
2	Relative to anaesthesia there is a lower percentage of the workforce represented by females. As this is likely to increase along with the potential for part time working and the above a significant increase in consultant numbers should be anticipated.
3	We may see an increase in ICM only consultants and this is something that will need to be factored in.

Out of hours work is undertaken in a variety of ways. For on-call, the majority (74%) of consultants are on a frequency of 1 in 10 or more onerous. Some (29.4%) simultaneously cover other clinical areas of practice as well as ICM when on call; 36.5% of hospitals have their out of hours cover for ICM provided by non-intensivists. Some out of hours work is classified as scheduled, and there is an average allocation of 1.37 PAs for this type of work.

Trainees

A Joint training scheme for the completion of training in ICM with a base specialty was established in 2001. Trainees ultimately 'belonged' to their 'parent' or base specialty Royal College. The number of trainees who achieved joint certification by parent specialty background is shown in Table 3:

Table 3: *Numbers of trainees achieving Joint training certification by parent or base specialty (2006-12)*

Year	Trainees reaching CCT
2006	44
2007	59
2008	71
2009	86
2010	67
2011	83
2012	99
TOTAL	**509**

Parent specialty	% trainees
Anaesthetics	82%
Medicine	12%
Emergency Medicine	6%

National recruitment to the new Single CCT in ICM took place for the first time in 2012. Some 72 posts were advertised and 52 were appointed to. In 2013 national recruitment trainees could for the first time form dual training programs with a second specialty; 88 posts were advertised. Of those interviewed, 47% came with a partner specialty National Training Number (NTN), largely from ST3 and ST4, and 53% came directly from core training. Recruitment data for 2013 are summarised in Table 4:

Table 4: *National recruitment data for trainees in Intensive Care Medicine 2013*

Background	% intending
Intending to Dual ICM with Anaesthetics	72%
Intending to Dual ICM with Medicine	17%
Intending to Dual ICM with Emergency	4%
Intending to remain single specialty	7%

Key messages from this section are:

1	The number of posts for the new ICM specialty is growing and this trend needs to continue.
2	The breakdown by partner specialty is similar to that historically in the Joint CCT although there is a move towards more non-anaesthetic trainees.

1.4   Access to Critical Care

Author: Timothy Evans

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, transfer to another hospital where more complex clinical needs can be met.

All acute hospitals carrying out elective surgery must be able to provide Level 2 care. Patients with a predicted surgical mortality in excess of 10% should have access to facilities for Level 3 dependency on site. Hospitals admitting emergencies should normally have all levels of care available.

A comprehensive Critical Care service must be planned and delivered systematically across any given health system. The characteristic of the modernised service is Integration (a hospital wide approach to Critical Care, with services that extend beyond the physical boundaries of the units that house the relevant beds, sufficient to provide support to and to interact and communicate with the range of acute services including specialist services).

Transfers out of units to receive the same level of care (presumably due to bed-shortages) declined by 11.0% per year after 2000. Early discharges because of a shortage of beds declined from 7.1% in 1998 to 3.3% in 2006. Although the rate of night discharges (midnight to 4:59 am) steadily increased from 2.8% in 1998 to 4.2% in 2006, the proportion reported as being because of a shortage of Critical Care beds declined (44.5% to 21.8%), suggesting that the proportion deemed "unplanned" fell from 1.2% to 0.9%[1].

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1.5   Delivery of Critical Care in the UK

Author: Julian Bion

Critical care delivery worldwide is characterised by diversity of structures and resources[1, 2], of processes and outcomes of care[3-6], and of specialty status and training[7]. In the UK, ICM became a primary specialty across the four nations with the foundation of the UK Faculty of Intensive Care Medicine in 2010, and General Medical Council approval of the ICM training programme in 2011. Substantial regional differences exist in resource allocation (Table 1), and the administrative structures through which Critical Care services are commissioned and funded also differ between jurisdictions. Intensive care units also vary widely in consultant-staffing, interaction with infection control and screening for bloodstream infections[8], and implementation of best practice such as lung-protective ventilation[9], suggesting opportunities for improvement through harmonisation of best practice – the main driver behind *Guidelines for Provision of Intensive Care Services*.

Analysis of the delivery of Critical Care is complicated by the term itself, incorporating as it does a mix of Level 2 and Level 3 care, and hence encompassing specialty-specific high-dependency care which may lie partially outside the remit of general Intensive Care units. The Intensive Care National Audit and Research Centre's Case Mix Programme database for 2011-12 includes 157,606 admissions to 237 adult Critical Care units, of which 135,332 admissions were to 206 NHS adult general Critical Care Units in England, Wales and Northern Ireland, which excludes admissions to specialist Critical Care Units (neurosciences, cardiothoracic, liver), stand-alone HDUs, paediatric and neonatal ICUs, and independent sector Critical Care units. The NHS Health and Social Care Information Centre for England[10] records all episodes identified by hospitals as requiring Critical Care support; for 2012-13 there were 237,710 adult Critical Care episodes, of which 62% were general Intensive Care admissions, and 16.6% were admissions to cardiac surgical units. Comparisons between the four nations are offered in Table 1, with data drawn from various sources.

Table 5: Adult Intensive Care Delivery in the UK

Adult Intensive Care Delivery in the UK				
	England	*Wales*	*Scotland*	*Northern Ireland*
Adult ICUs	223	15	26	10
Critical care beds	3829	166	173	86
Critical care beds per 100,000 population	7	3.2	3.2	4.7
Admissions/year	237,710	9887	36373	n/a
Year of data	2011-2013	2012	2011-12	2013
Sources	Health & Social Care Information Centre [10]; Intensive Care National Audit & Research Centre	'Together for Health' Welsh NHS Review of critical care 2014[11]	Scottish Intensive Care Society Audit Group 2013[12]	Northern Ireland Intensive Care Society

Hospital care is funded through different mechanisms in the four nations. Scotland, Wales and Northern Ireland have retained central block-funding distributed by regional Health Authorities, but in England services are commissioned by NHS England through local Clinical Commissioning Groups for general services combined with central funding for specialised services.

For intensive care, reimbursement is based on a tariff for the number of organ systems requiring support, from around £630 for one organ to £1,800 for six, multiplied by the number of days of support. Specialised intensive care services (e.g. ECMO) are commissioned according to contract service specifications defined in national

standards, developed by the professional organisations and ratified by the Adult Critical Care Clinical Reference Group, reporting to NHS England via the National Clinical Director for Critical Care. Specialised service standards apply equally to general Intensive Care services and are therefore an integral part of the wider set of core standards presented here in *Guidelines for Provision of Intensive Care Services* (GPICS).

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1.6   Interactions with other services

Author: Julian Bion

Intensive Care Medicine presents an interesting paradox. It owns few, if any, unique therapies or interventions; it has an impressive track record of negative clinical trials; and yet, as discussed in the next Chapter (2.7) there has been an inexorable improvement in case-mix adjusted mortality rates from critical illness over the years[1,2]. Broad inspection of the research literature suggests that most gains are to be made from interventions which facilitate earlier diagnosis and treatment[2,3], minimise the harmful effects of organ support[4,5,6], enhance communication[7,8], and promote a proactive system-wide approach to the care of patients at risk of critical illness[9,10]. The 'art' of intensive care therefore lies more in integrating multi-professional care and complex interventions over time, across locations and between teams, than in the delivery of any single treatment. Consequently, intensivists must be systems experts, both in terms of physiology and of healthcare delivery.

Interaction with 'other services' starts with the multi-professional teams in the Intensive Care unit: doctors, nurses, advanced Critical Care practitioners, physiotherapists, dietitians, infection control and microbiology, and pharmacists; with further input by occupational therapy, speech and language therapy, and clinical psychology. The morning and evening rounds are key opportunities to draw together information about the patients, to establish daily goals and determine main risks and communication tasks, using a standardised data collection sheet or an electronic equivalent. Given the size of the ICU team, and the impact of staff rotations and shift-working, it helps cohesion and flattens hierarchies if the morning round starts with each member introducing themselves by name and rank, including the consultants.

Interaction with microbiology is best conducted with relevant laboratory data available and at a consistent time each day. The appropriateness, dose, and duration of antimicrobial therapies may be reviewed, together with the ecology of the ICU, screening practices, and patterns of resistance. Ideally a senior member of the nursing staff should also be present.

The timing of interactions with visiting medical or surgical teams will need to accommodate their other commitments. One approach is to establish, as a routine, a brief early morning case review with a trainee member of the visiting team (to determine dischargeability for example) which may then be followed in the middle of the day by consultant-to-consultant discussion, informed by available laboratory or imaging tests. Continuity of care between teams and over time is essential.

Radiological investigations should be planned in discussion with the radiologist performing the procedure. Ideally the consultant intensivist should review imaging results directly with the radiologist rather than receiving the report at a later stage, particularly if interventional radiology is a possibility.

Organ donation requires close collaboration between the intensivist, the family, and the Specialist Nurse for Organ Donation, as part of the process of meticulous donor management to improve the outcome with donated organs[11].

Admission to and discharge from the ICU are points of maximal discontinuity. Emergency admissions to the ICU should be accompanied by direct discussion between the referring and admitting consultant to ensure that admission is appropriate. Families must be informed. Discharge should be planned with care, particularly of the frail elderly whose reserves will have been further limited by critical illness. In addition to their roles in the ICU, physiotherapists[12], pharmacists[13] and outreach staff have important roles in maintaining continuity of care following ICU discharge.

Night time discharge should be avoided[9, 10]. The mechanisms for this are uncertain, but are probably related to discontinuities in communication, care planning, medications, and a lower level of physical and

psychological support of patients who are still very frail. Patients with tracheostomies who cannot be decannulated at ICU discharge require regular review by trained staff (either outreach, or by transfer to wards with the requisite skills) in order to ensure airway patency and airway protection. Responsibility for admission and discharge resides with the intensivist, who should in addition have admitting rights to ease occasional extra-mural referrals.

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1.7   Outcomes

Author: Julian Bion

The remarkable halving in mortality achieved by positive pressure ventilation of polio victims in the 1950s[1], and the progressive eradication of the disease achieved by immunisation, created an opportunity for polio ventilator units to serve alternative clinical populations. Initially caring for patients with respiratory failure, these units started to accept those with multiple organ failure as organ system support technologies became more sophisticated. Intensive care developed haphazardly, often in a subspecialty format, caring for diverse populations which were difficult to compare. It was William Knaus who conceived of 'severity of illness' as a unifying concept, in 1981 developing the Acute Physiology and Chronic Health Evaluation (APACHE) score as the instrument for quantifying severity and predicting risk of death for groups of patients[2]. More than 30 years on, APACHE is in its fourth iteration, and there are now multiple other severity scoring systems available[3].

The descriptive power of these scoring systems is impressive, providing important insights into the epidemiology of critical illness; the impact of resource constraints and rationing; the unanticipated adverse effects of sedative agents; harms associated with delayed admission to, or premature discharge from, intensive care; and secular trends in improving outcomes from critical illness. It would be inconceivable now to conduct a randomised clinical trial without some form of case-mix adjustment. However, despite these manifest benefits, the link between aggregate Standardised Mortality Ratios (SMR) and quality of care remains elusive. The reasons for this may include the lack of a reliable measure of quality of care and the absence of a direct link between quality and outcomes, or the inherent linkage between physiology and therapeutic intervention in which poor or delayed care results in more disordered physiology and a higher predicted risk of death, and therefore no change in SMR. Differences in aggregated SMRs between ICUs, like differences in Hospital Standardised Mortality Ratios (HSMR) between whole hospitals[4,5], may be a consequence of variations in referral and discharge practices, coding, and palliative care, not in quality of care.

How then should ICU outcomes and performance be assessed? It would be wrong to ignore SMRs, which may direct attention to opportunities for improvement provided that low SMRs are not regarded with complacency. However, in terms of explanatory and predictive utility, comparative rankings of SMRs are clearly insufficient. In 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 are therefore empowering to staff.

Process-of-care measures include audits of 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 night-time discharge from the ICU). National audits (such as those of the Intensive Care National Audit and Research Centre, and the Scottish Intensive Care Society Audit Group) report night-time discharge rates routinely, and the newly established Infection in Critical Care Quality Improvement Programme (ICCQIP) will in time provide comprehensive benchmarked data on ICU-acquired infections in England.

Experiential measures include patient and family satisfaction surveys, which provide an important opportunity for organisational reflective learning, and provide important insights into the quality of palliative care in ICUs[6]. Setting up and maintaining satisfaction surveys requires investment in staff resources and tools for survey distribution, collation and analysis. They may usefully be supplemented by staff and medical trainee surveys. Feedback of results, and monitoring of actions taken, requires 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 ICU provides an important vehicle for constructive change. The patient and family group may also be willing to contribute the patient voice to ICU research projects.

Research and audit activity are important indicators of an aspirational and self-critical environment. Engagement in research generally improves healthcare performance[7]. Participation in a research group is associated with lower burn out rates amongst ICU nursing staff[8]. The research environment for intensive care has improved substantially with the formation of the National Institute for Health Research and the development of a national strategy for Critical Care research being elaborated through the CRN Specialty Group for Critical Care, involving all professional organisations in the Critical Care Leadership Forum.

Longer-term outcomes include post-ICU in-hospital survival through to the years following hospital discharge. The difference between post-ICU and hospital survival is an important indicator which may provide insights into the quality of ICU rehabilitation, the timeliness and appropriateness of ICU 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[9,10,11]. Long-term post-hospital follow-up requires a funded infrastructure centred around an ICU follow-up clinic, often nurse-led and doctor-supported. 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 that 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[12, 13].

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Chapter Two

Critical Care Service — Structure

2.1   Physical Facilities

2.1.1   Levels 2 & 3 Physical Facilities
Authors: Carl Waldmann & Chris Danbury

INTRODUCTION

NHS Estates Health Building Note (HBN) 57 has been superseded by HBN 04-02 (2013)[1], and all new-build Critical Care Units should comply.

A Critical Care Unit (CCU) is a specially staffed and equipped, separate and self-contained area of a hospital dedicated to the management and monitoring of patients with life-threatening conditions. It provides special expertise and the facilities for the support of vital functions, and uses the skills of medical, nursing and other personnel experienced in the management of these problems. It encompasses all areas that provide Level 2 (high dependency) and/or Level 3 (intensive care) care as defined by the Intensive Care Society document *Levels of Critical Care for Adult Patients* (2009)[2].

STANDARDS

3.1   Intensive Care facilities must comply with national standards.

3.2   All equipment must conform to the relevant safety standards and be regularly serviced.

3.3   All staff must be appropriately trained, competent and familiar with the use of equipment.

RECOMMENDATIONS

1   Depending upon the designated level, function, size and case mix of the hospital and/or region that it serves, an ICU may range from 4 to over 50 beds. Large ICUs should be divided into pods of 8-15 patients[3].

2   The unit should have enough beds and resources to obviate the need to transfer patients to other Intensive Care Units for non-clinical reasons[4].

3   The unit should ensure there is an adequate incident reporting system with comprehensive feedback available and this should include devices[5].

BACKGROUND

HBN 04-02 provides guidance on Critical Care units that admit patients whose dependency levels are classified as Level 2 or 3. It does not distinguish between the different requirements for Level 2 and 3 patients, therefore all provisions apply equally. It excludes facilities for the high-security isolation of patients, dedicated centres for burns patients and areas within the hospital where Level 2 or 3 patients are managed on a time-limited basis. It is generally considered that this time limitation should be less than 24 hours.

Whilst it is acknowledged that not all facilities currently meet national standards, providers of Intensive Care services should establish a program of work/time-line to establish when national standards will be met. This should be overseen/undertaken by the Intensive Care clinical team, the local Adult Critical Care Operational Delivery Network and Commissioners.

Existing facilities that do not comply with HBN 04-02 should note that as part of their risk register. Hospitals should indicate when facilities will be upgraded to comply with the current HBN. (HBN 27 was published in 1992, HBN 57 in 2003 and HBN 04-02 in 2013). It is imperative that Critical Care is delivered in facilities designed for that purpose. When refurbishing an existing facility, best practice is to comply fully with HBN 04-02. However, if this is not possible, the reasons should be formally documented through the provider organisation's clinical governance process.

Critical Care Units should be inspected as part of the peer-review process and slippage should be investigated. Failure to follow this guidance may be questioned by both the Operational Delivery Network and Commissioning organisations. The local Adult Critical Care Operational Delivery Network and Commissioners should be notified of this.

Critically ill patients are highly vulnerable, and most are completely dependent on the care provided by expert staff. The experience of being admitted to a Critical Care Unit, whether planned or as an emergency, is likely to be a highly physically and psychologically stressful experience for patients, their families, friends and often staff. Key to ensuring excellence is the provision of state-of-the-art technology and facilities that are fit for the purpose. This should include the clinical areas in which patients are cared for and the support facilities that underpin these.

When planning or redeveloping a Critical Care area, HBN 04-02 must be considered by the following groups:

- Planning and design teams
- Executive directors and senior managers of provider organisations, including estates directors and their staff
- Clinicians from every profession working in, or in partnership with, CCUs
- Infection control teams
- All support staff employed within CCUs
- Representatives of patients and their families
- Manufacturers of information technology (IT), clinical and support equipment and furnishings
- The medical engineering industry.

This guidance includes all general CCUs that admit adult (or adolescent) patients whose dependency levels are classified as Level 2 or Level 3. The guidance outlines the emerging principles in planning facilities for critically ill people: user requirements, location and departmental factors and the views of users. The main issues related to improving patient areas are discussed including increasing the area of bed-spaces, increasing the number of single bedrooms, reducing Hospital Acquired Infection, the patient's right to privacy and dignity, strategies for noise reduction, and maximising natural light.

The staff/patient ratio in Critical Care is very high. More space is required for staff facilities, including rest-rooms, catering facilities, changing rooms, en-suite overnight accommodation for on-call staff, and education and training facilities. Improvements in support facilities for family and friends are also discussed. The guidance covers general design considerations, and provides detailed information on the specific functional and design requirements and engineering requirements for CCUs.

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2.2   The Critical Care Team: Staffing Numbers and Work Patterns

2.2.1 Consultants

Authors: Tim Gould & Chris Danbury

INTRODUCTION

The published *Core Standards for Intensive Care Units* and activities of the Adult Critical Care Clinical Reference Group (ACC CRG) have set down guidelines for staffing in Critical Care. The CRG National Service Specification will be commissioned from 2015. Adoption of this strategy nationally will have a beneficial impact on both quality of care and safety for patients.

STANDARDS

1.1.1   Care must be led by a consultant in Intensive Care Medicine.

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

1.1.3   In general, the consultant/patient ratio must not exceed a range between 1:8 to 1:15 and the ICU resident/patient ratio should not exceed 1:8.

1.1.4   There must be a designated Clinical Director and/or Lead consultant for Intensive Care[4,5].

1.1.5   A consultant in Intensive Care Medicine must be immediately available 24/7, be able to attend within 30 minutes[5] and must undertake twice daily ward rounds[2].

1.1.6   Consultant intensivist led multi-disciplinary clinical ward rounds within Intensive Care must occur every day (including weekends and national holidays). The ward round must have daily input from nursing, microbiology, pharmacy and physiotherapy.

1.1.7   All treatment plans must have clear objective outcomes identified within a specific time frame and discussed with the patient where appropriate, or relatives/carers if appropriate.

RECOMMENDATIONS

None.

BACKGROUND

"Our way is best"? What is the actual evidence that existing staffing models result in optimal outcomes? When considering making a recommendation for the optimum model of medical consultant staffing for Critical Care Units in the UK, it is prudent to look at the available evidence for current work patterns and review available published evidence. Balanced against this, it is important to remember existing medical consultant staffing often reflects historical precedent, hospital specialties and embedded practical necessities.

Data from two recent UK surveys (Faculty of Intensive Care Medicine, 2011, and ICNARC, 2012) indicates that approximately 100 ICUs (55%) in the UK have 10 or fewer mixed Level 3 and 2 beds and treat fewer than

450 patients each year (37 patients a month or 1.25 admissions a day). About 1,400 medical consultants have Direct Clinical Care Programmed Activities in Intensive Care Medicine, and 93% of these have accreditation in anaesthetics. Sixty percent of ICUs have 8 or fewer medical consultants on their rotas. When on call, 72% of units have a medical consultant dedicated only to Intensive Care cover. In terms of patterns of work, 20% of medical consultants do one day at a time, 20% do 7-day rotas and 60% do between 2-day and 5-day stretches. Only one ward-round per day is the practice in 23% of Intensive Care Units Monday to Friday and in 51% of units at weekends.

The evidence is clear that closed units with a dedicated medical consultant in Intensive Care on the shift[1] is the desired configuration to deliver Intensive Care. A meta-analysis of 52 papers shows that this is consistently associated with reduced ICU and hospital mortalities and reduced ICU and hospital lengths-of-stay[2]. However, resident medical consultant on call at night does not consistently improve outcomes[6,7,8], in an already-existing closed model. When comparing 5-day to 7-day working, there is no evidence that 7 day working is of benefit in terms of outcome or length of stay[3].

A statement from the Society of Critical Care Medicine on intensivist/patient ratios in closed ICUs[9] concludes that "specifying the maximum number of patients to be cared for is unrealistic". The European Society of Intensive Care Medicine working group[6] advised a range of 8-12. A study comparing ratios with outcome in 2005[10] demonstrated that a ratio of greater than 1 medical consultant to 15 patients was associated with increased length of stay.

The evidence regarding medical consultant staffing of ICUs does not yet provide a consistent view of the best model to use. Most studies have significant limitations, and the subject is complicated by the fact that optimal staffing may depend on ICU characteristics. The closed unit model favours better outcomes for patients, but we still do not fully understand the specific elements that lead to the improvement[8]. The culture, work practices, cohesiveness and ethos of the actual ICU team are the important determinants of outcome.

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2.2.2   Trainee Medical Staff

Authors: Adrian Wong & Steve Mathieu

INTRODUCTION

The recently published *Core Standards for Intensive Care Units* 2013 and the Adult Critical Care Clinical Reference Group's forthcoming *National Service Specification for Critical Care Services* offer clear guidance for staffing levels in Critical Care[1]. Recommendations from the Faculty of Intensive Care Medicine[2,3], the associated medical colleges[4] and the General Medical Council[5] and the European Working Time Directive are also considered in this chapter[6,7].

The focus of this section is on the necessary requirements for trainer medical staff/trainees to ensure adequate service delivery whilst maintaining high quality training and an appropriate work-life balance.

STANDARDS

1.1.8   Intensive Care trainees must comply with the requirements set by the Faculty of Intensive Care Medicine.

1.1.9   Intensive Care Units that receive trainees for training in Intensive Care Medicine must comply with the requirements for training set for them by the Faculty of Intensive Care Medicine.

RECOMMENDATIONS

1   Trainees should never work outside of their competencies, and departments should ensure that their job plans are consistent with patient safety at all times.

2   All ICUs should have an appropriate trainee educational structure in place:
- All trainees should receive a hospital and departmental induction.
- Every trainee should have a named educational supervisor, and a named consultant as clinical supervisor (in some cases this may be the same consultant).
- Supervisors should be consultants in Intensive Care Medicine who identify their educational role in their annual appraisal.
- Every trainee should have opportunities to complete assessments and appraisal(s).

3   A consultant representing the Faculty of Intensive Care Medicine should be appointed to ensure that the individual training requirements of trainees are met, and to act as a link between the department and the Faculty. Larger ICUs may have more than one Faculty Tutor.

4   Trainee rotas should be compliant with recommendations from NHS Employers for trainees and European Working Time Regulations (EWTR) regulations:
- All trainees must spend at least half of their working time during periods when consultants are rostered to be on site.
- A minimum of 12.5% of training time should be at night, since the nature of this experience is qualitatively different from that during the day[8].

5   Documented clinical supervision meetings should take place:

- At the beginning and end if an attachment is three months or less, or
- At the beginning and end, and at intervals not exceeding three months for longer attachments.

6   A minimum of 30 hours during each year of regional training is required for those in dual, joint and solo ICM training programmes. These training sessions need to be of a high quality, and formal feedback should be collected and acted upon. They should be mapped against the ICM curriculum in order to provide a wide range of clinical, ethical, managerial and other topics. The teaching programmes should be published well in advance, and each department should help facilitate trainee attendance when constructing a rota and when approving study-leave requests.

7   On-call and weekend components of the trainee rota should be made available at least six weeks in advance.

8   There should be opportunities to be involved in departmental clinical governance and patient quality service improvement projects, audits and research.

9   Appropriate access to educational resources should be available (e.g. Library services, Information Technology).

10 There must be rapid 24/7 availability of a doctor with advanced airway and resuscitation skills.
- This may not always be the ICM trainee and will be dependent on consultant presence and local practice with regards to support from anaesthesia services
- It is important that all staff are aware of who they must contact to gain immediate assistance in the event of a patient's airway being compromised.

BACKGROUND

Trainees on the ICU can range from Foundation Programme doctors to those undergoing Stage 3 training in ICM. They play a vital role in the care and safety of patients on the ICU. For trainees intending to pursue a career in ICM, there is a single CCT as well as dual CCTs programme. Dual programmes are available in:

- Acute Medicine
- Anaesthesia
- Emergency medicine
- Renal medicine
- Respiratory medicine

Regardless of trainees' intended career plans, Critical Care training offers valuable experience in assessment of the critically ill patient which will benefit patients in the future. Goals and learning plans should be agreed upon at the start of their time on the ICU with regular reviews and appraisals. The number of trainees needed on the ICU at any one time will depend on a number of factors (*Table 6*) and is subject to individual unit variation.

Table 6: *Trainee Factors*

Trainee Factors	Unit and Hospital Factors
Grade	Number of beds
Background experience	Case-mix of admissions
Full time/Less than full time	Workload
Total number of trainees available to ICU	Work pattern of consultant body
Skill mix	Availability of other allied healthcare professionals (e.g. Advanced Critical Care Practitioners)
	Surge capacity
	Telemedicine

However in general, ICU residents to patient ratio should not normally exceed 1:8.

The universal concern about the balance between providing adequate training and the necessities of service provision is widely acknowledged. However, it is essential that the requirements for medical training are fully recognised by hospital management, and that these are taken into account when planning rotas. The number of training posts is limited; simply increasing the number of trainees to meet the demands of the EWTR is not sustainable. As for the consultants, trainee rotas should encourage continuity of care and maximise learning opportunities.

Any ICU that offers medical training should be familiar with the training requirements at each of the various grades[2,3]. A proactive approach is required from the consultant body as well as trainees. In addition to formal, protected, structured teaching sessions, learning can take place by the bedside within and outside the boundaries of the ICU. The role of simulation training in medical training is rapidly expanding. If trainees are unable to attend formal sessions, training material could be made available online along with other educational resources so that they can be accessed at a later date.

Trainees on the ICU should be provided with every opportunity to be involved in departmental clinical governance programmes. These include clinical audits, quality improvement projects, and surveys and research. There should be adequate access to IT and library resources available to support this.

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2.2.3   Nurse Staffing

Authors: Andrea Berry & Annette Richardson

INTRODUCTION

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

The standards and specifications have been developed and agreed by representatives working on behalf of the Critical Care professional nursing organisations; the British Association of Critical Care Nurses (BACCN), the Critical Care National Network Nurse Leads Forum (CC3N), the RCN Critical Care & In-flight Forum and the Intensive Care Society Nurses and Allied Health Professionals Committee (NAHP) who are collectively termed the UK Critical Care Nursing Alliance (UKCCNA).

The evidence relating to nurse staffing in Critical Care in some areas is limited. Where robust evidence is unavailable, professional Critical Care consensus has been used to support the standards.

More detailed information relating to the nursing standards can be found in the *Core Standards* in Chapter 6.

STANDARDS

1.2.1   Level 3 patients (level guided by ICS levels of care) require a registered nurse/patient ratio of a minimum 1:1 to deliver direct care[3,4,5].

1.2.2   Level 2 patients (level guided by the ICS levels of care) require a registered nurse/patient ratio of a minimum of 1:2 to deliver direct care[5].

1.2.3   Each designated Critical Care Unit will have an identified lead nurse who is formally recognised with overall responsibility for the nursing elements of the service[5] e.g. Band 8a Matron.

1.2.4   There will be a supernumerary clinical coordinator (sister/charge nurse bands 6/7) on duty 24/7 in Critical Care Units[6]. Units with < 6 beds may consider having a supernumerary clinical coordinator to cover peak activity periods, i.e. early shifts.

1.2.5   Units with greater than 10 beds will require additional supernumerary (this person is not rostered to deliver direct patient care to a specific patient) registered nursing staff over and above the clinical coordinator to enable the delivery of safe care. The number of additional staff per shift will be incremental depending on the size and layout of the unit (e.g. multiple single rooms). Consideration needs also be given during events such as infection outbreak

1.2.6   Each Critical Care Unit will have a dedicated Clinical Nurse Educator responsible for coordinating the education, training and CPD framework for Critical Care nursing staff and pre-registration student allocation[3].

1.2.7   All nursing staff appointed to Critical Care will be allocated a period of supernumerary practice[3].

1.2.8   A minimum of 50% of registered nursing staff will be in possession of a post registration award in Critical Care Nursing[7,8].

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

1.2.10   Where direct care is augmented using non-registered support staff, appropriate training and competence assessment is required[9].

RECOMMENDATIONS

1   Step 1 of *National Competencies for Adult Critical Care Nurses* should be commenced when a nurse with no previous experience of the speciality begins in Critical Care.

2   Steps 2 and 3 of *National Competencies for Adult Critical Care Nurses* should be incorporated into academic critical care programmes.

3   Adult Critical Care Nursing academic programmes should be awarded at academic Level 6 as a minimum, and should make up at least 60 credits. Courses should adopt the core curriculum described in the *National Standards for Critical Care Nurse Education* (2012).

4   Nurses supplied through an agency to work in critical care should provide evidence of appropriate experience and competence to care for critically ill patients.

BACKGROUND

The nature and delivery of Critical Care services are evolving with great speed. This is seen both in the increased complexity of treatments being delivered and 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 nurses to provide safe levels of care 24/7. Whatever the service model, the 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[11] 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 Critical Care nursing standards provide a sound framework to inform numbers, skill mix, educational standards, support and nursing leadership.

It is widely acknowledged that the Critical 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[12]. Furthermore, correlation has been established between nurse staffing levels in Critical Care and the incidence of adverse events[13]. Most recently, West et al.[14] 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. Appropriate preparation through post-registration education and training of specialist Critical 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 Critical 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 Critical Care services are delivered. Nurse leaders are well placed to take charge of factors known to affect outcomes, which include team work, inter-professional communication, standardised care processes and process compliance[15]. The Kings Fund[16] suggest 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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2.2.4   Advanced Critical Care Practitioners

Authors: Anna Batchelor & Carole Boulanger

INTRODUCTION

The purpose of the Advanced Critical Care Practitioner (ACCP) role is to provide care that is focused on patients and their needs, recognise acutely ill patients, initiate early treatment, support patients through critical illness and, where appropriate, enable a dignified death. The inclusion of ACCPs in the team will enhance continuity and quality of care.

The Advanced Critical Care Practitioner role facilitates a new way of working and complements existing roles within the Critical Care team.

STANDARDS

None.

RECOMMENDATIONS

1   An ACCP should successfully complete a two year Postgraduate Diploma which follows the Faculty of Intensive Care Medicine (FICM) ACCP curriculum.

2   Whilst working autonomously, the Advanced Critical Care Practitioner will always work within a multi-professional team led by a consultant who is trained in ICM.

3   ACCPs should be Associate Members of the FICM. ACCPS who trained before the publication of the FICM curriculum should apply to be assessed for equivalence.

4   ACCPs should complete the independent prescribing course.

5   ACCPs should acknowledge any limitations in their knowledge and skills, and must not perform clinical activities they do not feel skilled or competent to perform. As part of their training, they must develop a high level of clinical judgement and decision-making.

6   ACCPs should act within the formal code of conduct of their present statutory regulator. Trainee ACCPs are required to practise within the structure of the FICM curriculum and the National Education and Competence Framework, with the appropriate level of supervision.

7   An ICU resident may be a medical trainee, SAS doctor or ACCP.

BACKGROUND

The National Education and Competence Framework for Advanced Critical Care Practitioners[1] was published in 2008, and since then over 100 nurses and physiotherapists have entered training. ACCPs are now forming part of the Critical Care work force, in many situations working on the trainee medical rota.

The FICM ACCP curriculum based on the Framework will form 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 health care 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, and
- Make sure that each patient's treatment and care is based on best practice.

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2.2.5   Physiotherapy

Authors: Craig Brown & Sara Bolton

INTRODUCTION

Physiotherapy is one of the principle and most consistent therapy services for Critical Care. Traditionally the role of the physiotherapist was maintaining bronchial hygiene for intubated patients, but as the role has developed with improved research, the focus for patients has been directed towards earlier engagement with their environment and physical activity as soon as possible[1,2].

STANDARDS

1.1.6   Consultant Intensivist led multi-disciplinary clinical ward rounds within Intensive Care must occur every day (including weekends and national holidays). The ward round must have daily input from nursing, microbiology, pharmacy and physiotherapy.

1.3.6   The Critical Care team must have a physiotherapist of adequate experience and seniority who can help contribute/construct a suitable weaning plan for complex patients, or long stay patients, in conjunction with the wider multi-professional team[6].

1.3.7   Physiotherapy staffing must be adequate to provide the respiratory management and rehabilitation components of care[3].

RECOMMENDATIONS

1   There should always be an identifiable lead physiotherapist who will be accountable for the service provision, and provide suitable training and supervision to junior staff in development/training posts.

2   The service provision should be based upon the overall patient case-mix and the level of dependency of the patients. Staffing ratios should be set to enable early mobility and the physical rehabilitation of patients across the Critical Care environments.

3   A suggested ratio would be 1 wte physiotherapist to 4 ICU Level 3 beds, based on the costing template from CG83[3].

4   Physiotherapy intervention for physical rehabilitation should be such that those patients at high risk of developing Critical Care Acquired Weakness or those that have developed Critical Care Acquired Weakness should be offered 45-minutes of intervention per day over five days, depending on the patients' tolerance to input[4].

5   The routine secretion clearance of ventilated patients should be discontinued[5].

BACKGROUND

The National Stroke Quality Standards have suggested a minimum of 45-minutes per day of intervention over five days, for patients who may require more than one therapist to facilitate intervention[3]. Currently

there are no national data for the numbers of complex Critical Care Rehabilitation patients. Considering that the effects of Critical Care Acquired Weakness often leave patients unable to move initially, and may have long term effects up to five years[7,8,9], it seems appropriate that these Critical Care patients should have the same opportunity to meaningful interventions delivered by an appropriately trained physiotherapist.

Staffing ratios can be calculated according to the Critical Care case-mix, and intervention time delivered across a seven-day service throughout a year. This calculation will identify how many hours of Physiotherapy time would be required for the Critical Care Unit, and gives flexibility should the nature of the case-mix within the service change.

Suggestions for physiotherapy staffing ratios can be put at 1 wte to 4 ICU beds (Level 3) but there is little evidence to demonstrate why this should be the case nationally. Lancashire and South Cumbria Critical Care Network carried out a gap-analysis across eight Critical Care Units in 2006, and identified this ratio in order to ensure patients had adequate respiratory and rehabilitation interventions. This ratio was then used by NICE for the development of the costing template[5].

The Physiotherapy service provision for Critical Care has historically always included an out-of-hours/on-call service, as well as some provision for weekend work. The quality of this service can vary according to the time provided to patients, the case-mix of the patients seen at a weekend, and the skills of the physiotherapist providing those interventions. Some centres have already adopted a full seven-day service with dedicated specialist physiotherapists available across all seven days[10]. Local data from one of these centres suggest that patients have an increase in available contact with a physiotherapist, as well as increased time to start the mobility phase of their admission[10].

With the changing nature of the NHS services towards a seven-day culture, it is imperative that Critical Care services engage with their Therapy services to ensure adequate staff and skill mix for their specific patient cohort. These may be fully commissioned services as part of a specific service, for example Trauma, or through internal Service Level Agreements.

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2.2.6 Pharmacy

Authors: Emma Graham-Clarke & Mark Borthwick

INTRODUCTION

Clinical pharmacy (represented by two professions: pharmacists and pharmacy technicians) is an integral part of the multi-professional Critical Care team, delivering direct pharmaceutical care to patients, optimising pharmacotherapy in individual patients as well as on a unit-wide basis, and playing a key role in medicines management. There is good evidence that the direct inclusion of pharmacists within the team reduces medication errors, improves patient outcomes by enhancing and individualising drug therapy in addition to managing costs from drug budgets.

STANDARDS

1.4.1   There must be a Critical Care pharmacist for every Critical Care unit.

1.4.2   There must be sufficient pharmacy technical staff to provide supporting roles.

1.4.3   Clinical pharmacists providing a service to Critical Care must be competent to provide the service.

1.4.4   Clinical pharmacists who provide a service to Critical Care areas and have the minimum competencies (Foundation Level) must have access to a more senior specialist Critical Care pharmacist for advice and referrals.

1.4.5   Clinical pharmacy services must be ideally available 7 days per week. However, as a minimum the service must be provided 5 days per week (Monday-Friday). This must include attendance at consultant-led Multidisciplinary Ward Rounds.

1.1.6   Consultant Intensivist led multi-disciplinary clinical ward rounds within Intensive Care must occur every day (including weekends and national holidays). The ward round must have daily input from nursing, microbiology, pharmacy and physiotherapy.

RECOMMENDATIONS

1   Where Critical Care pharmacy services are provided for more than the traditional Monday-Friday (5-day) model, the minimum staffing level of 0.1 wte per Level 3 bed (or two Level 2 beds) should be increased proportionately.

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

3   Critical Care pharmacists should undergo an independent recognised process to verify competence level.

4   The most senior pharmacist within a Trust / Healthcare Organisation who routinely works on a daily basis with critically ill patients must be competent to at least Advanced Stage II (Excellence).

5   Where a team of Critical Care pharmacists is in place, there should be a structured range of expertise, from trainee to Fellow (Mastery) level.

6   Critical Care pharmacists are encouraged to become independent prescribers.

BACKGROUND

Critical 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].

Critical Care pharmacists must have appropriate skills, knowledge and time to achieve this.

The Faculty of the Royal Pharmaceutical Society (launched 2013) provides an independent recognition process for assessing pharmacist competency at three levels, reflecting the earlier knowledge and skills framework from the Department of Health (England)[5]. Advanced Stage I is equivalent to previous Foundation level, with Advanced Stage II equivalent to Excellence, and Fellowship equivalent to Mastery[6].

To date, few pharmacists have gone through this process, and it remains the responsibility of Chief Pharmacists (or equivalent) to ensure that pharmacists are competent for their role.

Since the Modernisation Agency document in 2002, practice has evolved, with pharmacists taking referrals, e.g. for nutrition or delirium, and becoming involved in research. External drivers, such as legislation and policy statements have resulted in developments including medicines reconciliation, and requirements for medicines storage and controlled drugs audits[7-8]. Also, data has emerged on the benefits a pharmacist brings to the multi-professional ward round[3-4] and independent prescribing, permitting optimisation of patient care[9]. Early data from a UK study of pharmacist clinical contributions (PROTECTED-ICU) shows a high intervention rate (1 in 6 items prescribed) for prescribing error identification and resolution, and additional medicines optimisation.

In comparison to medical and nursing teams, the pharmacy team will be very small. In many cases it will consist of just one or two practitioners, often shared with other job/clinical areas to make the post viable. It is crucial that appropriate proportional uplifts are applied to the core figure to ensure continuity of service for annual leave, sickness and study leave, etc., and these have not been accounted for in the core figure. The proportion for the uplift should start at 20% and may be greater if required to make the team workable.

Core Standards for Intensive Care Units 2013 gives guidance on staffing levels sufficient to provide a 5-day service. The provision of a 7-day service will clearly require additional time (overall, 0.12-0.14 wte per Level 3 bed or two Level 2 beds).

Wherever possible, structured teams of Critical Care pharmacists should exist to bring the highest levels of clinical pharmacy expertise to patient care, as well as to facilitate training, recruitment and retention of staff. Larger teams might typically comprise a Mastery level pharmacist and deputy, with the remainder of the team being a combination of Excellence and Foundation level pharmacists. Small teams or sole practitioners should consist of Excellence level practitioners as a minimum.

Pharmacy technicians provide a supportive role to pharmacists, undertaking activities such as stock management, budget reporting and sometimes medicines reconciliation. No specific staffing level for pharmacy technicians is recommended at this time because the requirement depends on local practices and circumstances.

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RESEARCH IN PROGRESS TO INFORM PRACTICE

- PROTECTED-ICU study. *A study of pharmacists' interventions (errors, optimisations and consultations) made over 14 days on 21 UK ICUs.*

2.2.7   Dietetics

Authors: Ella Segaran & Dannielle Bear

INTRODUCTION

Patients in the Critical Care setting are at high risk of malnutrition[1]. Those who are mechanically ventilated require artificial nutrition support (enteral or parenteral) to meet their nutritional needs, and those who are not intubated may still require nutrition support in the form of oral, enteral or parenteral nutrition. Recent evidence suggests that provision of nutrition to critically ill patients is complex, and that not all patients will gain the same benefit from nutritional support[2].

Given the lack of nutrition training and knowledge of healthcare professionals[3], 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. This section outlines recommendations for the role of the dietitian and clinical standards for dietetic provision that should be met for critically ill patients.

STANDARDS

1.5.1   All patients unable to take oral intake must normally have nutrition support (enteral or parenteral) commenced on admission, to ensure adequate nutrition to facilitate rehabilitation.

1.5.2   There must be a dietitian as part of the Critical Care multidisciplinary team.

1.5.3   The ICU lead dietitian will be involved in the assessment, implementation and management of appropriate nutrition support route, in collaboration with the rest of the MDT team.

RECOMMENDATIONS

1   The ICU lead dietitian should be able to demonstrate that they have appropriate training, professional development, skills and competence to understand the severity of illness of each patient so that they can manage the complex nutritional needs of all critically ill patients.

2   The ICU lead dietitian should provide training, support and appropriate supervision to junior staff working on the ICU.

3   A suggested ratio would be 0.05-0.1 wte dietitian per ICU bed as per *Core Standards for Intensive Care Units 2013*

4   The ICU lead dietitian should develop, implement and revise nutrition protocols in association with the multi-professional team, to ensure all patients receive timely, appropriate and cost-effective nutritional support, including initiating nutrition support out-of-hours.

5   The ICU dietitian will undertake a nutritional assessment to determine patients' nutritional risk and thereby those who will benefit the most from nutrition support. The outcome of the nutritional assessment will include recommendations for the most appropriate route of feeding and feeding regimen[1].

6   Suitably skilled and experienced ICU dietitians may undertake extended-scope practitioner roles
        including inserting feeding tubes, using ultrasound techniques to track muscle-wasting and indirect
        calorimetry to determine energy needs.

7   The ICU dietitian should lead nutrition-related audit and research to widen the evidence base and
        evaluate nutrition-related research.

8   The ICU lead dietitian should contribute to consultant-led ward rounds and MDT meetings, and have
        regular consultant communication where nutritional goals and plans are discussed.

9   The ICU lead dietitian should be part of the MDT patient goal-setting for Critical Care rehabilitation, to
        ensure adequate nutrition support is provided[4].

10   The ICU lead dietitian should provide on-going education and training for clinicians, nurses and AHPs
        and act as a resource for other professionals.

11   As a core member of the ICU multi-professional team, the ICU dietitian should contribute to ICU
        meetings and clinical governance activities.

BACKGROUND

Evidence suggests that accumulation of energy and protein deficits during an Intensive Care admission
results in poorer outcomes, including increased length of stay, prolonged mechanical ventilation and
increased infections[5,6]. Whilst feeding protocols have long been the standard of practice on the intensive
care unit (ICU), evidence continually suggests that their use alone is not sufficient to prevent these
nutritional deficits, and some degree of individualised nutrition support is recommended[7,8]. This may be in
the form of supplemental parenteral nutrition or post-pyloric feeding which require careful review to avoid
complications.

Provision of nutrition support in this group of patients is complex and not all patients will benefit to the
same degree. Consideration of many factors is needed, including current nutritional status, age, degree of
inflammation, number of organ failures, comorbidities and projected length of stay[1]. The dietitian is best
placed to advise on the most appropriate nutritional regimen for these patients and to provide on-going
monitoring[9,10].

Only a specialist dietitian and above will have the highly-developed knowledge, skills and expertise within
the field of Critical Care, to be able to manage the complex issues seen in these patients. This level of
advanced practitioner is required 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. They will also be
expected to undertake regular audit to ensure the effectiveness of the protocol and other nutritional
interventions.

Analysis from the International Nutrition Survey continually shows that there is a direct correlation between
the total number of funded dietitians in Critical Care and the better provision of nutrition support and earlier
initiation of enteral nutrition[2,11,12]. The combination of a dedicated ICU dietitian and feeding protocol was
required to increase energy provision, increase the use of combined feeding methods to achieve targets and
reduce inappropriate use of parenteral nutrition[13,14]. The dietetic provision was only equivalent to 0.02 wte
per bed in the Soguel et al study[13]. This was considered inadequate by the authors, and possibly contributed
to the failure to demonstrate further outcome benefits.

Within the first seven days after extubation, oral intake has been shown to be inadequate, with patients receiving <50% of estimated requirements[15]. Patients are at high nutritional risk as the result of the critical illness and poor nutritional intake. ICU patients who are discharged to the wards should continue to receive dietetic follow-up to support rehabilitation[4].

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2.2.8   Occupational Therapy
Author: Lauren Maher

INTRODUCTION

The published *Core Standards for Intensive Care Units* and activities of the Adult Critical Care Clinical Reference Group have set down guidelines for Staffing in Critical Care.   The CRG National Service Specification will be commissioned from 2015.   Adoption of this strategy nationally will have a beneficial impact on both quality of care and safety for patients.

STANDARDS

1.3.1   Assessment of the rehabilitation needs of all patients within 24 hours of admission to Critical Care and NICE 83 eligible patients on discharge from Critical Care must receive a rehabilitation prescription.

1.3.4   Patients receiving rehabilitation are offered a minimum of 45 minutes of each active therapy that is required, for a minimum of 5 days a week, at a level that enables the patient to meet their rehabilitation goals for as long as they are continuing to benefit from the therapy and are able to tolerate it.

RECOMMENDATIONS

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

2   The occupational therapy clinical lead should be responsible for providing training and clinical supervision for junior staff providing occupational therapy services in Critical Care.

3   The service provision should be flexible and based upon the overall patient case-mix of the Critical Care environment and the level of dependency of the patients.

4   All occupational therapy staff working in a Critical Care environment should adhere to the College of Occupational Therapists' Code of Ethics and Professional Conduct (COT 2010) and the Professional Standards (COT 2011).[1,2]

5   The Critical Care team should include a senior occupational therapist with sufficient experience to contribute to and develop rehabilitation programs that address the complex functional and cognitive needs of the patient cohort.

6   Occupational therapy staffing levels should be sufficient to provide physical and cognitive rehabilitation components of care, address complex seating needs and splinting fabrication, and facilitate access to ongoing support or rehabilitation services.

7   A suggested ratio would be 0.22 wte occupational therapist per Critical Care bed, taking into consideration length of time and number of staff members required for intervention[3].

BACKGROUND

Therapy services in Critical Care have not traditionally included rehabilitation or other therapeutic input from occupational therapists. 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[5,6,7]. There is an increasing evidence base that the long-term complex physical, cognitive, psychological and social needs of this patient cohort further support early intervention from a multi-professional therapy team[8-12].

The National Guidance for Rehabilitation after Critical Illness recommends that patient-centred rehabilitation programs should be commenced as early as possible[4]. Goals will be required to address the complex physical, cognitive and psychological needs of these patients and so experienced occupational therapists will be needed within the team for it to be able to deliver meaningful interventions which address these needs[7-9].

The *Core Standards for Intensive Care Units* and *The National Stroke Quality Standards* suggest a minimum of 45-minutes per day of intervention, over five days a week, at a level that enables patients to meet their rehabilitation goals. Considering the complex conditions of patients within the Critical Care environment, and the known effects of Critical Care Acquired Weakness, a significant number of these interventions will require input from more than one therapist[4].

There is limited evidence available to identify a national standard for staffing ratios of occupational therapists in Critical Care. Critical Care case-mix and amount of intervention time delivered across a service throughout a 12-month period could be used as a method for calculating a sufficient staff ratio for an individual service. However, referral methods must be considered to ensure that all suitable patients have access to therapy. A degree of flexibility should be available within the service to accommodate the requirements of any fluctuations in case mix.

Lancashire and South Cumbria Critical Care Network completed an *Audit of Unmet Need in Critical Care* over eight Critical Care Units in 2006. This identified a significant gap in the rehabilitation service from occupational therapists and suggested a ratio of 0.22 wte per Critical Care bed to ensure patients received adequate rehabilitation interventions and provision of splints and other adaptive equipment.

Traditionally, occupational therapy staffing does not include on-call services for Critical Care nor does it include weekend working. With NHS services moving towards seven-day service provision, it is essential that consideration be given to increasing Allied Health Professional (AHP) working in Critical Care to ensure sufficient staffing and continuity of care for this patient cohort[13]. Need for this may be best assessed on an individual service basis and established through local service level agreements.

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2.2.9   Speech and Language Therapy

Authors: Sarah Wallace & Susan McGowan

INTRODUCTION

People with Critical Care needs who have difficulty with communication and/or swallowing require access to a Speech and Language Therapy (SLT) service to maximise their choice, participation, safety and wellbeing. The specific value of SLT within the Critical Care setting has been highlighted in a number of national documents.

STANDARDS

1.3.2   All patients with a tracheostomy must have communication and swallowing needs assessed when the decision to wean from the ventilator has been made and the sedation hold has started.

1.3.4   Patients receiving rehabilitation are offered a minimum of 45 minutes of each active therapy, for a minimum of 5 days a week, at a level that enables the patient to meet their rehabilitation goals for as long as they are continuing to benefit from the therapy and are able to tolerate it.

2.10   Transfer from Critical Care to a ward must be formalised.

3.3   All staff must be appropriately trained, competent and familiar with the use of relevant equipment.

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

RECOMMENDATIONS

1   All people with Critical Care needs who have communication and/or swallowing difficulties should have access to an early, timely, responsive and appropriately skilled SLT service which can provide quality care.

2   While there is no agreed national guidance regarding the minimum staffing levels for SLT services in ICUs, local discussion and planning should ensure that there are sufficient SLT resources available to support the complex needs of these patients within a multi-professional context. Variations in SLT staffing provision should reflect the size and case-mix of the ICU and account for any unmet need.

3   The speech and language therapist should prescribe, apply and adapt a wide variety of high-and low-tech communication aids as required.

4   Organisations should support Critical Care competency programmes for speech and language therapists, and ensure SLTs are appropriately trained and competent in assessment and management of communication and swallowing difficulties and use of relevant equipment.

5   Speech and language therapists should provide regular intervention for swallowing and communication difficulties as required for the patient to meet their rehabilitation goals.

6   Critical care should have access to a speech and language therapist of adequate Critical Care experience and seniority who can help contribute to/construct a suitable weaning plan for complex, or long stay patients, in conjunction with the wider multi-professional team.

7   Transfer from Critical Care to a ward should include handover information on communication and swallowing difficulties, SLT recommendations and treatment plans.

8   SLT services for people with Critical Care needs should be provided within an integrated multi-professional context. They should deliver direct swallowing and communication input, and empower and educate others in these aspects of care.

9   Speech and language therapists should contribute to multi-professional clinical governance meetings and collaborative audit and research.

BACKGROUND

Intubation and tracheostomy have long been associated with high risks of dysphagia (swallowing difficulties) and aspiration[1]. The prevalence of swallowing dysfunction after extubation has been reported in 20-83% of patients intubated for longer than 48 hours[2,3]. Swallowing problems may be undiagnosed in the Critical Care population due to silent aspiration, yet they have a greater impact in this vulnerable group. Long duration of mechanical ventilation is independently associated with post-extubation dysphagia, which is independently associated with the need for tracheostomy, longer hospitalisation and poor patient outcomes[4]. The prevalence of communication difficulties in this population is reported to be between 16-24%[5] and causes significant patient anxiety and difficulty in participating in treatment decisions. Laryngeal injuries detected by specialist SLT endoscopy assessment occurred in 58% of tracheostomised/ventilated Critical Care patients, affecting airway protection, decannulation decisions and communication[6,7].

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 are due to the presence of equipment/technologies used to support life (e.g. tracheostomy). SLT expertise is therefore integral to the Critical Care multi-professional team (MDT) approach, providing specialist knowledge and skills which all people with complex communication or swallowing needs should be entitled to access[8,9,1].

The role of the SLT in Critical Care working within the MDT is to:
- Use specialist skills to inform differential diagnosis regarding the nature and cause of communication and swallowing difficulties, including higher level cognitive-linguistic difficulties/cognitive difficulties and disorders of consciousness.

- Carry out specialist instrumental assessment for swallowing difficulties such as Fibreoptic Endoscopic Evaluation of Swallowing (FEES) and Videofluoroscopy where appropriate.

- Provide specific communication and swallowing rehabilitation, goals, programmes, equipment and advice to optimise and maintain function, in liaison with the MDT.

- Provide screening, assessment and advice on laryngeal injuries and dysphonia, and tracheostomy speaking valve use.

- Reduce the impact of communication and swallowing difficulty "throughout the patient's journey from hospital stay and into primary care" by providing support[10].

- Provide training to the MDT and carers regarding communication and swallowing difficulties, in areas such as screening and managing non-complex difficulties.

- Assess and manage swallowing and communication in ventilator-dependent and tracheostomised patients, contributing to the MDT assessment of weaning and the ability of the patient to safely swallow oropharyngeal secretions and oral diet and fluids.

- Identify communication and swallowing difficulties that may impact on the patient's ability to function in their normal environment, and support appropriate discharge destination planning and referral to rehabilitation if required (including patients with higher level cognitive communication difficulties).

- Carry out clinical audit and engage in collaborative research (e.g. user experience) and evaluate patient outcomes of SLT intervention.

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2.2.10 Practitioner Psychologists

Authors: David Howell & Dorothy Wade

INTRODUCTION

A significant number of patients in Critical Care suffer acute psychological distress and frightening symptoms such as hallucinations and delusions. Many go on to develop serious psychological problems including post-traumatic stress disorder (PTSD) following their admission. Relatives and staff may also be stressed by Critical Care. Input by practitioner psychologists (health, clinical or counselling) is needed to reduce the stress and trauma experienced in Critical Care. This section makes recommendations and highlights clinical standards that are relevant to the care of critically ill patients who are psychologically harmed by their experience of Critical Care.

STANDARDS

1.3.3   All patients will be screened for delirium.

2.16   Patients discharged from ICU must have access to an ICU follow-up clinic.

1.3.1   Assessment of the rehabilitation needs of all patients within 24 hours of admission to Critical Care and NICE 83 eligible patients on discharge from Critical Care must receive a rehabilitation prescription.

1.3.5   Patients must have all rehabilitation outcomes quantified using a tool that can track progression from the Acute sector into Primary care to facilitate care needs in the Community.

2.7   Each patient must have an assessment of their rehabilitation needs within 24 hours of consultant admission to Critical Care.

2.10   Transfer from Critical Care to a ward must be formalised.

RECOMMENDATIONS

Psychological input can play a vital role both in the acute Critical Care setting, and as part of the patient's follow-up care, both in-hospital and post-hospital.

1   In the acute setting, a psychologist should:

- Provide or supervise the psychological assessment of all patients, both in the ICU and after transfer to other wards
- Provide psychological support to patients, relatives and staff. There is evidence showing that all three groups suffer from significant stress and traumatic reactions. Staff provision may include group stress management sessions and drop-in sessions.
- Provide training to:
  - o increase staff knowledge and understanding of psychological reactions and psychological outcomes of ICU patients, and
  - o increase staff competency in providing basic psychological support to Critical Care patients, particularly those who are distressed, agitated, hallucinating or delusional.

- Play a role within the MDT, attending ward rounds, and being available for consultation by other staff on matters relating to communication, sleep, effects of sedation, anxiety, stress, mood, delirium and family issues. A psychologist should also be involved in developing holistic care plans for long-stay patients.

2   The psychologist should play a full role in the follow-up care of Critical Care patients including:

- Assessing and supporting patients who suffer traumatic stress reactions, such as flashbacks to frightening delusions, or depression, after their transfer to other wards
- The psychological (emotional and cognitive) assessment of patients attending Critical Care follow-up clinics
- In a well-resourced follow-up clinic, psychologists should offer sessions of trauma-focused cognitive behavioural therapy (CBT)[1]. If not possible, they can make recommendations to GPs and/or Community Mental Health Teams regarding further appropriate psychological treatment in the community.

3   Ideally, to fulfil all of these important roles, a large unit should employ a full-time practitioner psychologist registered with the Health and Care Professions Council (HCPC). However, a smaller unit could be served by a half-time psychologist. At the very least, units should have access to dedicated sessions from an HCPC-registered practitioner psychologist.

BACKGROUND

There is increasing evidence that the psychological impact of a Critical Care admission can be severe. It is known that patients experience extreme stress[2,3] and altered states of consciousness[4] in intensive care. Subsequently, there is a high prevalence of psychological morbidity including post-traumatic stress disorder (PTSD)[5], depression[6] and anxiety among Critical Care survivors. Studies have found that more than half of Critical Care patients suffered symptoms suggestive of a psychological disorder in the months after their admission[3].

Patients are exposed to many stressors in the ICU, including illness, pain, sleep deprivation, thirst, hunger, dyspnea, unnatural noise and light, inability to communicate, isolation and fear of dying. They also commonly have extreme emotional reactions in response. Interventions, such as mechanical ventilation or invasive monitoring for cardiovascular support, may be difficult for patients to tolerate. Furthermore, the onset of delirium, including frightening symptoms, such as hallucinations and paranoid delusions, is common in intensive care.

Acute stress in the Critical Care unit has been shown to be one of the strongest risk factors for poor psychological outcomes after intensive care[2,3] and therefore it is important to detect it and minimise it where possible. It is known that healthcare staff who have not been trained in mental health may find it difficult to recognise acute psychological stress, including psychosis-like symptoms, in patients. Therefore many highly distressed patients do not receive psychological support in Critical Care units, and continue to suffer serious distress after discharge from Critical Care.

In the UK, the 2009 National Institute for Health and Care Excellence (NICE) guideline CG83[7] states that patients should be assessed during their Critical Care stay for acute symptoms such as anxiety, depression, panic episodes, nightmares, delusions, hallucinations, intrusive memories, flashback episodes and underlying psychological disorders, to determine their risk of future psychological morbidity. An intensive care psychological assessment tool (the IPAT) has recently been validated and may be used by appropriately trained Critical Care staff for this purpose[7,8]. Psychological support should be provided as part of patient's rehabilitation and recovery pathways in the ICU, on the general wards and after their return home.

There is also evidence that the Critical Care experience is traumatic for families, and relatives frequently suffer from PTSD (33% in one study) once their family member has left the ICU[9]. A Critical Care psychologist can play an important role in communicating with distressed families and listening to and helping to calm their fears. Critical care staff, both nurses or doctors, have also been shown to suffer from high rates of stress, burn-out and even PTSD in a number of large studies.

The work of psychologists in Intensive Care has rarely been evaluated, but clinical case reports suggest that a range of psychological therapies could be beneficial for distressed intensive care patients[10]. An intervention to introduce the input of psychologists to an Italian Critical Care Unit reduced the incidence of PTSD a year later with a large effect-size (using a historical, not randomised control design)[11].

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- Recent editorials in the Critical Care literature have emphasised the need for psychological interventions in the Critical Care setting to be evaluated. This work is now underway, with randomised controlled trials in both the UK (https://www.icnarc.org/Our-Research/ Studies/Poppi/About) and the US planned to evaluate the effectiveness of CBT-inspired psychological interventions carried out in Critical Care.

Chapter Three

Critical Care Service — Process

3.1   Patient Pathway

3.1.1   Admission, Discharge and Handover
Author: Jane Eddleston

INTRODUCTION

Minimising delays to definitive treatment is associated with better outcomes. Escalation of care up to and including Critical 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 Critical Care should be delivered by a multi-professional team, and hand-over standardised for all clinical groups. Treatment plans must be produced immediately after referral and constantly revised.

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.

STANDARDS

1.1.5   A consultant in Intensive Care Medicine must be immediately available 24/7, be able to attend within 30 minutes and must undertake twice daily ward rounds.

1.1.6   Consultant Intensivist led multi-disciplinary clinical ward rounds within Intensive Care must occur every day (including weekends and national holidays). The ward round must have daily input from nursing, microbiology, pharmacy and physiotherapy.

1.3.1   Assessment of the rehabilitation needs of all patients within 24 hours of admission to Critical Care and NICE 83 eligible patients on discharge from Critical Care must receive a rehabilitation prescription.

2.2   There must be documentation in the patient record of the time and decision to admit to Intensive Care[2].

2.3   Admission to Intensive Care must occur within 4 hours of making the decision to admit[3].

2.4   Patients must not be transferred to other Intensive Care Units for non-clinical reasons.

2.5   On admission to Intensive Care all patients must have a treatment plan discussed with a consultant in Intensive Care Medicine[4].

2.6   Patients must be reviewed in person by a consultant in Intensive Care Medicine within 12 hours of admission to Intensive Care[4,5].

2.8   There must be a standardised handover procedure for medical nursing and AHP staff for patients discharged from Critical Care Units[6,7].

2.9   Patients need a clear and safe pathway for escalation of care from Level 2 care to Level 3.

2.10   Transfer from Critical Care to Ward must be formalised[7].

2.11   Discharge from Critical Care to a general Ward must occur within 4 hours of the decision.

2.12   Discharge from Critical Care must occur between 0700hrs and 2159hrs[8].

2.13   Unplanned readmission rate to ICU within 48hrs of discharge, to a ward, must be minimal.

2.16   Patients discharged from ICU must have access to an ICU follow-up clinic.

2.17   Geographically remote ICUs must have an established review/referral relationship with a bigger centre.

RECOMMENDATIONS

1   Unplanned re-admission rate to Critical Care within 48 hours of discharge to a Level 0 or Level 1 facility should be recorded, and be ≤1.8% of all discharges[1].

BACKGROUND

Studies from the UK Case-Mix Programme of the Intensive Care National Audit and Research Centre (ICNARC) confirm the prognostic importance of timely admission to ICU 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.

The presence of routine multi-professional clinical rounds affords patients continuity of care, reduces variation, reduces cost and optimises outcomes.

Discharge from Critical Care should also be timely (within four hours of decision to discharge) and occur as early as possible in the day to permit familiarisation of the patient with the ward staff. A standardised handover procedure should accompany the discharge. This should include:

- A summary of 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.

The receiving (ward) consultant responsible for ongoing care needs to be directly involved in this process. The discharge process must ensure compliance with the NICE 50 and 83 Short Clinical Guidelines.

The prevalence of unplanned re-admission within 48 hours in the UK is ≤2% (median 1.8% CMP 12/13) and a high rate of early re-admission (within 48 hours) could reflect premature discharge, incorrect use of ward care, deficient hand-over of the patient during the discharge process, or a poor response to treatment despite appropriate care.

Re-admission is generally associated with increased hospital stay, increased consumption of resources and greater morbidity and mortality.

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3.1.2   Critical Care Outreach

Author: Sarah Quinton

INTRODUCTION

Critical Care as a specialty has developed over the past decade to include Critical Care Outreach Services (CCOSs). CCOSs support all aspects of the acutely & critically ill patient pathway, including early identification of patient deterioration, timely admission to a Critical Care bed when required and delivery of effective follow-up for patients post discharge. CCOSs are also fundamental in providing educational support to enhance skills and knowledge of the multi-professional ward teams in general ward areas when caring for the at-risk and deteriorating patient.

These activities address recommendations in NICE Clinical Guideline 50[1] and 83[2].

Comprehensive Critical Care Outreach (3CO) can be defined 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", defined by seven core elements[3]:

- **P**atient Track and Trigger
- **R**apid response
- **E**ducation, training and support
- **P**atient safety and clinical governance
- **A**udit and evaluation; monitoring of patient outcome and continuing quality care
- **R**ehabilitation after critical illness (RaCI)
- **E**nhancing service delivery

STANDARDS

2.1   There must be a hospital wide standardised approach to the detection of the deteriorating patient and a clearly documented escalation response.

RECOMMENDATIONS

1   All hospitals should use NEWS (National Early Warning Score)[4] or an equivalent validated Track and Trigger system that allows rapid detection of the signs of early clinical deterioration in all adult patients over 16yrs (except pregnant women and those requiring palliative care)[3,4,5]. All eligible patients should have NEWS observations undertaken at least 12-hourly, with escalation in frequency of recording as part of an agreed hospital-wide graded response.

2   Each hospital should have a graded clinical response strategy consisting of three levels of response (low, medium, & high)[1,4]. Each level 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/urgency of response, including a clear escalation policy to ensure that an appropriate response always occurs and is available 24/7.

3   Each organisation should ensure patients receive care from appropriately trained Critical Care Outreach/Rapid Response personnel. CCOS staff should have annual competency-based assessments of

core and additional specific competencies relating to first-line clinical assessments and intervention should be clearly outlined and closely reflect the DH Competencies for recognising and responding to acutely ill patients in hospital[6]. There should be accessible educational support for registered and non-registered ward staff in caring for critically and acutely ill ward patients in accordance with Recorder and First Responder levels outlined in the DH competencies[6], with particular emphasis on training in the locally used Track and Trigger system and instigation of the referral process.

4   Organisations should deliver the seven core elements of Comprehensive Critical Care Outreach (3CO), with an operational policy that should outline the team's remit within the hospital and include the seven core elements of comprehensive Critical Care outreach.

5   All CCOSs should participate in the "National Critical Care Outreach Activity Outcome Data Set"[3], and develop an audit tool to assess utilisation of their Track and Trigger and graded response system, with clear governance procedures for action against poor compliance . This should be undertaken in combination with an audit of compliance against the standards within CG50 and should be fed back to hospital Boards and Networks where relevant.

6   Each hospital should be able to provide a Critical Care Outreach/Rapid Response Team that is available 24/7[3,5]. There should be regular reviews 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 hospital Board level with appropriate communication cascade[7].

BACKGROUND

The introduction of Critical Care Outreach Services was recommended in the year 2000[7] in response to evidence demonstrating the adverse consequences of failure to recognise and respond to obvious physiological deterioration. The aim was to ensure patients received timely intervention regardless of location, with Outreach staff sharing Critical Care skills with ward-based colleagues to improve recognition, intervention and outcome. Subsequent recommendations for the implementation of CCOSs have emerged from the Intensive Care Society (2002); NOrF (2003); NCEPOD (2009) and the Critical Care Stakeholder Forum (2005)[5,8,9].

Historically, CCOS and team configurations have developed on an ad hoc basis dependent upon perceived local need and resources available, with wide variety in the provision of services. Additionally, the level of investment in education and preparation of outreach personnel has varied between organisations. Recently, NOrF has developed Operational Standards and Competencies for CCOSs to redress this absence and provide a standardised operational framework for Critical Care Outreach Teams, whilst recognising the organisational links required with other hospital providers to facilitate provision of a robust 24-hour service.

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- METHOD Study– *Medical Emergency team: Hospital Outcomes after a Day* , Subbe et al

3.1.3   Rehabilitation

Authors: Craig Brown & Steve Brett

INTRODUCTION

In 2009, NICE published guidance for *Rehabilitation after Critical Illness*[1] emphasising improved identification of need, access and quality of rehabilitation, both during the ICU admission and upon discharge into the community. At the time of this publication it was estimated that around 140,000 people per year are discharged after a Critical Care stay; many of these people will benefit from a rehabilitation programme.

Optimisation of recovery from critical illness is now a therapeutic objective (as well as survival), which requires a multi-professional and multiple therapy approach.

STANDARDS

1.3.1   Assessment of the rehabilitation needs of all patients within 24 hours of admission to Critical Care and NICE 83 eligible patients on discharge from critical care must receive a rehabilitation prescription[1].

1.3.2   All patients with a tracheostomy must have communication and swallowing needs assessed when the decision to wean from the ventilator has been made and the sedation hold has started[2].

1.3.3   All patients will be screened for delirium[3].

1.3.4   Patients receiving rehabilitation are offered a minimum of 45 minutes of each active therapy that is required, for a minimum of 5 days a week, at a level that enables the patient to meet their rehabilitation goals for as long as they are continuing to benefit from the therapy and are able to tolerate it[4].

1.3.5   Patients must have all Rehabilitation outcomes quantified using a tool that can track progression from the Acute sector into Primary care to facilitate care needs in the community[5].

RECOMMENDATIONS

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

2   All complex/high risk patients should have a named Key Worker allocated to co-ordinate patient/carer liaison with therapy services, and to ensure that assessments, outcome measures and goals are collated and transferred to the community services.

3   A structured (and eventually nationally consistent) integrated care pathway for hospital discharge must be employed to facilitate care at home or closer to home for patients whose needs can be met in the community.

4   A Rehabilitation Prescription transfer of patient information should record rehabilitation requirements including physical, functional, communication, social, spiritual, nutritional and psychological aspects and have nationally agreed assessments and outcome measures.

5   All patients should have individualised goals set for rehabilitation. For those assessed as low-risk this may take the form of a simple bedside discussion during the ward round. By contrast high-risk patients will require a focused MDT with weekly goals set, documented and audited. These will be set in conjunction with the patient and/or carer where appropriate.

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

7   For high-risk/complex patient the opportunity to capture the experience should be offered to the patient and family in a manner which they can reflect upon and engage with during the time spent in hospital. 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.

BACKGROUND

Admission to ICU may be as an elective or an emergency case. Some patients have a protracted length of stay (LOS) from days to months and some patients may die during their admission.

There are no nationally or internationally agreed time-frames for what constitutes a prolonged ICU LOS, although this is known to be associated with physical, psychological and social morbidity and higher mortality over five years compared to age and sex matched populations[6,7].

The social impact of Critical Care admission in particular can often be underestimated, so that within the first year after discharge, a third of patients experience a negative impact upon their employment status.

All patients passing through ICU should have prospective screening for these known morbidities, repeated regularly, especially as patients move across organisational boundaries. Early mobility and the social re-engagement of patients whilst in the acute setting can help reduce these effects during their inpatient stay[8,9].

The therapy provided to patients should be case-mix dependent, and be flexible enough to recognise changing needs. For example, for some patients the cognitive and psychological recovery may become more prevalent than the physical recovery, and therefore this change needs to be reflected with the provision of the relevant professionals and their time.

There are currently no nationally standardised tools for assessment of process or outcome for this patient population, limiting local and national comparisons and restricting the ability to share a common link with the wider rehabilitation community.

Recovery, especially from the psychological impact of Critical Care, can take time and often continues into the community setting. The impact to the patient can take the form of post-traumatic stress disorder (PTSD)[9] and family/carer dynamics need to be considered, as they become the main carers in the majority of cases[5]. Strategies to support both the families and patients have included the use of a diary to enable the patient to understand the complexity of their medical situation as well as enabling family and visitor's to reflect on difficult emotions[10].

The patient pathway, or Rehabilitation Prescription, from the acute ICU into the community setting should, where possible, maximise the chances of patients re-establishing their pre-admission social and occupational

framework; this can be complicated by multi-agency responsibility. Within this pathway, it is essential that co-ordination of services can be facilitated with clear communication around comprehensive goals and standardised outcome measures.

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3.1.4   Outpatient Follow Up: Rehabilitation after Critical Illness

Authors: Carl Waldmann & Melanie Gager

INTRODUCTION

Critical illness leaves patients at risk of long-term physical and psychological problems. Leaving ICU is the start of a long recovery process, and there may be a considerable impact on patient morbidity and survival. Implementation of an ICU follow-up service has allowed provision of support following hospital discharge and the management of complications effectively. In 1989, the Kings Fund report[1] highlighted that morbidity as well as mortality should be considered following intensive care: 'there is more to life than measuring death'. The National Audit Commission (*Critical to Success*)[2] and the National Expert Group (*Comprehensive Critical Care*)[3] have since echoed the need to focus on quality of life after-discharge.

STANDARDS

2.16   Patients discharged from ICU must have access to an ICU follow-up clinic[4].

RECOMMENDATIONS

1   20-30 minute appointments should be offered at two, six and twelve months following hospital discharge, by a team consisting of intensivists and nurses with appropriate expertise. Other disciplines may need to be present such as clinical psychologists.

2   Selection of patients who need to attend should be based on length of stay (>4 days) or risk (e.g. following anaphylaxis, or post-partum Critical Care).

3   Follow-up should involve actively seeking common physical sequelae such as weakness and sexual dysfunction[4,5] and the consequences of ICU-related procedures (e.g. tracheostomy).

4   Psychological sequelae, such as nightmares and post-traumatic stress disorder, should be considered; this is facilitated by review of clinical notes with patients and family or writing of a diary[6].

5   There should be regular communication with the patient's GP and, where appropriate, referrals for psychological and physical problems should be coordinated.

6   Setting up of an ICU Patient and Relatives support group should be encouraged.

BACKGROUND

Follow-up facilitates service evaluation and audit of the standard of the ICU care given to patients. It has a fundamental role in assessing long-term outcomes. The follow-up appointments are a convenient point in time to review patients. Patients are typically seen 2, 6 and 12 months after discharge; there is an outpatient tariff to pay for the consultations.

One of the services offered to patients who have had tracheostomies, is the organisation of surgical referrals when needed to improve cosmetic outcome. Though rarely necessary following percutaneous tracheostomy, this surgery can be performed as an outpatient in ENT departments under local anaesthesia to improve the appearance of any tethering. This group of patients may also be referred for MRI scans to exclude the presence of tracheal stenosis, and to give reassurance to anaesthetists should the patients require future surgery.

Continuity of care by intensivists enables early diagnosis and management of ICU problems. 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, including the Traumatic Stress Counselling service. The follow-up clinic enables quality assurance of the Critical Care service provided to both patients and relatives.

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3.1.5   The Patient and Relative Perspective

Author: Keith Young

INTRODUCTION

Any admission to an intensive care unit is likely to be unexpected, frightening and life-changing. Recognising the patient as an individual and involving them (where this is possible) and family members in the decision-making process about their care and treatment will, in most cases, bring a better understanding of what is involved, and may help reduce difficulties later. Many patients will, initially, be unaware of where they are or what is happening because they will be sedated, either as a consequence of their clinical condition, or as a part of their treatment. For their friends or relatives however, the impact will be immediate, traumatic and highly stressful. Very few people will have been in an Intensive Care Unit before, and for many the reality can be very different to that sometimes portrayed in the media. It can be noisy, with aural alerts going off unexpectedly. It is also busy - with staff frequently moving around throughout the day and often at night. It can also be visually alarming with many patients looking very sick but also hooked-up with wires and lines to monitors, pumps, ventilators or various other items of equipment.

STANDARDS

1.3.1   Assessment of the rehabilitation needs of all patients within 24 hours of admission to Critical Care and NICE 83 eligible patients on discharge from Critical Care must receive a rehabilitation prescription.

1.3.3   All patients will be screened for delirium.

1.3.4   Patients receiving rehabilitation are offered a minimum of 45 minutes of each active therapy that is required, for a minimum of 5 days a week, at a level that enables the patient to meet their rehabilitation goals for as long as they are continuing to benefit from the therapy and are able to tolerate it.

1.3.5   Patients should have all Rehabilitation outcomes quantified using a tool that can track progression from the Acute sector into Primary care to facilitate care needs in the community.

2.7   Each patient must have an assessment of their rehabilitation needs within 24 hours of admission to Critical Care.

2.16   Patients discharged from ICU should have access to an ICU follow-up clinic.

RECOMMENDATIONS

1   Establish effective communications with relatives and patients. All staff, particularly clinical staff, should introduce themselves to relatives and patients and explain their role in the care of the patient.

2   Relatives and patients will often want to know something of the treatment being given, the risks involved and possible outcomes. Relatives will also want to know what they, as visitors, can do to help their loved one.

3   Time spent talking to patients and their relatives about their condition, treatment and possible outcomes is rarely time wasted and is nearly always beneficial. When possible, patients and relatives must be involved in discussions on treatment options, which would include explaining to them some of the possible consequences of a stay in Intensive Care. Although it may not be possible to talk to patients who are sedated or unconscious, it is widely recognised that many who do appear in this state may still retain some degree of comprehension, so it is good practice to explain what is being done to them in simple terms even if a response is not apparent. Additionally, initiatives such as patient diaries, can assist greatly during the recovery stage by appraising the patient of what has happened to them or of the treatments given, etc. Such diaries can be beneficial if maintained on behalf of the patient by a relative and continued after the patient has been discharged from the Unit or even from the hospital as many patients continue to suffer confusion or disorientation after they have returned home.

4   Do not 'talk over' patients or their relatives.

5   Communications with relatives or carers may be especially important when the patient has learning difficulties or is otherwise mentally or physically disabled. This, of course, includes elderly patients who may have dementia or other psychological difficulties.

6   The most important concern for patients and their relatives is the likely outcome of the spell in intensive care. Relatives and patients should be given realistic predictions and feel informed and involved in their own recovery.

7   Efforts should be made to appraise patients and families/carers of the support services, particularly rehabilitation services, which are available in their local community. This is a major concern to many patients, and an early assessment of rehabilitation needs is essential, along with effective coordination with community services.

8   Local patient-support groups, such as those organised under the auspices of ICU Steps, can bring significant help to many patients and their families at a local level. They can also complement information from patient-satisfaction surveys and help inform patient services and patient/patient relatives' experience within Units.

9   Unfortunately, for some patients recovery will not be possible. In these cases, once the initial shock has passed, most relatives will want reassurance that effective pain relief and palliative care will be available. Where this is likely to be the situation, palliative-care teams should be involved, and the patients and family members reassured that pain relief and management will be available. It must be recognised that for many patients, the fear of being in pain is one of the biggest anxieties that they have.

BACKGROUND

For many patients, a spell in intensive care is sudden, unexpected and traumatic, but may be a relatively short interlude within their overall journey from the onset of the illness to their eventual recovery. Recognising patients as individuals and – where this is possible – involving them and, if they agree their family members, in decisions regarding care and treatment can provide valuable opportunities to improve initial care and ongoing treatments. Treatment and care should take account of peoples' needs and preferences.

It is important to explain to relatives the possible consequences of a stay in Intensive Care, especially if the patient is a parent with young children who may be visiting. For instance, many patients in Intensive Care will change appearance physically, either as a consequence of the reason for their admission, or as a result of their treatment, and this can be especially frightening. Similarly, reducing their sedation may cause

disorientation, hallucination and anxiety, or they may become extremely angry and bad tempered. It is important that relatives (and patients if possible) understand that this is normal and will pass with time.

It is important not to 'talk over' patients or their relatives. Apart from being rude, it is important to recognise that patients and relatives do not automatically lose intelligence or understanding because they are ill or because they are concerned or stressed. It is also widely recognised that many patients who are sedated or apparently unconscious may retain the ability to hear and understand something about what is happening to them. Inability to communicate or respond does not automatically equate to inability to hear.

Most relatives will know the patient and what they are normally like or what their normal reactions may be, and this can have a significant impact on how treatments are provided or on predicting reaction to treatment. Insights into a patient's likes and dislikes, character and opinions can all be relevant and assist with the recovery plan. Pre-existing chronic conditions may distort or mask reactions to tests or treatments, and relatives can often assist in these situations. This is particularly important if the patient has learning difficulties or is psychologically or physically disabled making direct communication or understanding difficult.

For those that do recover, it is reported that for many patients loss of memory and disorientation following a period of sedation is one of biggest hurdles to overcome, and this can be significant even before they are discharged from Intensive Care. Steps to help remedy this may include patient-diaries, pictures, and the introduction of exercise that can assist with the restoration of function[1-2]. Access to follow-up clinics may assist with this process.

However, the consequences of the patient's spell in intensive care may still be prolonged, and impact on their overall recovery. The extent to which support services, particularly rehabilitation services, will be available in their local community is a major concern for many patients. In developing clinical guidelines on rehabilitation following critical illness, NICE drew attention to the need to involve local services[3]. This may become increasingly relevant as intensive care (and other specialist services such as Trauma) is concentrated in centralised centres. Concern over the availability of support services locally and the impact on lifestyle and family commitments of, say, long journeys for follow-up clinics or out-patient visits are major concerns for patients and families.

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Chapter Four

Critical Care Service — Activity

4.1   Disease Management

4.1.1   Sepsis
Author: Anthony Gordon

INTRODUCTION

Sepsis is the most common reason for admission to general Intensive Care units. Mortality rates remain high and, although trials of new therapeutics have generally been negative, there is emerging evidence that mortality rates from sepsis are improving. This would appear to be due to improved recognition of sepsis and illness severity by all clinical staff, and more timely, standardised management. There is consensus that early treatment with appropriate antibiotics and fluid resuscitation improves outcomes for patients.

STANDARDS

1.1.5   A consultant in Intensive Care Medicine must be immediately available 24/7, be able to attend within 30 minutes and must undertake twice daily ward rounds.

1.1.6   Consultant Intensivist led multi-disciplinary clinical ward rounds within Intensive Care must occur every day (including weekends and national holidays). The ward round must have daily input from nursing, microbiology, pharmacy and physiotherapy.

2.1   There must be a hospital wide standardised approach to the detection of the deteriorating patient and a clearly documented escalation response.

2.3   Admission to Intensive Care must occur within 4 hours of making the decision to admit.

2.5   On admission to Intensive Care all patients must have a treatment plan discussed with a consultant in Intensive Care Medicine.

2.6   Patients must be reviewed in person by a consultant in Intensive Care Medicine within 12 hours of admission to Intensive Care.

2.9   Patients need a clear and safe pathway for escalation of care from Level 2 care to Level 3.

2.17   Geographically remote ICUs must have an established review/referral relationship with a bigger centre.

RECOMMENDATIONS

1   Early signs of sepsis can easily be missed, especially by inexperienced staff. Hospitals should have a standardised system so that all staff recognise acutely ill patients developing sepsis, for example the National Early Warning Score (NEWS).

2   Although there remains uncertainty about the value of protocolised resuscitation, all patients with sepsis-induced tissue hypoperfusion should be resuscitated promptly. Hospitals should have local

guidelines to assist junior doctors in the recognition, resuscitation and early management of sepsis. Useful toolkits can be downloaded from the UK Sepsis Trust.

3   Relevant microbiological samples for culture (including blood cultures) should be taken before antibiotics are started. This sampling should not significantly delay antibiotic treatment. In patients with sepsis-induced acute organ failure, hypoperfusion or shock, broad-spectrum intravenous antibiotics to cover likely pathogens should be administered within one hour of diagnosis. In stable patients, in whom the diagnosis of infection is uncertain, it may be appropriate to wait for the results of microbiological testing.

4   During the first six hours of resuscitation, the priorities should be to ensure adequate intravenous fluid replacement, administration of vasopressors to maintain a target mean arterial pressure, and consideration of inotropes and red-cell transfusion if oxygen delivery is deemed to be inadequate.

5   Hospitals should have local guidelines about appropriate antibiotic choices for different sites of infection, taking into consideration local resistance patterns. Antibiotic prescriptions should be reviewed daily, preferably with specialist microbiological input, to consider de-escalation/stopping/changing if appropriate.

6   Radiological services, including ultrasound and CT scanning, should be available 7-days per week to aid sepsis diagnosis and potentially drain infected collections. If applicable, source control (percutaneous drainage/surgery) should be undertaken as soon as practically possible and within 12 hours.

7   If intravascular catheters are a likely source of severe sepsis, they should be removed promptly (and sent for culture) after other vascular access has been established. Intravascular catheters should be sited using aseptic non-touch techniques. Central vascular catheters should be sited using full sterile gowns and drapes.

8   Crystalloids should be the initial resuscitation fluid. Hydroxyethyl starches may lead to worse outcomes, including renal dysfunction, and should be avoided.

9   Fluid therapy should be titrated using dynamic measures, e.g. pulse-pressure/stroke-volume variation, cardiac output, oxygen delivery, lactate clearance. Repeated fluid challenges and re-assessments will generally be required to ensure adequate fluid resuscitation. Excessive fluid administration should be avoided if there is no improvement in haemodynamics.

10   A target mean arterial pressure should be defined. For most patients 65-70mmHg is appropriate. Occasionally, higher targets may be needed in chronic hypertensive patients, especially if hypoperfusion is evident at lower blood pressures. Similarly in younger, previously healthy patients a lower blood pressure may be adequate if perfusion is adequate.

11   Noradrenaline is the initial vasopressor of choice, and must be administered via a central venous catheter. Dopamine leads to a higher rate of tachycardia and arrhythmias. Patients requiring vasopressor therapy should have an arterial catheter placed to measure invasive blood pressure and for blood sampling.

12   Acute lung injury is common in sepsis. Mechanical ventilation should be readily available for all patients who have severe sepsis. The ventilation strategy should be lung-protective (i.e. tidal volumes limited to ~6mls/kg of ideal body weight and plateau pressure limited to 30 cmH$_2$0). More detailed guidance is available from the ARDSnet website.

13   Patients who have sepsis are at high risk of developing acute kidney injury. The ability to offer timely renal replacement therapy must be available. If renal replacement therapy cannot be provided in the treating hospital,then a robust service level agreement with another hospital must be in place to accept such patients without delay.

BACKGROUND

There are more than 30,000 admissions to ICU due to sepsis in the UK each year, and the number is rising[1]. Mortality rates remain high and there are more deaths in the UK from sepsis than from either breast or colon cancer. In 2004, a set of internationally agreed guidelines for the management of sepsis (*Surviving Sepsis Campaign*) were published, and these have been updated every few years[2]. Over the last decade there is evidence that mortality rates from sepsis are now beginning to fall[3]. Although there may not be uniform agreement about all aspects of these clinical guidelines, there is some evidence to suggest that improved compliance with the guidelines may be associated with improved outcomes[4].

The focus of good sepsis management centres on early recognition and prompt treatment. Although there is some debate about the exact components of resuscitation and what targets to aim for[5] [6], the goals of sepsis management should be to restore intravascular volume, and to ensure an adequate blood pressure and cardiac output to perfuse vital organs. Treating early with appropriate antibiotics (with source control when possible) improves outcomes[7], and it is therefore important to take microbiological cultures and have local antibiotic policies that reflect local resistance patterns. Local guidelines help empower junior doctors to begin appropriate treatment promptly for patients who have sepsis, wherever they may present within the hospital. It is important that a senior doctor experienced in sepsis management reviews all patients who have sepsis at an early stage.

Recent sepsis trials have demonstrated that synthetic starches lead to a worse outcome compared to crystalloids[8,9], that dopamine leads to more arrhythmias that noradrenaline[10] and that using higher doses of catecholamines to achieve higher blood pressure targets adds no clear advantage and may lead to more side-effects[11].

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4.1.2   Acute Respiratory Failure

Authors: Mark Griffiths & Gavin Perkins

INTRODUCTION

Over 100,000 patients per year with acute respiratory failure (ARF) are admitted to ICU in the UK for mechanical ventilation. Whilst a proportion of these patients will fulfil diagnostic criteria for acute respiratory distress syndrome (ARDS)[1], in roughly half of ARDS cases mechanical ventilation was initiated for a reason other than ARF. This implies that a significant proportion of ARDS develops in ICU, which is concordant with recent data highlighting both the iatrogenic contributors to the syndrome and that these may be modified to prevent ARDS. This section makes recommendations and highlights clinical standards that are relevant to the care of patients who suffer from or are at risk of developing ARF.

STANDARDS

None.

RECOMMENDATIONS

1   All patients with, or at risk of, ARF requiring mechanical ventilation should be subjected to a lung protective ventilation strategy using low tidal volumes and airway pressures.

2   Patients with moderate to severe ARDS may benefit from the application of high positive end expiratory pressure (PEEP) and from prone positioning for at least 12 hours per day.

3   The use of neuromuscular blocking agents in patients with ARDS for the first 48 hours of mechanical ventilation may improve outcome by mitigating ventilator-patient dysynchrony and thereby ventilator associated lung injury.

4   Patients with severe but potentially reversible ARF who cannot achieve adequate gas exchange with protective ventilatory settings, should be discussed with an Extra-corporeal Membrane Oxygenation-capable (ECMO) Centre. The role of extra-corporeal carbon dioxide removal in patients with ARF has not yet been defined, but this support may help to mitigate the adverse effects of mechanical ventilation in patients with ARDS and obstructive airways diseases (e.g. asthma and chronic obstructive pulmonary disease [COPD]).

5   Units should develop rescue plans for refractory hypoxaemia that complement the advice of their local ECMO centre. Depending on local expertise, these may include: recruitment manoeuvres, alternative ventilation modes (e.g. high frequency oscillation ventilation [HFOV], airway pressure release ventilation) and inhaled vasodilators (e.g. nitric oxide and prostacyclin). These strategies do not improve the outcome of unselected patients with ARDS, indeed the use of HFOV may cause harm by improving gas exchange at the expense of worse ventilator-associated lung injury.

6   Non-invasive ventilation has an established role in providing respiratory support for patients with acute exacerbations of COPD and early ARDS.

7   A conservative management strategy targeting neutral fluid balance may benefit respiratory recovery in patients with ARDS without compromising the function of other organs.

BACKGROUND

ARF has multiple causes, which may affect the lungs directly (e.g. pneumonia and COPD) or indirectly as part of the multi-organ dysfunction syndrome (e.g. sepsis syndromes). Treatment depends on the underlying causes, but because these may not be immediately obvious, a robust diagnostic approach is required.

In the absence of disease-modifying therapies for ARF, the mainstay of ARF management is to provide respiratory and other organ support whilst causing minimal harm.

The Berlin definition for ARDS distinguishes ARDS into mild, moderate and severe categories on the basis of the severity of impairment of oxygenation (PaO_2:FiO_2 ratio of <300, <200 and <100 mm Hg respectively)[1].

Ventilatory strategies
Meta-analysis of 20 observational studies and control groups from randomised controlled trials which included 2,822 participants at risk of ARDS suggests that patients at risk of ARDS undergoing surgery or being ventilated in the intensive care unit have a lower risk of progression to ARDS and a reduced mortality rate if they receive protective ventilation strategies[2].

Meta-analysis of six randomised controlled trials involving 1,297 patients showed that the use of protective ventilation in patients with ARDS reduces early (28-day) mortality[3].

The use of high levels of PEEP in patients with ARDS has been evaluated in seven randomised trials (2,565 participants). Compared to standard levels of PEEP, high PEEP improves oxygenation but has no effect on mortality or the risk of barotrauma[4]. An individual patient data meta-analysis from three of these trials suggests that patients with moderate or severe ARDS (P:F ratio < 200 mm Hg) may benefit from the application of higher levels of PEEP[5].

High-frequency-oscillation ventilation has been subject to six randomised controlled trials which enrolled 1,608 patients with ARDS.[6] Meta-analysis of the results of these trials showed that although HFOV improves oxygenation and does not seem to increase the risk of barotrauma or hypotension, it does not improve survival.

Non-ventilatory strategies
Pharmacological interventions evaluated to date have either had no overall effect (e.g. steroids) or have been shown to be harmful (e.g. beta agonists), and should not be used routinely.

Risk factors for the development of ARDS amongst patients at risk include blood transfusion, fluid overload and inappropriate initial antibiotic therapy. Careful consideration of the risks and benefits of these treatments should be considered on an individual patient basis.

For patients with established ARDS, the use of prone positioning has been evaluated in nine RCTs with 2,242 patients[7]. Prone positioning improved mortality, particularly in patients with severe ARDS. The effects were more pronounced when the duration of time spent in the prone position exceeded 12 hours.

A multi-centre randomised controlled trial evaluating the use of 48-hours neuromuscular blockade in patients with moderate to severe ARDS (P:F ratio < 150 mm Hg) improved mortality, increased ventilator and organ-failure free days, and reduced biotrauma without any difference in ICU acquired paresis[8].

A randomised trial of a conservative fluid strategy in 1,001 patients with established ARDS who did not have evidence of tissue hypoperfusion, led to fewer days of mechanical ventilation and reduced length of ICU stay, without altering the incidence of renal failure or mortality rates[9].

Referral of patients with potentially reversible, severe ARDS to a regional ECMO centre has been shown to improve mortality and is cost-effective[10]. A propensity-matched analysis of patients in the UK with severe ARDS due to H1N1 showed improved mortality amongst patients referred and transferred to a regional ECMO centre[10]. After the H1N1 2009 influenza pandemic, a network of five ECMO centres was commissioned to provide retrieval of, and advanced care for, patients with severe ARDS and ARF in England and Wales.

The mortality rate of ARDS remains at approximately 40% for unselected populations, although that of the control groups of multi-centre studies has decreased progressively to between 20-30%. Chronic respiratory failure is a rare consequence of ARDS, but neuromuscular and psychological after-effects are common and are reflected in high levels of unemployment in survivors after hospital discharge[11]. Facilities to support rehabilitation during the recovery phase are recommended, as is follow-up in a specialist out-patient clinic after hospital discharge.

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RESEARCH IN PROGRESS TO INFORM PRACTICE

- *Vitamin D to prevent acute lung injury following oesophagectomy (VINDALOO): study protocol for a randomised placebo controlled trial.* http://www.trialsjournal.com/content/14/1/100.

- Faculty of Intensive Care Medicine and Intensive Care Society *Management of ARDS Clinical Guidelines* (in development).

4.1.3   Cognitive Impairment
Author: Valerie J. Page

INTRODUCTION

Delirium is common in critically ill patients, and often goes unrecognised. It is a predictor of worse outcomes for patients, including death and long-term cognitive impairment. It is distressing for patients and families.

STANDARD

1.3.3   All patients will be screened for delirium.

RECOMMENDATIONS

1   Identify and as far as possible actively manage underlying causes and risk factors for delirium[1].

2   In order to minimise sedative drug exposure in ventilated patients, a daily sedation target should be set[2].

3   Sedation protocols should be used, olanzapine with sedation breaks if required, to achieve and maintain daily sedation target[3].

4   All patients should be mobilised daily, according to their clinical status, as assessed by the physiotherapist in consultation with the medical and nursing staff[4].

5   All patients should be able to see an analogue clock[5].

6   Patients' hearing aids and visual aids, if needed, should be used.

7   Patient interventions and noise at night should be kept to a minimum to enable sleep.

8   ICU pharmacists should review patients' prescription charts and advise clinicians regarding the use of delirogenic drugs, including those with known anticholinergic properties.

9   Antipsychotics should be reserved for the management of acute agitation[6].

10   Written and verbal information about delirium should be given to patients and relatives early in the patient's admission.

BACKGROUND

Delirium is a manifestation of acute brain dysfunction, with altered wakefulness and cognition resulting in a confused patient. It has a rapid onset and fluctuates in severity. The incidence of delirium in critically ill patients is around 30% overall, but 60-80% in sick, ventilated patients[7]. The incidence of agitated delirium requiring clinical intervention is around 20%. Delirium is caused and maintained by a disease process or drugs with ongoing neuroinflammation and oxidative stress. Patients who develop delirium have increased

risk of dying and long-term cognitive problems, equivalent to moderate traumatic brain injury or mild Alzheimer's Disease, regardless of age[8,9]. The longer the delirium is maintained the worse the outcome.

Delirious patients will appear hyperactive (agitated, combative, insomniac), hypoactive (immobile, compliant, drowsy) or a mixture of these. The critically ill delirious patient is likely to appear drowsy, immobile and withdrawn. It is important to know the baseline cognitive function of patients, as those with pre-existing cognitive impairment, or dementia, are at high risk of developing delirium, resulting in an acceleration of their cognitive decline. The confused patient with normal cognition prior to admission will be delirious not demented.

All critically ill patients are at risk of delirium due to a combination of risk factors, in particular, infection and coma from any cause including sedation. Efforts should be made to mobilise patients early and minimise sedation, particularly avoiding the use of long-acting drugs. Sleep/wake disturbances are common in delirium, and sleep deprivation is probably an aggravating factor. Good sleep-hygiene needs to be promoted through measures including a reduction in noise, light and interventions at night. In addition, excellent care includes providing visual or hearing aids, good nutrition, attention to bowels, orientating patients (including availability of clocks) and continuity of nursing staff.

Clinicians must routinely screen for delirium using an assessment tool, or they will fail to recognise it at least two-thirds of the time. As a minimum, it is recommended to use one of two validated tools to screen for ICU delirium: the *Confusion Assessment Method-ICU* (CAM-ICU) which is a point-in-time assessment; or the *Intensive Care Delirium Screening Checklist* (ICDSC) which is a daily checklist of delirium signs. There are several useful screening tools for non-intubated patients. In practice, asking patients to spell LUNCH backwards (bCAM) or saying the months of the years backwards (4AT) will assist in diagnosis.

Management of the cause(s) is the most important clinical intervention.

There is currently no evidence to support the use of antipsychotics in critically ill patients, either to prevent or treat delirium. Currently, antipsychotics should be reserved for the management of acute agitation. The only available intravenous antipsychotic is haloperidol, contraindicated if the QTc is over 500ms and with caution if the QTc is over 450ms. Other significant side effects include extrapyramidal symptoms, sedation and, rarely, neuroleptic malignant syndrome. Alternative antipsychotics are intramuscular olanzapine, enteral quetiapine or risperidone. Olanzapine injection is not currently manufactured in the UK for cost reasons, and the parenteral form will need to be sourced from outside the UK via hospital pharmacy services or wholesalers. Alpha agonist drugs, clonidine or dexmedetomidine, can be useful as a part of a sedative regime. In an acutely disturbed patient where safety is an issue, a small dose of benzodiazepine may be required for rapid control.

Over half of patients who develop delirium will remember the experience as distressing, and family and friends often become extremely concerned[10]. Clinicians should be sensitive to the distress delirium causes, and provide reassurance when needed. Verbal and written information needs to be freely available.

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4.1.4　Acute kidney injury

Authors: Marlies Ostermann & Lui Forni

INTRODUCTION

Acute kidney injury (AKI) is common in critically ill patients. Patients with AKI have an increased risk of developing complications of other organ systems, a longer stay in hospital and an increased mortality rate, especially if renal replacement therapy is needed.

This section includes recommendations, and highlights clinical standards that are relevant to the care of critically ill patients who are admitted with AKI or develop AKI whilst in the Intensive Care Unit.

STANDARDS

None.

RECOMMENDATIONS

1　Acute kidney injury should be defined by a serum creatinine rise of ≥26.5µmol/L within 48-hours and/or decrease in urine output to <0.5 ml/kg/h for ≥6 hours as per recent Kidney Diseases Improving Global Outcomes (KDIGO) guideline[1]. The use of novel AKI biomarkers to define AKI should be limited to the research setting until their role in routine clinical practice has been confirmed.

2　Patients who are at risk of AKI should be identified early, and factors which contribute to AKI should be avoided if possible[1,2]. This includes the discontinuation of potentially nephrotoxic drugs and the avoidance of contrast media whenever possible. However, life-saving therapies or investigations should never be delayed or withheld because of AKI.

3　AKI is a syndrome which can have many different causes. The aetiology of AKI should be determined whenever possible and documented. All patients with AKI should have a urine dipstick[1,2].

4　An ultrasound of the urinary tract should be performed within 24-hours in all patients with risk factors for urinary tract obstruction or where the aetiology is uncertain, as per recent NICE guideline[2]. Where pyonephrosis is suspected, an ultrasound should be performed within six hours and facilities should be available for Interventional Radiology with locally agreed referral and transfer criteria where necessary.

5　Patients with AKI should be managed according to the recent KDIGO and NICE guidelines, with particular attention to the correction of hypovolaemia and hypotension[1,2]. There is no role for low-dose dopamine, fenoldopam, theophylline or atrial natriuretic peptide in treating AKI. Diuretics should be reserved for patients with fluid overload, especially if awaiting the initiation of renal replacement therapy, or for patients with fluid overload who are recovering renal function.

6　There is a risk of accumulation of drugs as renal function decreases. Patients' drug prescriptions need to be reviewed and adjusted on a daily basis. Close collaboration with a Critical Care pharmacist is essential.

7   All ICUs should have access to Nephrology services and locally agreed referral and transfer criteria[2]. As per NICE guidelines, nephrologists should always be informed when one or more of the following is present:

- A possible diagnosis that may need specialist treatment including immunosuppression or plasma exchange
- AKI with no clear cause
- AKI with inadequate response to treatment
- Uraemic complications of AKI
- Stage 3 AKI
- AKI in a renal transplant patient
- AKI on the background of chronic kidney disease stage 4 or 5
- Estimated glomerular filtration rate ≤30ml/min/1.73m^2 following an episode of AKI

8   ICUs should have the necessary facilities and expertise to provide acute renal replacement therapy for patients with AKI on a 24/7 basis.

9   The Critical Care team should have access to Nephrology and Interventional Radiology on a 24/7 basis.

BACKGROUND

Acute kidney injury (AKI) is common in critically ill patients and is associated with both increased short-term and long-term morbidity and mortality, and high healthcare costs, especially if renal replacement therapy is needed[3]. Twenty percent of cases are considered to be preventable[2].

Acute kidney injury is a syndrome characterised by acute reduction in renal function, but it is not a diagnosis. It can be due to multiple different aetiologies. However, during critical illness, AKI is often multi-factorial[3].

In the majority of patients with AKI, management consists of correction of hypovolaemia and hypotension, prevention of additional renal insults and treatment of the underlying disease. As outlined in the Kidney Disease Improving Global Outcome (KDIGO) guideline, there is no role for any specific drugs[1]. The use of diuretics should be limited to patients with fluid overload who are waiting to start renal replacement therapy or whose renal function is recovering following an episode of AKI.

Occasionally, AKI is caused by conditions which require specific treatment, including immunosuppressive drugs, plasma exchange or interventional radiology. Delay in treatment can significantly reduce the chances of renal recovery in these conditions and so the clinician must be alert to potential causes of AKI which may need an alternative approach. Hence, all patients with AKI should have a urine dipstick which needs to be discussed with a nephrologist in case of haematuria and/or proteinuria[1,2].

Drug metabolism and clearance can be affected by changing renal function, and regular adjustment of drug doses is essential.

The recently published NICE guideline emphasized that not all cases of AKI in the ICU needed to be referred to a nephrologist[2]. Guidance is provided as to when a nephrologist should be informed.

The above recommendations are based on the KDIGO and NICE guidelines, which emphasize that even if only 20% of cases of AKI were prevented or ameliorated, this would produce a large reduction in deaths, complications and healthcare costs[2].

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4.1.5   Acute Renal Replacement Therapy

Authors: Marlies Ostermann & Lui Forni

INTRODUCTION

Renal replacement therapy (RRT) is the key supportive therapy for patients with severe acute kidney injury (AKI). The main aims of this therapy are to manage the complications of AKI such as hyperkalaemia, to achieve and maintain metabolic homeostasis and to correct or prevent volume overload.

In the UK, the main types of acute RRT for critically ill patients are haemodialysis and haemofiltration, which can be provided continuously or intermittently. Acute peritoneal dialysis is rarely used.

This section includes recommendations and standards that are relevant to the care of critically ill patients undergoing RRT for AKI in the Intensive Care Unit (ICU).

STANDARDS

None.

RECOMMENDATIONS

1   ICUs should have the necessary facilities and expertise to provide acute renal replacement therapy (RRT) for patients with acute kidney injury (AKI) on a 24/7 basis.

2   Acute RRT should be considered for patients with progressive or severe AKI, unless a decision has been made not to escalate therapy. It should be started before the onset of life-threatening complications of AKI.

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

4   In patients with life-threatening complications of AKI, RRT should be started emergently unless a decision has been made not to escalate therapy[1,2].

5   Continuous and intermittent RRT should be considered as complementary therapies for AKI[1]. The decision whether to start continuous RRT or intermittent RRT should be based on the condition of the patient, expertise of the clinical staff and availability of machines in the ICU. Patients who are haemodynamically unstable or have acute brain injury or cerebral oedema should be treated with continuous RRT by preference[1].

6   The dose of RRT should meet the patient's needs and take into account their acid-base status, degree of electrolyte derangement and fluid balance. For patients receiving continuous RRT, it is recommended that an effluent volume of 20-25ml/kg/hr[1] is delivered. To achieve this in day-to-day practice, a higher target dose may have to be prescribed (ie. 25-30mL/kg/h) to compensate for interruptions in treatment. When using intermittent RRT, a Kt/V of 3.9 per week should be delivered[1].

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

8   The decision to use anticoagulation to maintain circuit patency should be based on the potential risks and benefits of the type of anticoagulant in an individual patient, the expertise of the clinical team and the options available in the ICU.

9   Bicarbonate, rather than lactate should be used as a buffer in dialysate and replacement fluid for acute RRT since it results in more efficient correction of acidosis, lower lactate levels and improved haemodynamic tolerability[1].

10   RRT affects the clearance of drugs. It is essential that the drug chart is reviewed and drug doses are adjusted whenever RRT is started or the RRT prescription is altered. Close collaboration with a Critical Care pharmacist with suitable experience in AKI and the effects of RRT is essential.

11   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].

12   Patients receiving acute RRT should be cared for by a multi-professional team which is trained and experienced in delivering and monitoring RRT.

13   The indication for RRT and prescription should be evaluated on a daily basis. The mode and dose of RRT may have to be altered depending on the condition of the patient. RRT should be discontinued when it is no longer required, either because the patient's kidney function has recovered to the point that it is adequate to meet the patient's needs, or because RRT is no longer consistent with the goals of care[1].

14   Patients receiving acute RRT should be discussed with the local renal team as per NICE guideline[2].

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 remains unclear. As suggested by the KDIGO and NICE guideline, the decision to start RRT should be based on the overall condition of the patient, rather than isolated urea, creatinine or potassium results[1,2]. The benefits of RRT must be balanced against any potential harm arising from the treatment, including risks related to central venous access, infections and anticoagulation. The RRT prescription should be tailored towards the patient's needs and be adjusted accordingly.

Continuous and intermittent RRT should be considered as complementary therapies for patients with AKI[1]. Randomised controlled trials comparing intermittent versus continuous therapies have not demonstrated a survival benefit or superiority in any outcome between the two techniques to-date. The choice depends on availability, expertise of the clinical team and the acute illness of the patient. Continuous RRT does offer the advantage of improved haemodynamic tolerance due to the slower fluid removal and the absence of fluid shifts induced by rapid solute removal. Therefore, continuous RRT should be used, where possible, for patients who are haemodynamically unstable and for patients with acute brain injury or acute cerebral oedema who may not tolerate fluid shifts[1].

The dose of RRT should meet the patient's needs and take into account their acid-base status, electrolyte derangement and fluid balance. Two large randomised controlled trials comparing different doses of RRT in AKI failed to demonstrate improved survival or recovery of renal function with higher delivered doses[4,5].

In sepsis patients with AKI, very high doses (>70ml/kg/hr) again failed to demonstrate benefit and resulted in increased complications[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 (ie. 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 and potentially changing needs of the patient. If the delivered dose of RRT does not meet the patient's needs, it should be increased and vice-versa.

The decision to use anticoagulation to maintain circuit patency should be based on the potential risks and benefits of the type of anticoagulant in an individual patient, the expertise of the clinical team and the options available in the ICU. 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 is not available in all ICUs in the UK.

Bicarbonate and lactate can be used as a buffer in dialysate and replacement fluid for acute RRT. Bicarbonate results in more efficient correction of acidosis and lower lactate levels, and is tolerated better haemodynamically. The KDIGO guideline recommends bicarbonate rather than lactate[1].

Drug clearance can be affected by the mode and dose of RRT, and this is particularly pertinent to antibiotics. It is therefore essential that prescription charts are reviewed and drug doses adjusted every time RRT is started or the prescription of RRT is altered. Critical 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. Their involvement is particularly important for patients on RRT.

Critically ill patients are often hypercatabolic and hypermetabolic with increased energy expenditures. 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.

As suggested by the recent NICE guidelines, patients receiving acute RRT should be referred to local renal services[2].

The majority of patients with AKI recover renal function. Acute RRT should be discontinued when it is no longer required because the patient's kidney function has recovered to the point that it is adequate to meet the patient's needs, or because RRT is no longer consistent with the goals of care[1].

The above recommendations are based on the KDIGO recommendations and the NICE guideline which emphasise that RRT is a key therapy which can be lifesaving but also harmful if delivered without attention to the patient's changing needs[1,2]. To avoid harm and unnecessary healthcare costs, it is essential to review the indication for RRT and its delivery on a daily basis.

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RESEARCH IN PROGRESS TO INFORM PRACTICE

- *Sampling Antibiotics in Renal Replacement Therapy - A Multinational Prospective Pharmacokinetic Study* (SMARRT) (Trial ID: ACTRN12613000241730).

- *Effect of continuous haemofiltration on essential nutrients in critically ill patients with severe acute kidney injury* (Trial ID: ISRCTN88354940).

4.1.6   Anaemia

Author: Tim Walsh

INTRODUCTION

Anaemia is prevalent in critically ill patients. It has a multifactorial aetiology, which includes blood loss from bleeding and blood sampling, impaired erythropoiesis, and shortened red blood cell (RBC) lifespan. The only currently available method for treating acute anaemia is RBC transfusion. Clinicians need to assess the relative risk to benefit balance of transfusing stored allogeneic RBCs to critically ill patients, because it is recognised that stored RBCs have potential adverse effects.

There is strong evidence to support a generally restrictive approach to RBC transfusion in the critically ill. This section makes recommendations to minimise anaemia during critical illness, and to guide clinicians when making individual transfusion decisions according to patient co-morbidity and acute diagnosis.

STANDARDS

None.

RECOMMENDATIONS

1   Erythropoietin should not be used to treat anaemia in critically ill patients until further safety and efficacy data are available[1].

2   In the absence of clear evidence of iron deficiency, routine iron supplementation should not be used to treat anaemia during critical illness[1].

3   The introduction of blood-conservation sampling devices should be considered to reduce phlebotomy-associated blood loss[1].

4   Paediatric blood-sampling tubes should be considered for reducing iatrogenic blood loss[1].

5   In the absence of bleeding, single-unit RBC transfusions should be given-followed by repeat Hb measurement[1].

6   In the early resuscitation of anaemic patients with severe sepsis, if there is clear evidence of inadequate oxygen delivery, transfusion of RBCs with a target haemoglobin (Hb) of 90–100 g/l should be considered[1].

7   During the later stages of severe sepsis, a conservative approach to transfusion should be followed with a target Hb of 70–90 g/l[1].

8   In patients with traumatic brain injury, the target Hb should be 70–90 g/l for most patients[1].

9   Anaemic critically ill patients with stable angina should have a Hb maintained at >70 g/l, but transfusion to a Hb > 100 g/l has no proven benefit[1].

10   In patients suffering from an acute coronary syndrome, the Hb should be maintained at >80–90 g/l.

11 Red cell transfusion should not be used as a strategy to assist weaning from mechanical ventilation when the Hb is >70 g/l[1].

12 All ICUs should audit RBC transfusion practice and ensure adherence to national guidelines[1].

13 All ICUs should report adverse transfusion reactions to SHOT and SABRE.

BACKGROUND

Anaemia affects up to 60-80% of ICU patients[1,2]. Most patients have a normochromic, normocytic anaemia with high ferritin concentrations and low serum iron, transferrin, and transferrin saturation. Only 10-15% of patients have a history of chronic anaemia prior to ICU admission, which highlights the importance of acute factors in its development. Multiple factors contribute to anaemia, including haemodilution, bleeding, and blood sampling[2]. Strategies to decrease blood sampling frequency and volume can decrease anaemia and RBC transfusions. In addition, patients do not display increased erythropoietin concentrations or reticulocytosis in response to anaemia, having an acute inflammatory anaemia with impaired erythropoiesis.

Absolute iron deficiency is rare, but many patients may have a functional iron deficiency from redistribution of iron into macrophages and reticuloendothelial cells, which may limit availability of iron for red cell production. Inflammation makes iron studies difficult to interpret. Exogenous erythropoietin treatment generates modest increments in Hb, and is not an effective transfusion-sparing therapy in critically ill patients; in trials it was also associated with increased thromboembolic events[1].

The best evidence to guide what Hb level should trigger transfusions in non-bleeding critically ill patients comes from the Transfusion Requirements In Critical Care, "TRICC" trial[3]. This trial found similar overall outcomes when a transfusion trigger of 70 g/l (target 70-90g/l) was compared with a trigger of 100g/l (target 100-120g/l), with better outcomes found for younger and less severely ill patients. Recent systematic reviews of transfusion threshold trials support this finding, indicating that the default transfusion threshold should be 70 g/l for ICU patients[4,5]. A recent trial has also demonstrated no outcome benefit among patients with septic shock admitted to Critical Care[6].

Uncertainty exists for some acute conditions and chronic comorbidities:

- *Chronic stable ischaemic heart disease*: evidence for this group is weak, but suggests that some patients benefit from RBC transfusion to achieve a higher Hb, but individual judgement is needed[1].

- *Acute coronary syndrome*: evidence for this group is weak, but physiological rationale and low quality evidence suggest that maintaining a higher Hb (>80g/l) is associated with better outcomes[1].

- *Acute brain injury* (traumatic brain injury, stroke, sub-arachnoid haemorrhage): evidence for these patients is weak, but accumulating evidence suggests little benefit from RBC transfusion at Hb >70g/l[1].

- *Sepsis:* RBC transfusion to achieve a Hb of 90-100g/l was associated with improved outcomes as part of an early severe sepsis resuscitation protocol when central venous saturation was <70%[7], but this finding was not reproduced in a recent large RCT (PROCESS)[8] and ARISE[9]. A target Hb of >70-90g/l should only be considered in **early** sepsis resuscitation for patients with clear evidence of tissue hypoxaemia, and does not benefit most patients with septic shock during ICU care[6].

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RESEARCH IN PROGRESS TO INFORM PRACTICE

- ABLE (ISRCTN44878718) and TRANSFUSE (NCT01638416) trials (two RCTs exploring the importance of the age of transfused RBCs for treating anaemia during critical illness).

- TRISS trial (NCT01485315; a trial comparing the use of restrictive and liberal transfusion strategies for patients with septic shock).

4.1.7   Sedation

Authors: Tony Whitehouse & Mike Grounds

INTRODUCTION

Sedation is one of the most widespread procedures performed in critically ill patients. It is used to facilitate ICU therapies[1] and to try to ease the patient through a distressing environment. Maintaining light levels of sedation in stable adult ICU patients is associated with improved clinical outcomes (e.g. shorter duration of mechanical ventilation and a shorter ICU length of stay[2]). Deep sedation is sometimes necessary.

In the stable/recovering patient, the skill of the ICU team is to find the "Goldilocks Zone" – a combination of sedatives and analgesics in doses that result in a calm, responsive patient who is able to tolerate the therapies around them.

STANDARDS

None.

RECOMMENDATIONS

1   Clinicians should decide what they are aiming to achieve by the use of sedative and analgesic drugs when they assess their patients.

2   ICUs should use a sedation protocol that includes:
- A sedation score that ensures the patient is comfortable; the sedation score should be measured regularly throughout the whole day. Assessments every 2-4 hours are suggested
- A means of assessing pain and providing adequate analgesia
- An outline of other non-pharmacological interventions that may be used to ensure the well-being of the patient (e.g. verbal reassurance & adjuvant analgesia).

3   Regular sedation/analgesia holds should be undertaken to ensure no accumulation of sedative/analgesic drugs[3,4]. This should be a complete cessation of sedation until the desired sedation score is reached. A sedation hold may last for a matter of seconds or it may be for longer to avoid accumulation and over-sedation.

4   A target for sedation should be decided and regularly reviewed to reflect the changes in condition of the patient. A sedation scoring system helps ensure this degree of sedation is appropriately maintained.

5   Sedation should be regularly re-titrated to maintain the prescribed sedation score[5].

6   Sedation should be titrated to ensure that the minimum possible dose compatible with patient safety and comfort is used at all times.

BACKGROUND

The term 'sedation' has become a catch-all phrase to describe everything from anxiolysis, (a little something to help you sleep) to a state of unresponsiveness that mimics general anaesthesia. High-quality care does not only rest on the judicious use of drugs, but also requires an understanding of the causes of ICU distress and the creation of an environment that reduces stress. ICU patient may have a limited number of ways of expressing themselves, and a patient who is pulling at monitoring lines may be distressed, in pain, delirious or a combination of all three.

Critically ill patients are often anxious, and agitated as well as uncomfortable or in pain. Maintaining an optimal degree of anxiolysis, sedation and analgesia is complex, and may constantly vary with changes in the patient's condition. Clinicians will need to have a system in place to ensure that changes in a patient's condition are reflected in the sedation and analgesia that they receive. This is often assessed by the use of a sedation hold.

A sedation scoring system will enable the ICU staff to optimise and minimise the patient's sedation and analgesia whilst simultaneously providing maximum benefit and comfort for the patient. There is no evidence to suggest that one sedation score is superior to another; the Richmond Agitation-Sedation Scale (RASS) is one of the most validated. ICUs should adopt only one sedation scoring system to avoid confusion.

Sedatives reduce anxiety and analgesics reduce pain and the combination will allow patients to deal with these stressful events, but care must be taken to ensure that too much sedation is not given, thus exposing the patient to the side effects of over sedation[5]. Pain is often under-recognised and inadequately treated. Preventing pain can be more effective than treating pain, and may require smaller quantities of analgesics. Opioid analgesia plays an important role in the management of patient comfort. The use of analgeso-sedation may improve ICU outcome[6]. Alternative methods of providing analgesia should be considered where appropriate.

There are a number of different drugs and combinations of drugs, including sedatives and opioids, that have been used for the provision of sedation for patients in the ICU. There are no particular drug combinations that have been shown to improve ICU mortality. Current data suggest that some drug combinations will improve some other outcomes (time to tracheal extubation, length of ICU stay, rates of delirium, costs, etc.). Some drugs have been shown to reduce the time to extubation or duration of ventilation or rates of delirium. Clinicians should chose a sedative/analgesic combination based on the outcome that best suits their patients' needs.

Sedative drugs are associated with increased rates of delirium[7]. Retrospective studies suggest that benzodiazepines are associated with higher rates of delirium than other sedatives. There are many risk factors for delirium. Delirium has been associated with poor outcomes, increased length of hospital stay and higher mortality[7,8]. Although there are a number of guidelines for reducing and/or treating delirium in ICU patients (the FICM and ICS are in the process of jointly developing their own), at this time it is not clear what the best/optimal treatment is. There are no recommendations for the best way to manage delirium.

There are a number of non-pharmacological interventions that can help allay anxiety, reduce stress and relieve pain. This requires understanding by the ICU clinical team and a focus on the many factors that can help in this situation, such as reductions in noise, increasing sleep time by reducing interventions (particularly at night), reducing sleep deprivation, natural light and appropriate room temperature.

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4.1.8   Post-cardiac arrest management

Authors: Jerry P. Nolan & Jasmeet Soar

INTRODUCTION

There are approximately 50,000 treated cardiac arrests each year in the UK, and approximately one-eighth of these will be admitted to an intensive care unit (ICU). Approximately one-third of those admitted to ICU will be discharged from hospital – 80% return to their normal residence. There is considerable variation in the outcome of post-cardiac arrest patients admitted to UK ICUs.

STANDARDS

None.

RECOMMENDATIONS

1   Clinicians should use a local protocol for post-cardiac arrest care that includes the use of targeted temperature management[1].

2   Patients with sustained return of spontaneous circulation (ROSC) who remain comatose or agitated with a decreased conscious level, and those with breathing difficulties should be sedated, their trachea intubated and lungs ventilated. Hyperoxia may exacerbate neurological injury; once arterial blood oxygenation saturation can be monitored reliably, the FIO_2 should be reduced to achieve normoxia (94% -98%)[2]. Ventilation should be adjusted to achieve normocapnia; there is some evidence that hypocapnia may be harmful in the post-cardiac arrest setting[3].

3   Immediate angiography and percutaneous coronary intervention (PCI) when indicated should be performed in resuscitated out-of-hospital cardiac arrest (OHCA) patients whose initial ECG shows ST-elevation myocardial infarction[4]. National Institute for Health and Care Excellence (NICE) Clinical Guideline 167 for the acute management of ST-segment elevation myocardial infarction (STEMI) recommends: 'Do not use level of consciousness after cardiac arrest caused by suspected acute STEMI to determine whether a person is eligible for coronary angiography (with follow-on primary PCI if indicated)' [5,6].

4   Immediate angiography and percutaneous coronary intervention (PCI), when indicated, should be considered in resuscitated OHCA patients whose initial ECG does not show ST-elevation myocardial infarction, but in whom a non-cardiac cause is excluded. Investigations to exclude a non-cardiac cause will include a thorough history, a computed tomography (CT) brain scan and/or CT pulmonary angiography[7].

5   Haemodynamic instability is common after cardiac arrest and manifests as hypotension, low cardiac index, arrhythmias and impaired contractility on echocardiography. Infusion of fluids may be required to increase right-heart filling pressures or, conversely, diuretics, vasodilators and inotropes/intra-aortic balloon pump may be needed to treat myocardial dysfunction. In the presence of a significant inflammatory response, noradrenaline may be required to maintain an adequate blood pressure. Early echocardiography will enable the extent of myocardial dysfunction to be quantified, and may guide

therapy. In the absence of definitive data the aim should be to achieve a mean arterial blood pressure that produces an adequate urine output, taking into consideration the patient's normal blood pressure.

6   Targeted temperature management, aiming for a constant target temperature between 33° and 36 °C, should be used for adults who remain unconscious after initial resuscitation from OHCA and who are to be admitted to ICU for active treatment. Temperature management should be started as soon as possible after sustained ROSC has been achieved. The uncontrolled infusion of large volumes of cold fluid should not be used pre-hospital, but may be used to initiate cooling in a closely monitored environment such as the emergency department or the ICU. Target temperature should be maintained for 24 hours before slow, controlled rewarming at 0.25°C per hour. Avoid hyperthermia (> 38.0°C) for 72 hours after ROSC. There is no evidence that the method of temperature control influences neurological outcome.

7   Targeted temperature management should also be considered for patients who remain unconscious after initial resuscitation from in-hospital cardiac arrest and who are to be admitted to ICU for active treatment.

8   Short-acting sedatives and opioids (e.g. propofol, alfentanil, remifentanil) should be used to enable earlier neurological assessment after rewarming.

9   Seizures, myoclonus or both occur in about 20-30% of patients who remain comatose and are cooled after cardiac arrest. Continuous EEG monitoring should be used in patients receiving neuromuscular blocking drugs to ensure that seizures are not missed. Seizures should be treated with benzodiazepines, levetiracetam, sodium valproate, phenytoin or propofol. Post-hypoxic myoclonus can be very difficult to control, and neurological advice should be sought. Levetiracetam and/or propofol may be effective but phenytoin is relatively ineffective.

10   Both hyperglycaemia and hypoglycaemia after ROSC are associated with poor neurological outcome. Based on expert consensus, blood glucose should be maintained between 4-10 mmol. L^{-1} following ROSC.

11   Adequate time should be given for sedatives and neuromuscular blockers to be cleared before attempting to assess neurological prognosis. In practice, this means waiting until at least 72 hours after ROSC. A multi-modal approach should be used for prognostication in comatose patients after cardiac arrest, and comprises clinical examination, or neurophysiological investigations (electroencephalography, somatosensory evoked potentials), and/or biomarkers (particularly neuron specific enolase) and/or imaging (CT, MRI). Reliable prognostication is complex – follow the joint guidelines of the European Resuscitation Council and the European Society of Intensive Care Medicine (in press)[8].

BACKGROUND

The annual incidence of emergency medical service treated out-of-hospital cardiac arrest (OHCA) is 0.5 per 1,000 population[9], and data from the United Kingdom National Cardiac Arrest Audit (NCAA) indicates that the annual incidence of in-hospital cardiac arrest to which a resuscitation team is called is 1.6 per 1,000 admissions[10]. Unless the period of cardiac arrest has been very brief, most of those patients in whom a spontaneous return of circulation (ROSC) has been achieved will remain comatose for a variable period, and will require further treatment on an intensive care unit (ICU). Data from the UK Intensive Care National Audit and Research Centre (ICNARC) indicate that approximately 6,350 patients each year are admitted to UK ICUs after cardiac arrest[11]; these are estimated to represent 13% of the total 50,000 treated cardiac arrests

(in-hospital and out-of-hospital) annually in the UK. Mechanically ventilated survivors of cardiac arrest account for 6% of all admissions to UK ICUs[11]. Approximately 30-40% of patients admitted to an ICU after cardiac arrest will survive to be discharged from hospital, and most of these will have a good neurological outcome[11-13]. Systemic ischaemia during cardiac arrest, and the subsequent reperfusion response after ROSC, causes the post-cardiac arrest syndrome (PCAS)[14].

The severity of PCAS is determined by the cause and duration of cardiac arrest, and has four key clinical components:

- Post-cardiac arrest brain injury – this manifests as coma and seizures
- Post-cardiac-arrest myocardial dysfunction – this can be severe and recovery is usual after 48-72 hours
- Systemic ischaemia/reperfusion response – tissue reperfusion can cause programmed cell death (apoptosis) effecting all organ systems
- Persisting precipitating pathology – coronary artery disease is the commonest precipitating cause after OHCA.

Post-cardiac arrest patients are likely to have improved outcomes if they are cared for in a hospital that offers a comprehensive package of care that includes PCI, targeted temperature management and multi-modal prognostication in collaboration with neurology services[15].

New international and Resuscitation Council (UK) guidelines for cardiopulmonary resuscitation that include post-cardiac arrest management will be published in October 2015.

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4.1.9   End of Life Care

Author: Dan Harvey

INTRODUCTION

A significant number of critically ill patients will unfortunately die, despite intensive care support. Functional outcomes following critical illness may sometimes be poor, especially in the setting of significant co-morbidity, and decisions to limit or withdraw therapy are common[1]. Thus death on the ICU is commonplace, and the practice of good palliative care is an essential component of good intensive care medicine.

STANDARDS

1.1.7   All treatment plans must have clear objective outcomes identified within a specific time frame and discussed with the patient where appropriate, or relatives/carers if appropriate.

RECOMMENDATIONS

1   Patients with a high risk of death in the ICU should be identified early, so that appropriate management can be planned, as outlined below. These patients should be managed by multi-professional teams, which should include senior medical and nursing staff from ICU and referring teams, and may also include specialist members from palliative care.

2   Patients' and families' need for spiritual and emotional support should be assessed. If appropriate religious or secular expertise should be sought, this may include referral to chaplaincy, psychological services or to the patients' GP. Staff should also have access to these support services.

3   Consideration of organ donation, with timely referral to the Specialist Nurse for Organ Donation if appropriate, should occur in all cases of withdrawal of life sustaining treatment[2].

4   End of Life decision-making should take account of the relevant statutory requirements (namely the Mental Capacity Act (MCA) and Human Tissue Act in England, and the Adults with Incapacity Act in Scotland) and relevant professional guidance (namely the General Medical Council's Good Medical Practice and specifically *"Treatment and care towards the end of life: Good Practice in Decision Making").* The practical means of decision making according to these recommendations is the "shared decision" model, which is a dynamic process with responsibility for the decision being shared between the caregiver team and patient's representatives. The purpose is to reach consensus on a process that is in accordance with the patient's values, while providing comfort and support to the family and surrogates. Ultimate responsibility for the determination of treatment in an incapacitated patient's best interests rests with the treating clinician.

5   Whilst the accurate prediction of absolute mortality rates has improved, prognostication of functional outcomes following critical illness remains difficult. In such circumstances the extent of any uncertainty should be clearly communicated to patients and their families, although communicating an understanding of risk is challenging. Where possible, at least two senior medical opinions should be sought before a recommendation of withdrawal or limitation of life-sustaining therapy is made[3]. It is recognised that resources may often frustrate this ideal, if so, such decisions should be reviewed

6   For incapacitated patients with no suitable representative, there should be consideration of referral to the Independent Mental Capacity Advocate (IMCA) service[4], especially where decision making involves value judgements about the patient's quality of life.

7   All treatments and interventions should be reviewed following a treatment limitation or withdrawal decision, to determine if they continue to contribute toward a therapeutic goal, which may now be patient comfort rather than cure. Interventions which are potentially harmful or distressing and do not contribute toward the revised goal of therapy should be withdrawn[5]. A therapeutic plan to manage distressing symptoms at the end of life should be made, and consideration given to ensure these remain practicable and achievable by the ICU MDT at all times. Therapeutic options for the assessment and relief of pain, dyspnoea, anxiety and agitation should be available. Medications should be titrated as required for the relief of symptoms based on explicit assessments[6].

8   If death is considered to be close, patients should not normally be transferred to other locations, unless it is to facilitate significant improvements in care, or unless there is insufficient capacity within ICU. Family agreement should be sought prior to considering a change in location. Standards of care during withdrawal of life-sustaining therapy should remain constant between patient locations (e.g. between emergency department and ICU).

9   *Do Not Attempt Cardiopulmonary Resuscitation* (DNACPR) decisions are an intrinsic part of palliative care plans in critically ill patients, and should be discussed with patients and families within that context. DNACPR orders instituted in emergent situations for incapacitated patients must be discussed with the patient's surrogates (as defined by the MCA[7]) at the earliest opportunity as a part of a proposed treatment plan.

10   Declaration of death by cardiorespiratory or neurological criteria should be done according to professional guidance[8].

BACKGROUND

The purpose of this section is not to produce a didactic recipe for managing end-of-life care for patients in Critical Care; indeed a core tenet of our recommendations is that such plans are necessarily individualised in each and every case. Instead the purpose of this document is to highlight what such plans should include to meet quality and legal standards. Readers are directed to the published literature for some excellent reviews of the evidence base[1,2,3,9].

Despite continuing improvements in clinical outcomes of intensive care, a significant proportion of patients within ICU will not survive. Intensive care treatment involves a considerable burden on the patient, with inevitable pain and distress which can only be partially offset. Thus, if the probability of an outcome acceptable to the patient decreases, the net benefit of ongoing treatment must be considered. As net benefit decreases intensive care may serve only to prolong death rather than life. In such circumstances a transition to palliative care may be appropriate. As both a philosophy of care and a mode of care delivery, palliative care prioritises aggressive symptom management, psychosocial support of patients and families, and alignment of treatments with individual patient care goals, values, and preferences[10].

Although a minority of patients die suddenly, the majority of deaths within ICU follow a withdrawal or limitation of therapy decision, often made as the failure of a treatment plan becomes clear. The General Medical Council has published extensive guidance to aid decision making in this area. Its guidance covers

best practice in decision-making in patients with and without capacity, and takes account of the relevant law[6]. This guidance seeks to clarify the law's application within the Intensive Care Unit rather than to replace or reproduce it.

The timely identification of suitable patient-representatives according to the MCA can be difficult. It is important to note that the definition of what represents a reasonable effort and time frame to communicate with patient representatives is necessarily context sensitive and is not formally defined.

Ultimately all treatment limitation or withdrawal plans will end in patient death, and attempts at cardio-pulmonary resuscitation (CPR) are not appropriate within the context of palliative care. The High Court has recently considered this issue in detail in two rulings with significant potential impact on the application of *Do Not Attempt Cardiopulmonary Resuscitation* decisions. Readers should keep up to date with professional guidance in this area.

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4.2   Disease Prevention

4.2.1   Venous thromboembolism
Authors: Russell Allan & Kevin Rooney

INTRODUCTION

Venous thromboembolism (VTE) is common in hospitalised patients, and those with critical illness are at particular risk. Without any preventative intervention, the incidence of deep vein thrombosis has been described to be as high as 50%, with pulmonary thromboembolism (PTE) being the third leading cause of death after day one[1]. PTE is considered to be the most common preventable cause of hospital death. Even with appropriate preventative intervention the risk of PTE in intensive care remains significant.

Thromboprophylaxis can be considered as either mechanical or pharmacological. Within both of these subgroups, various options exist, making the available evidence heterogeneous. Furthermore, evidence for thromboprophylaxis in the Critical Care population is relatively scarce and largely extrapolated from studies of medical and surgical patients. Within these populations, risk stratification is performed to assess who will benefit from intervention. ICU admission is considered a high-risk indicator in these assessments.

The Critical Care population further complicates the use of thromboprophylaxis due to the high prevalence of coagulation defects, thrombocytopenia, renal dysfunction, critical perfusion and invasive interventions. Despite this a majority of patients have a benefit from thromboprophylaxis that outweighs the risk. Unfortunately in everyday practice even these patients have thromboprophylaxis omitted on occasion[2,3]. We hope that this guidance will minimise this number and help standardise the approach to VTE prevention in Critical Care.

STANDARDS

1.4.1 There must be a Critical Care Pharmacist for every Critical Care Unit.

RECOMMENDATIONS

1   All critically ill patients should be considered as being at high risk of venous thromboembolism[1].

2   Pharmacological thromboprophylaxis should be prescribed unless contraindicated[4,5].

3   When appropriate, prophylaxis should be commenced within the first 24-hours of ICU admission[6].

4   Contraindications include coagulopathy, thrombocytopenia, active bleeding or recent ischaemic or haemorrhagic stroke[7].

5   When an indication, for long term anticoagulation exists, such as atrial fibrillation, recent or recurrent VTE or metallic heart valve, no pharmacological thromboprophylaxis is required in addition to the patient's current anticoagulation regime.

6   Low molecular weight heparin (LMWH) is currently the agent of choice for VTE prevention[5,8]. Alternative agents must be used if there is a history of heparin-induced thrombocytopenia (HIT)[9].

7   Factor Xa level monitoring is not required routinely during LMWH therapy, however it may be required in specific circumstances (e.g. renal impairment, morbid obesity).

8   Platelet count should be measured during unfractionated heparin (UF) and LMWH therapy. Consideration should be given to the possibility of HIT in all patients on UF or LMWH[9].

9   Mechanical thromboprophylaxis should be used in critically ill patients when contraindication exists to pharmacological prophylaxis or in conjunction with the latter in patients at very high risk of VTE. When used, intermittent pneumatic compression is superior to graduated compression stockings[10,11,12].

10   Patients with stable or improving traumatic brain injury should be considered for pharmacological prophylaxis within 72-hours of injury[13,14].

11   Patients with acute ischaemic or haemorrhagic stroke should not receive routine pharmacological thromboprophylaxis within the first two weeks[15]. Intermittent pneumatic compression thromboprophylaxis is an effective method of reducing the risk of DVT and possibly improving survival in a wide variety of patients who are immobile after stroke[10].

12   Inferior vena cava (IVC) filters should not be used routinely with pharmacological prophylaxis or in individuals where pharmacological prophylaxis is contraindicated[16]. Where a DVT is present and a contraindication exists to anticoagulation, an IVC filter may be considered[17]. In these exceptional circumstances, a temporary IVC filter could be used but early retrieval and anticoagulation should be initiated once the contraindication has resolved[18].

13   Daily review and risk assessment of continued requirement for VTE prophylaxis and presence of contraindications should be undertaken.

14   On discharge from Critical Care the continued requirement for thromboprophylaxis should be assessed, with consideration of ongoing risk factors.

15   Clinical governance tools should be in place to ensure and aid compliance[2,3].

BACKGROUND

VTE occurs when a thrombus forms, usually in the deep veins of the lower limb. This can then travel through the venous system to the heart and on to the pulmonary vessels where it can lodge and cause obstruction to flow. The effect can vary from asymptomatic to cardiorespiratory arrest depending on the size of the pulmonary branch affected. Predisposing factors can be classified by considering Virchow's triad:

- Venous stasis – e.g. immobility, proximal venous obstruction
- Hypercoagulable state – e.g. trauma, dehydration, pregnancy, thrombophilia
- Vessel wall damage – e.g. previous DVT

Critically ill patients often have several of these factors and thus exhibit an elevated risk of VTE. In such cases we should aim to reduce this risk and ultimately mortality and morbidity. It would seem logical to achieve this by addressing Virchow's triad, and in particular reducing venous stasis and coagulation via mechanical

and pharmacological methods respectively. It is however important to consider the evidence base for each of these.

The critically ill population are a distinct group who have unique issues and require specific consideration. Studies looking at thromboprophylaxis within Intensive Care are insufficient to answer all our questions, and therefore we have to draw upon evidence from other populations. This should however be done with caution and an understanding of the limitations.

Further difficulties in making conclusions relate to the variety of endpoints measured in the various studies. There is little agreement on what is an appropriate endpoint. In particular the identification of asymptomatic VTE may not reflect a useful clinical endpoint, and a mortality difference has often been absent or not assessed.

In exploring subgroups of critically ill patients these issues become even more prominent, but they have helped define a safety profile in certain conditions. Particular difficulties exist where there is high risk of haemorrhage and of VTE, and available evidence has allowed recommendations to be made in some of these subgroups [13,14,15].

With the development of new anticoagulants, more uncertainties now exist. LMWH appears superior to UFH and has a greater evidence base than the novel anticoagulants. Therefore, at this time, it is the drug class of choice[5,7]. No difference in effect of various LMWHs has been demonstrated [5].

Despite general agreement with previously published recommendations on VTE prophylaxis compliance has been demonstrated as substandard [2,3]. This has been shown to improve with targeted clinical governance and quality improvements measures [3].

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4.2.2   Ventilator-associated pneumonia

Authors: Thomas P Hellyer & A John Simpson

INTRODUCTION

Ventilator-associated pneumonia (VAP) is a common ICU healthcare-associated infection (HCAI). Prevention is an important clinical goal, since VAP is associated with an increased mortality, length-of-stay and cost. This chapter makes recommendations on measures that should be implemented to reduce the incidence of VAP. The discussion expands on these recommendations and other prevention measures that have been the focus of important investigations, but which are not currently recommended for routine use.

STANDARDS

None.

RECOMMENDATIONS

1   ICUs should have standardised systems to monitor VAP rates and antibiotic resistance patterns.

2   Patients should be nursed in a semi-recumbent position (30°- 45°).

3   Mechanically-ventilated patients should be tracheally intubated with an orotracheal tube and cuff-pressure maintained above 20 cmH$_2$O.

4   Subglottic suction tubes should be considered for use in patients who it is anticipated will be mechanically ventilated for more than 72 hours.

5   Ventilator tubing and suction systems should only be changed if specifically indicated, such as by visible soiling, to avoid unnecessary changes.

6   Stress ulcer prophylaxis should be used judiciously, and only in patients considered to be at high risk of upper gastrointestinal (GI) bleeding.

BACKGROUND

VAP occurs in 10-20% of ICU patients and is associated with an increased mortality, length of ICU and hospital stay, and cost. Preventing VAP should be part of an overall strategy to reduce HCAI. The best definition of VAP and the optimal criteria for diagnosis remain controversial, and studies in VAP prevention are limited by inconsistent definitions. Furthermore, although many interventions have reduced rates of VAP, few have had an impact on length of stay or mortality.

Central to the pathogenesis of VAP is micro-aspiration of potential pathogens into the respiratory tract. Nursing mechanically-ventilated patients in a semi-recumbent rather than a supine position reduces the rate of VAP, although the degree to which the patient is semi-recumbent may be of less importance[1]. Micro-aspiration can be further reduced by using orotracheal intubation over nasotracheal intubation (with reduced risk of maxillary sinusitis)[2], maintaining an endotracheal tube (ETT) cuff pressure greater than 20

cmH_2O^3 and not performing routine ventilator circuit changes[4]. The use of an ETT with a subglottic drainage port has been associated with a reduction in VAP and length of ICU stay[5].

The prevention of stress ulcers must be weighed up against the increased risk of VAP, as raising the pH of the stomach contents promotes colonisation with potentially pathogenic organisms. There is no clear evidence to support the use of sucralfate over H2-receptor antagonists as a strategy to reduce the risk of VAP[6]. Furthermore recent evidence from a large observational study of over 35,000 patients demonstrated that proton pump inhibitors offer inferior GI protection in comparison to H2-receptor antagonists, while increasing the risk of pneumonia and Clostridium difficile infection[7]. A meta-analysis by Marik et al[8] found that, overall, H2-receptor antagonists protected against GI bleeding with an odds ratio (OR) of 0.47 (95% confidence interval (CI) 0.29-0.76), but this treatment effect was only observed in patients who did not receive enteral feeding, and there was an increase in VAP in the subgroup of patients receiving H2-receptor antagonists who were enterally fed.

The use of oral chlorhexidine is widespread and recommended in previous guidelines. Meta-analyses that have shown the largest reduction in VAP rates have been heavily influenced by trials of cardiac surgery patients[9,10]. Recent meta-analyses of RCTs in the general ICU population have shown a more modest, non-significant reduction in VAP with chlorhexidine, but has also suggested an increased risk of death[11,12]. Chlorhexidine should not be recommended except for cardiac surgery patients and further trials are needed in the general ICU population.

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- *Selective Decontamination of the Digestive Tract in the ICU* (SuDDICU) trial. http://www.ccctg.ca/Programs/SuDDICU-study.aspx.

- *Resistance in Gram-Negative Organisms: Studying Intervention Strategies* (R-GNOSIS). http://www.r-gnosis.eu/.

4.2.3   Line Related Sepsis

Authors: Annette Richardson & Carol Peden

INTRODUCTION

Critically ill patients are at risk of line sepsis, as many of these patients require invasive lines to monitor and provide treatments. There is good evidence to guide Critical Care staff on how to prevent line sepsis and improve patient outcome. This section provides Critical Care recommendations relevant to patients requiring invasive lines as part of their care, treatment and management.

STANDARDS

None.

RECOMMENDATIONS

1   Critical care units should adhere to EPIC 3 guidelines[1] (updated 2014) for the prevention of line-related sepsis; these are national evidence-based guidelines for preventing healthcare-associated infections. These guidelines are also NICE accredited[2].

2   A central line insertion bundle should be adopted.

3   A central line maintenance bundle should be adopted.

4   A peripheral line insertion and maintenance bundle should be adopted.

5   Line-infection rates, based on a standardised definition of line infection, should be monitored and reviewed monthly.

BACKGROUND

Bloodstream infections (BSI) are an important cause of morbidity and mortality in critically ill patients. The micro-organisms that colonise catheter hubs and the skin adjacent to the insertion site are the source of most catheter-related bloodstream infections (CR-BSI). CR-BSI associated with the insertion and maintenance of central venous catheters (CVCs) are potentially amongst the most dangerous complications associated with healthcare. In the most recent national prevalence survey, the Health Protection Agency reported that the prevalence of BSI was 0.5%, accounting for 7.3% of HCAI detected; 64% of BSI occurred in patients with a vascular access device[1].

There is substantial evidence that levels of harm from catheter-related infection can be reduced by relatively simple technical, cultural and behavioural changes, including the use of bundles to ensure reliable delivery of key steps in care [3-6]. The power of a "bundle" is that it brings together evidence-based components that have been identified to improve the clinical outcome of interest. The need to deliver simple but compulsory steps helps to empower all members of the multi-professional team to ensure that all bundle components are complied with during line insertion. The focus of measurement is the completion of the entire bundle as a single intervention, rather than completion of its individual components. The central line and peripheral line

bundles have been proven to reduce infection, and compliance with the bundle components should be routine practice in an ICU. Regular monitoring of compliance should be made and recorded[3].

The Michigan-Keystone project significantly reduced infection rates in 108 ICUs across the State of Michigan[4]. In the UK, a study with the aim of replicating this success, "Matching Michigan", was undertaken between 2009-2011 in 202 English ICUs[7]. There was a marked reduction in CVC-BSI in English ICUs over the time of the study, although this study did not show a significant impact from the quality improvement intervention in its own right, as rates of central-line bloodstream infection (BSI) decreased across the whole country during the time of the programme, which took place during a period of national activity to improve infection rates.

Central venous catheters can be in situ for periods of hours to weeks and are manipulated by a multitude of staff members. CVCs are accessed frequently; because each entry into the delivery system is an opportunity to introduce infection, the post-CVC insertion period presents multiple opportunities for risk of infection. Almost 72% of all central line-associated bloodstream infections reported to the National Healthcare Safety Network (NHSN) in the US by Pennsylvania hospitals in 2010 occurred more than five days after insertion, suggesting that infection prevention lapses were partly responsible. Studies revealed that lapses in proper infection prevention techniques occurred in 45% of cases[1].

To prevent infection to patients, staff must be vigilant, not only about insertion, but also maintenance of the line. Units should audit and analyse all infections that occur, based on standardised definitions of infection in order to understand where improvement is required[8].

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ADDITIONAL INFORMATION

Central Line Insertion Bundle Example:
- Hand hygiene, gown, gloves, hat, mask, eye protection when indicated
- Skin antisepsis: 2% chlorhexidine gluconate in 70% isopropyl alcohol
- Maximal sterile precautions including full barrier drapes
- Site of insertion: avoid the femoral route
- CVC maintenance: aseptic access technique, daily site review, and remove CVCs at earliest opportunity.

Central Line Maintenance Bundle Example:
- The need for the CVC is reviewed and recorded on a daily basis
- The CVC dressing is intact.
- The CVC dressing has been changed in the last seven days.
- A solution of 2% chlorhexidine gluconate in 70% isopropyl alcohol is used for cleaning the insertion site during dressing changes
- Hand hygiene is performed immediately before accessing the line or site
- An antiseptic containing 70% isopropyl alcohol is used to clean the access hub prior to accessing; rub the access hub for at least 15 seconds ("scrub the hub").

CVC Infection Rate Monitoring Example:
- Units should clearly define how they class a central venous catheter infection
- Infection rates should be tracked monthly and displayed on charts for all staff to observe
- If infections are rare, "days between" infections can be tracked
- Root cause analysis of infections should be considered to identify learning points for future infection prevention and improvement.

4.2.4 Infection Control

Author: Peter Wilson

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 Critical Care patients. The microbiologist and infection control staff are an essential part of the team applying these standards.

STANDARDS

None.

RECOMMENDATIONS

1   Patients should be screened for carriage of MRSA according to locally determined prioritisation. Although patients with a long stay or multiple antibiotic treatments are at higher risk, sensitivity of filtering 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 in allocation of single-room isolation.

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

5   Cleaning of the environment should 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.

6   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.

7   There should be surveillance systems in place for audit and feedback of nosocomial infection, for example, catheter-related bacteremia.

8   The Critical Care team should have access to a microbiologist of adequate experience and seniority, who can help identify and mitigate infection control risks, and advise on the choice and duration of antimicrobial chemotherapy in accordance with local formularies as a part of antibiotic stewardship.

9   Infection control nursing staff should be available to provide day-to-day advice on prevention of spread of infection, isolation priority and procedures and decontamination.

10   Infection control procedures should be documented and agreed by the multi-professional team.

11   Allocation of patients to single-room isolation for known or suspected infection should be reviewed on admission and frequently thereafter.

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

13   Healthcare workers should decontaminate their hands immediately before and after every episode of direct contact or care.

14   Staff should follow safe insertion and maintenance procedures for intravascular and urinary catheters, and remove them when not needed to minimise the risk of infection.

BACKGROUND

Critically ill patients are subject to invasive procedures and multiple direct contacts with staff and the environment. 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[2]. 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 is sufficient. When a pathogen is isolated, narrowing of broad-spectrum should be considered. Single-dose antibiotics (or 24-hours) 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* or 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[3].

Urinary and intravascular catheter infections are correlated with the duration of placement of the catheter. Frequent review of the need for catheters is required, and 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 bacteremia[4].

Nosocomial pathogens particularly MRSA, *Acinetobacter* and *Clostridium difficile* can survive in the environment for many months[5]. Additional cleaning of high-contact surfaces, for example, keyboards and bed rails 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 ICU stay. However recent evidence suggests oral chlorhexidine gel should be discouraged.

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- http://www.bmj.com/content/348/bmj.g2197.

4.3   Specialised Critical Care

4.3.1   ECMO

Authors: Simon Finney & Jeremy Cordingley

INTRODUCTION

Extracorporeal membrane oxygenation (ECMO) can provide total cardiac and/or respiratory support for patients. It can bridge patients with acute cardiac/respiratory failure over a period of recovery of native function. ECMO can also be used to support patients with severe chronic heart and lung disease to transplantation if recovery is not possible.

For the purposes of this chapter, ECMO is defined as pumped extracorporeal support which is undertaken with the specific aim of providing some oxygenation support for the patient. This is intended to distinguish it from extracorporeal carbon dioxide removal ($ECCO_2R$) which can be undertaken at extracorporeal blood flows of typically less than 1.3 L/min and has a different clinical profile of complications, training requirements, patient dependence on the circuit, and vascular access.

The recommendations are based upon current literature, international guidelines, and the Service Specification for ECMO Service for Adults with Respiratory Failure developed by the former National Specialist Commissioning Team, whose role was subsequently taken over by NHS England. The Service Specification was reviewed and ratified by the Adult Critical Care Clinical Reference Group. Currently there is not an NHS England service specification for ECMO for adult patients with cardiac failure.

STANDARDS

1.1.1   Care must be led by a consultant in Intensive Care Medicine.

1.2.1   Level 3 Patients (level guided by ICS levels of care) require a registered nurse/patient ration of a minimum 1:1 to deliver direct care.

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

2.15   Level 3 units must have access to a Regional Home Ventilation and weaning unit. Arrangements should 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.

2.16   Patients discharged from ICU must have access to an ICU follow-up clinic.

3.2   All equipment must conform to the relevant safety standards and be regularly serviced.

3.3   All staff must be appropriately trained, competent and familiar with the use of equipment.

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

RECOMMENDATIONS

1   Patients should be cared for by a multi-professional team using agreed protocols. This team should include representation from Critical Care physicians, Critical Care nurses, Clinical Perfusion, Cardiothoracic surgery, Respiratory Medicine, Cardiology, Rehabilitation therapists, and Palliative Care.

2   Patients who require ECMO need input from other specialities, and this is often highly specialist. ECMO should be conducted at institutions that can provide this directly or have contractual links with other providers to support these needs. For example, severe respiratory failure is likely to require support from thoracic surgeons, specialist imaging, and sub-speciality respiratory physicians; severe acute cardiac failure is likely to require support from interventional cardiologists, echocardiographers, electrophysiologists, heart-failure specialists, cardiac surgeons, and cardiac mechanical support programmes.

3   ECMO Providers should have backup equipment on site 24/7 to support the patient in the setting of a sudden circuit or device failure.

4   Providers should have an anticipated minimum case load of 20 cases per annum.

5   ECMO providers should collaborate with one another to maximise capacity across the system during periods of surge activity, to ensure timely admission for patients. This may impact upon normal elective activity in ECMO centres during periods of high demand.

6   ECMO providers should collaborate with one another in terms of clinical governance and quality improvement. This should include the sharing of activity, process and outcome data to allow centres to benchmark themselves against one another

7   Patients should only be considered for bridge to transplant with the prior knowledge and agreement of a transplant programme, and in line with any guidance issued by NHS Blood and Transplant.

8   ECMO providers should submit details of all ECMO runs to the international registry hosted by the Extracorporeal Life Support Organisation (www.elsonet.org).

9   ECMO providers should have specific training programmes in place to ensure that the ICU has nurses, doctors and clinical perfusionists with the knowledge and skills to undertake ECMO on-site continuously throughout the ECMO run. The programmes should comply with the ELSO international guidelines. Personnel should demonstrate clinical competence and experience regularly.

BACKGROUND

ECMO in the veno-venous configuration can provide pre-pulmonary gas exchange and obviate the need for native lung function. Initial trials undertaken demonstrated no improvement in mortality and significant bleeding complications. These trials were undertaken in the context of injurious mechanical ventilation and no longer apply. Conceptually, respiratory ECMO has developed to not only rescue life-threatening hypoxaemia/hypercapnia, but also to enable lung protective ventilation. Coupled with technological advances that have simplified ECMO this has shifted the balance of risks.

The CESAR study[1] demonstrated that patients transferred to a single ECMO centre, rather than staying at the referring institution, were more likely to survive without severe disability. Most patients received ECMO at the ECMO centre. The study had limitations in its single-centre design, cross-overs in that ECMO-randomised

patients did not receive ECMO, and possible cofounders (higher use of corticosteroids; Molecular Adsorbent Recirculating System [MARS]; and lung-protective ventilation). Corticosteroid use has never been demonstrated to improve mortality in ARDS. MARS has not been shown to improve survival in acute liver failure. The increased use of lung-protective ventilation in the ECMO centre may have a reflected a different standard of care, but this could also be the mechanism of benefit as lung-protective ventilation is much easier in the setting of additional extracorporeal gas exchange.

Despite these limitations and with good outcomes in patients with severe H1N1 influenza A[2] (albeit these data relate only to that condition), there has been international adoption of ECMO in patients with severe acute potentially reversible respiratory failure. In the United Kingdom, the CESAR inclusion and exclusion criteria are used to define patients who may benefit from ECMO. The five nationally designated centres are:

- Glenfield Hospital, Leicester (0300 303 1573)
- Papworth Hospital, Cambridgeshire (01480 830541)
- Royal Brompton Hospital, London (020 7351 8585)
- St. Thomas's Hospital, London (020 7188 2511)
- Wythenshawe Hospital, Manchester (07837 541143)

Uncertainty remains as to whether ECMO should be adopted earlier in less severe respiratory failure. The recent positive studies in prone-ventilation and negative studies in high-frequency ventilation impact on this question.

ECMO in the veno-arterial configuration can provide total cardiac and pulmonary support for a patient with INTERMACS 1/2 cardiogenic shock. It has not been subject to clinical trials, but has good physiological rationale. NICE recommends it is delivered within specific governance arrangements.

The NICE guideline on acute heart failure recommends that patients with severe acute failure should be discussed early with mechanical circulatory support centres. It is recommended that outcomes are shared between providers and with the international registry. Many patients do not recover cardiac function, and thus close liaison with a cardiac mechanical support and transplant programme is important.

ECMO requires skills and knowledge transferred from Clinical Perfusion. Patients cannot survive even brief failures of their ECMO circuit, and teams must be able to manage failures immediately. Coagulopathies develop beyond those associated with the administration of heparin. Bleeding is common and can be very difficult to manage. Appropriately trained personnel should be available on the ICU continuously.

There is no robust data to support a minimum volume for an ECMO centre. Nevertheless, the current UK model of requiring 20 cases per annum is widely respected internationally. It is a pragmatic choice, based on balancing case-load against the training burden and the infrastructure burden. Higher volume ensures exposure of staff to ECMO and minimises any distracting effect that a very high acuity patient can have on other patients on the ICU.

Complete Service Standards are included in the NHS England Service Specification; '*ECMO Service for Adults with Respiratory Failure'*. ECMO centres are also expected to meet the Service Specification for Adult Critical Care.

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- EOLIA trial (clinicaltrials.gov reference: NCT01470703).
  A multi-centre international randomised study of ECMO instituted early in severe ARDS vs. conventional therapy with the option of rescue ECMO.

- CHEER study (clinicaltrials.gov reference: NCT01186614).
  A study in patients with refractory out of hospital cardiac arrest. This observational study is describing the effects of automated CPR, hypothermia and VA-ECMO in the emergency department, and early coronary intervention on outcome.

4.3.2   Cardiothoracic Surgery

Author: Alain Vuylsteke

INTRODUCTION

Cardiac

In the United Kingdom, cardiac surgery is mainly carried out in specialist units within teaching hospitals or specialist hospitals dedicated to cardiothoracic work.

The nature of cardiac surgery demands that all patients should be cared for post-operatively in a unit that conforms to the standards of general Level 2 and 3 intensive care facilities[1]. Some patients will progress in a few hours from Level 3 to Level 1 status, while others will remain at Level 2 or 3 for longer.

Many units care for selected cardiac surgical patients in the immediate post-operative period in facilities other than designated ICUs. These are variously referred to as the High Dependency Unit (HDU), 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. The patient-monitoring and staff requirements of such a facility are no less than the essential monitoring requirements of patients cared for in ICU[2], and the governance arrangements should be the same[1].

Thoracic

In the United Kingdom, thoracic surgery is mainly carried out in specialist units within teaching hospitals or specialist hospitals dedicated to cardiothoracic work.

After major thoracic surgery, patients must be transferred to a properly equipped and staffed area. In the United Kingdom most patients will return to a facility providing Level 2 care. Some patients who have had oesophageal surgery and some patients undergoing lung surgery may need post-operative mechanical ventilation on ICU. Access to ICU or HDU is therefore essential. Nursing staff in ICUs and HDUs receiving patients after thoracic surgery should be trained in thoracic nursing care and have access to the same services that are available on a general thoracic ward[1].

STANDARDS

None.

RECOMMENDATIONS

1   In cardiothoracic units, there should be immediate access to Critical Care facilities, which should be staffed by appropriately trained personnel[1].

2   It is preferable that all cardiac surgery and post-operative care be carried out in a dedicated environment, located close to the theatres[1,3].

3   Wherever cardiac anaesthesia and surgery are performed, there should be a resident anaesthetist and a resident cardiac surgeon capable of emergency chest re-opening[1].

4   Wherever thoracic anaesthesia and surgery are performed, there should be a resident anaesthetist and thoracic, or cardiothoracic, surgeon capable of emergency chest re-opening[1].

5   Transthoracic and transoesophageal echocardiography should be immediately available[1].

6   Perfusion services should be readily available[1].

7   Thoracic patients should be managed in dedicated thoracic units post-operatively, with access to an acute-pain service and governed by pain-relief protocols[1].

8   All cardiothoracic units should participate in local and national audit[4].

BACKGROUND

The delivery of Critical Care for all patients is evolving rapidly. Simultaneously, the requirements of patients undergoing cardiothoracic surgery is evolving rapidly, with an increased number of patients with multiple co-morbidities being offered an ever-increasing number of complex cardiothoracic interventions, including those performed in the cardiac-catheter laboratory[4].

Cardiac anaesthetists and surgeons have recognised the need to deliver care to their patients in accordance with published guidance, and this recognises the requirement to adhere to the Core Standards for Intensive Care Units[1].

Studies documenting important incidences of major complications and mortality after classic cardiac surgical operations, such as coronary artery bypass grafting emphasise the importance of Critical Care for patients undergoing cardiothoracic surgery[5]. Arrangement in specialist units has been shown to decrease resource utilisation[3,6].

Cardiothoracic intensive care provides an important area of training. It offers training in the post-operative care of patients with severe heart and lung disease, essential for all intensivists whatever their future area of practice.

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4.3.3   Neurocritical Care

Authors: David Menon & Martin Smith

INTRODUCTION

Neurocritical care is devoted to the comprehensive care of critically ill patients with neurological or neurosurgical disease (hereafter called neurological disease). Care of such patients requires an understanding of the physiology and pathophysiology common to brain diseases in general, as well as the skills and knowledge to treat a range of specific conditions. Given the exquisite vulnerability of the injured brain to physiological insults, optimal care of such patients also demands meticulous attention to maintenance of systemic and cerebral physiological targets while ensuring appropriate protection of extracranial organs. Consequently, the care of critically ill neurological patients requires not only the skills and expertise of the general intensivist in optimising and supporting cardiorespiratory, renal and metabolic function, but also the ability to assess the compromised nervous system clinically and to augment such assessment with the use of specialist neuromonitoring modalities such as intracranial pressure, brain tissue oxygenation and chemistry, and neurophysiology.

The neurointensivist integrates the multi-specialty input provided by other medical, surgical, and diagnostic subspecialists, and the multi-professional care contributions from nurses, physiotherapists, speech and language therapists, pharmacists, and dietitians. Neurocritical care teams must be familiar with the unique aspects of neurological disease processes and the effects of interventions on the injured brain, and integrate all aspects of neurological and medical management into a single care plan.

Recovery from neurological disease can be protracted, and acute survival is not an adequate metric of outcome in many neurological diseases, particularly after acquired brain injury. Consequently, the neurointensivist, more than any Critical Care medicine specialist, needs to be cognisant of long-term functional state as a key outcome goal, a requirement that should underpin close interaction with neurorehabilitation specialists even in the acute phase of illness. Finally, the loss of capacity and/or communication that frequently accompanies neurological disease, and the ever-present possibility of poor quality survival, makes the judgment of best interests an exceptionally challenging task for all who work in neurocritical care.

STANDARDS

1.1.1   Care must be led by a consultant in Intensive Care Medicine.

1.2.1   Level 3 Patients (level guided by ICS levels of care) require a minimum registered nurse/patient ratio of a minimum 1:1 to deliver direct care.

1.3.1   The rehabilitation needs of all patients must be assessed within 24 hours of admission to Critical Care and NICE 83 eligible patients must receive a rehabilitation prescription on discharge from Critical Care.

1.3.2   All patients with a tracheostomy should have communication and swallowing needs assessed when the decision to wean from the ventilator has been made and the sedation hold started.

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

2.16   Patients discharged from ICU should have access to an ICU follow-up clinic.

RECOMMENDATIONS

1   Patients should be cared for by a multi-professional Critical Care team with specialist expertise and experience in managing critically ill neurological patients using agreed protocols based on the best evidence available.

2   The ICU team should include Critical Care physicians, Critical Care nurses, physiotherapists, pharmacists, dietitians, and speech and language therapists with specialist expertise and experience in caring for acutely unwell patients with neurological and neurosurgical disease.

3   Medical and nursing staff in the neurocritical care setting should be competent in the clinical assessment of neurological state, and should possess the appropriate expertise for implementation, maintenance, and interpretation of monitors of neurological and cerebrovascular physiology.

4   Care of critically ill neurological patients should fully integrate involvement of admitting specialties (neurology and neurosurgery), and diagnostic specialties (neuroradiology and neurophysiology).

5   As well as the usual requirements for laboratory and imaging support, the neurocritical care unit should have access to investigation facilities and appropriate clinical expertise for:
   a) Diagnostic radiology (24-hour access to CT; access to MRI for ventilated subjects, and diagnostic angiography)
   b) Interventional neuroradiology
   c) Neurophysiology (including electroencephalography [EEG] and evoked-response diagnosis and monitoring). Access to continuous 24-hour EEG monitoring is highly desirable.

6   Early and formal involvement of the neurorehabilitation team should be sought to optimise outcomes and facilitate transitions of care.

7   There is a strong case for the provision of Critical Care of acute neurosurgical and neurological diseases only in specialist neuroscience centres.

8   Critical Care units should 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 when the need for specialist neuroscience care no longer exists.

9   Effective protocols should be organised to allow referral of patients with spinal injuries to spinal rehabilitation units and those with persistent ventilatory insufficiency to long term ventilation units.

10   Post-ICU follow up and audit of outcomes require a longer interval than for general Critical Care, and should ideally include a measure of functional recovery at a minimum of six months.

BACKGROUND

Neurocritical care is an emerging specialist area of Intensive Care Medicine, which is building a clinical portfolio that began with the management of post-operative neurosurgical patients, traumatic brain injury (TBI) and subarachnoid haemorrhage (SAH). Although TBI and SAH continue to make up a large proportion of admitted cases, neurocritical care has expanded to include all acute neurosurgical and neurological diseases. In particular, the admission of patients with intracerebral haemorrhage (ICH), acute ischaemic stroke, neuromuscular disorders, status epilepticus and central nervous system infection is becoming increasingly common, and neurocritical care now provides comprehensive management for all life-threatening disorders of the central nervous system and their complications.

The last two decades have seen increasing evidence leading to a consensus that the specialist care of critically ill neurological patients is best undertaken by clinical teams who have a special interest in this area of clinical practice, and are likely to see large volumes of cases. Accumulating epidemiological evidence has shown that even "non-surgical" TBI patients fare better when cared for in specialist neurosciences units[1], a finding that has been borne out by the improvements in outcome that accompany increased referral of such patients to neurosciences centres[2], and by large comparative-effectiveness research studies[3] which also document the cost-effectiveness of such referral[3]. Critically, similar evidence is now emerging for conditions such as ICH and SAH, and provides the basis for the establishment of stroke centres.

Several factors may underpin such findings. First, in conditions such as TBI, referral to a specialist neuroscience centre in the UK is part of a framework of management in systems of trauma care where the neurosurgical services are co-located with other key specialties. Data that address benefits of trauma care systems in the UK are only just emerging[4]. An additional factor may be case-load, since increased clinical experience often translates into improved care and therefore outcome. However, the relationship between case-load and outcome is not simple – while inter-centre variations in case-load amongst trauma centres suggests an outcome benefit of higher caseload in TBI[5,6], within-centre increases in case-load (which presumably overwhelm resources) can result in worse outcome when temporal trends are assessed[5], arguing strongly for the provision of adequate resource. The benefits of higher caseload are also seen in inter-centre variations in outcome for other conditions, such as aneurysmal SAH[7].

It seems clear that the expertise needed to deliver such high-quality care does not require care in single-specialty neurocritical care units (although such units can and do deliver cost-effective and high-quality care) since the outcomes of large multi-speciality ICUs that incorporate neurocritical care are not statistically different from specialist neurocritical care units, at least for TBI[3]. A more relevant factor for many specific diseases, and for neurocritical care in general, is the presence of staff with specific experience and expertise in the management of critically ill neurological patients and the adoption of widely accepted international management guidelines (such as those for monitoring-guided therapy[8], and management of TBI[9] and SAH[10]) that are delivered consistently.

Notwithstanding the availability of such guidelines, neurocritical care must always encompass management of the extracranial organ dysfunction that frequently accompanies neurological disease, bearing in mind that brain-directed therapy can have potentially adverse effects on systemic organ systems and *vice versa*. This strongly argues for qualified Critical Care physicians (with neurointensivise care expertise) coordinating clinical management in this context, rather than the care of such patients being allocated to organ system specialists, unless (as is common in the USA) they possess Critical Care training. The schemes of consultant staffing may vary depending on local arrangements, but the Critical Care consultant responsible for the management of critically ill neurological patients must be available to provide immediate advice and, where required, be able to review patients within an appropriate time frame.

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RESEARCH IN PROGRESS TO INFORM PRACTICE

- Collaborative European NeuroTrauma Effectiveness Research in TBI (CENTER-TBI; https://www.center-tbi.eu/): A 5400 patient precision medicine and comparative effectiveness research study, funded by the European Union FP-7 Program, across 70+ centres in Europe. Study recruitment starts in late 2014, and results are expected to emerge from 2018 onwards. This is part of the International Traumatic Brain Injury Research initiative, which also involves similar studies in the USA, Canada and other countries. (http://intbir.nih.gov/).

- *Randomised Evaluation of Surgery with Craniectomy for Uncontrollable Elevation of Intra-Cranial Pressure* (RESCUE-ICP; http://www.rescueicp.com/). An MRC/NIHR funded randomised trial of decompressive craniectomy versus medical management in refractory intracranial hypertension. Recruitment to the study is complete, and results are expected in 2015.

- Eurotherm3235Trial (http://www.eurotherm3235trial.eu/home/index.phtml) is an international, multi-centre, randomised controlled trial, funded by the NIHR HTA Program, which will examine the effects of

titrated therapeutic hypothermia (32-35°C) as a treatment for raised intracranial pressure after traumatic brain injury in 600 patients with TBI admitted to the ICU. Recruitment is ongoing.

- CRASH 3 (https://ctu-web.lshtm.ac.uk/c3w/) is a large, international, randomised, placebo controlled, MRC funded trial, to quantify the safety and effect on mortality and morbidity of the administration of tranexamic acid in patients with TBI. Recruitment is ongoing.

- RESCUE-ASDH (*Randomised Evaluation of Surgery with Craniectomy for patients Undergoing Evacuation of Acute Subdural Haematoma* - http://www.rescueasdh.org/) is an NIHR-HTA funded trial, is a multi-centre, pragmatic, parallel group randomised trial funded by the NIHR-HTA, that aims to compare the clinical and cost-effectiveness of decompressive craniectomy versus craniotomy for the management of adult head-injured patients undergoing evacuation of an acute subdural haematoma. The study has just begun recruiting.

4.3.4   Trauma

Author: C. A. Eynon

INTRODUCTION

In 2010, the National Audit Office published '*Major trauma care in England[1]*. There were an estimated 20,000 cases of major trauma (injury severity score >15) each year resulting in 5,400 deaths. In-hospital mortality for trauma patients was 20% higher than in the USA. The lost economic output as a result of major trauma was estimated between £3.3 billion and £3.7 billion. In September 2010, an NHS Clinical Advisory Group produced a report defining the components of a regionalised approach to trauma care[2]. These and similar reports have led to significant changes in the management of patients with major trauma[3-6].

STANDARDS

1.1.1   Care must be led by a consultant in Intensive Care Medicine.

1.3.1   Assessment of the rehabilitation needs of all patients must occur within 24 hours of admission to Critical Care. NICE 83 eligible patients on discharge from Critical Care must receive a rehabilitation prescription.

1.3.6   The Critical Care team must have a physiotherapist of adequate experience and seniority who can help contribute/construct a suitable weaning plan for complex patients, or long stay patients, in conjunction with the wider multi-professional team.

1.5.2   There must be a dietitian as part of the multi-disciplinary team.

1.5.3   The ICU lead dietitian will be involved in the assessment, implementation and management of appropriate nutrition support route, in conjunction with the rest of the MDT team.

2.17   Geographically remote ICUs must have an established review/referral relationship with a bigger centre.

RECOMMENDATIONS

1   Patients with major trauma should be transferred to the Major Trauma Centre (MTC) using an 'automatic acceptance' policy. This includes transfer of all patients with severe head injuries (Glasgow Coma Score ≤ 8) or severe spinal injury to the local neuroscience centre (usually co-located with the MTC) irrespective of the need for neurosurgery. All patients with moderate head injuries (GCS 9-13) should be discussed with the neurosciences centre, and management plans agreed between the referring hospital and the neurosciences centre.

2   Transfer and retrieval of patients within the network should be carried out following the recommendations of the Intensive Care Society, the Paediatric Intensive Care Society, the Association of Anaesthetists and the Society of British Neurological Surgeons.

3   There should be a network protocol for assessing the whole spine in patients with major trauma. A management plan for potential spinal injuries, including those with no radiological evidence of spinal injury, should be completed by an appropriate consultant within 24-hours of admission.

4   For patients with a new diagnosis of traumatic spinal cord injury, the local Spinal Cord Injury Centre (SCIC) should be contacted within 4-hours of the injury. The SCIC will be responsible for providing ongoing advice, guidance and appropriate support until such time as the patient is transferred to an SCIC.

5   A tertiary trauma survey should be completed within 24-hours of admission to hospital for major trauma patients. This should include a thorough clinical examination (top to toe) and a review of all x-rays and reports, ensuring that all identified injuries are reviewed by the appropriate specialist team within 24-hours of admission or identification, whichever is the sooner.

6   Patients with major trauma are at high risk of venous thromboembolism (VTE)[7]. All patients should receive mechanical VTE prophylaxis. Low-molecular-weight heparin (LMWH) should be administered within 48-hours if no contraindications are present. Patients at high risk in whom neither mechanical VTE prophylaxis nor LMWH can be administered within 72-hours, should be considered for an inferior vena cava filter.

7   All hospitals admitting trauma patients should have a specialised acute pain service. Multi-modal therapy is increasingly recognised, when combined with early nutrition and ambulation, to improve functional recovery and reduce chronic pain. This includes regional analgesia, analgesic drugs and if necessary anticonvulsants, antidepressants and anxiolytics.

8   Effective nutritional management is crucial to recovery and rehabilitation following traumatic injury. Policies for nutritional management should be in place in Major Trauma Centres and Trauma Units. Policies should include consideration of the placement of naso-jejunal and percutaneous endoscopic gastrostomy (PEG) tubes, management of enteral and parenteral feeding, and other strategies to minimise nutritional compromise.

9   All patients with an ISS >8 should have a review by a rehabilitation consultant or alternative consultant with skills and competencies in rehabilitation, within 72-hours (or 4 calendar days if seriously at risk of dying[8]).

10   A full dataset of all patients sustaining traumatic injuries should be submitted to TARN (Trauma Audit Research Database). For major trauma centres, this data must be submitted within 25 days of the date of discharge (excluding coroner's cases).

BACKGROUND

April 2012 saw the establishment of major trauma networks across England. Each network has a Major Trauma Centre (MTC) at its centre that must be able to provide all the specialist services potentially required for a patient who has sustained major trauma 24/7. England has 12 MTCs accredited for the management of adults and children, 8 that are adults only, 4 paediatric only and 2 collaborative centres where services are currently split between different hospitals. Patients with injuries suggestive of major trauma are now transferred directly to the MTC, bypassing other hospitals. If, however, patients are greater than 45-minutes distance from the MTC, or have imminent airway compromise or cardiac arrest, they may be taken to a closer trauma unit for resuscitation and assessment. MTCs have a responsibility for accepting any patient who has been admitted with injuries that exceed the capabilities of the referring hospital.

Data from TARN indicates that in-hospital mortality from major trauma fell by nearly 20%[9] in the first year following the introduction of major trauma networks. The improvements in some aspects of major trauma care have, however, highlighted problems in other areas. There is increasing recognition of major trauma in the elderly population. Whether all of these patients would benefit from management at a major trauma centre is currently unclear. Timely assessment of rehabilitation needs and access to appropriate rehabilitation facilities remain difficult, often resulting in long delays with patients in unsuitable, acute care facilities.

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4.3.5   Weaning and Long Term Home Ventilation Services
Author: 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 this group can reduce the duration of ventilation and 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

1.3.6   The Critical Care team must have a physiotherapist of adequate experience and seniority who can help contribute/construct a suitable weaning plan for complex patients, or long stay patients, in conjunction with the wider multi-professional team.

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

1.5.2   There must be a dietitian as part of the Critical Care multidisciplinary team.

2.7   Each patient must have an assessment of their rehabilitation needs within 24 hours of admission to Critical Care.

2.15   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.

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   These patients should be managed by multi-professional teams consisting of senior medical, nursing, physiotherapy 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].

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 rehabilitation section of this document.

5   The majority of these patients will require a tracheostomy. Tracheostomy placement and management should follow ICS guidelines[4].

6   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[5].

7   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 telephone advice and be able to visit referring units to assist with weaning[1].

8   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 Critical Care will rapidly wean from ventilation. However 20-30% will need longer term support, and around 12% 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. A service specification for regional weaning centres and home-ventilation services has been developed, and the commissioning of such centres is currently being discussed[1].

A network of Home Ventilation centres already exists in the United Kingdom, and the proposed service specifications mostly reflect the current organisation of these services. At present, most patients with weaning delay are not transferred to specialist centres. The situation in the United Kingdom therefore differs from North America and some European countries, where purpose built longer term ventilation/weaning centres are more common. The future development of inpatient, longer term ventilatory facilities that are geographically separate from Critical Care Units will depend on many complex factors, including patient and family acceptability, quality of care, outcomes, and economic factors including the involvement of private healthcare providers.

There is however agreement in the United Kingdom that patients who will need long-term respiratory support at home should be managed by specialist regional home-ventilation teams. 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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RESEARCH IN PROGRESS TO INFORM PRACTICE

- BREATH trial.

- A multicentre RCT of rapid weaning onto NIV v standard care. Commenced 2013.

- http://public.ukcrn.org.uk/search/StudyDetail.aspx?StudyID=13347.

4.3.6   Burns

Authors: Ne-Hooi Will Loh & Tushar Mahambrey

INTRODUCTION

Burns may lead to major changes in the body homeostasis, with severe haemodynamic, respiratory and metabolic disturbances[1]. A significant number of patients in the United Kingdom will suffer from burns, and a proportion will have airway inhalational injuries which doubles the mortality. Kalson et al[2], in a population based study in the UK, have shown that burns contributed 5.4% of all serious injuries which varied by region from 1.5% to 12%. It demonstrates that burns remain a significant health problem even in the developed world. Burns care is advancing, with improvements in outcomes related directly to research from experts in the field. Burns-injury research reflects the multi-professional and holistic approach necessary to treat this patient population. Close collaboration between specialists is essential for both producing high-quality research output and delivering optimal clinical care. All of the following recommendations and standards apply to all burns patients receiving Critical Care, whether the patient is present in a general ITU or a specialist burns centre.

STANDARDS

1.3.1   Assessment of the rehabilitation needs of all patients within 24 hours of admission to Critical Care and NICE 83 eligible patients on discharge from Critical Care must receive a rehabilitation prescription.

1.3.4   Patients receiving rehabilitation are offered a minimum of 45 minutes of each active therapy that is required, for a minimum of 5 days a week, at a level that enables the patient to meet their rehabilitation goals for as long as they are continuing to benefit from the therapy and are able to tolerate it.

1.3.5   Patients should have all Rehabilitation outcomes quantified using a tool that can track progression from the Acute sector into Primary care to facilitate care needs in the community.

2.7   Each patient must have an assessment of their rehabilitation needs within 24 hours of admission to Critical Care.

RECOMMENDATIONS

1   Burns patients requiring hospitalisation should be managed in specialised burns centres by multi-professional teams consisting of senior medical (surgical, anaesthetic and Critical Care), nursing, pharmacists, physiotherapy and dietitians. There should be a designated burns Critical Care consultant Lead, who should be involved in the planning of burns services at the regional level.

2   There should be sufficient numbers of thermally controlled burns Critical Care beds to allow timely access for patients from within an agreed geographical area.

3   Protocols and appropriate facilities should be in place for transfer of critically ill burns patients between hospitals, and between burns units and centres. In patients with inhalational injuries, an airway risk

assessment should be undertaken by an appropriate senior clinician before inter-hospital transfers.

4   These patients should be managed in a consistent manner by the use of fluid resuscitation (first 48-hours) and transfusion threshold (for theatre) protocols[6].

5   Prior to transfer to a specialised burns centre, wounds should be covered with clean, dry material or non-adherent gauze[4]. The use of wet dressings should be avoided to prevent development of hypothermia in large burns wounds[5]. Tetanus prophylaxis, urinary catheter insertion and pain control should be addressed.

6   Patients with inhalational injuries frequently develop severe ARDS (Acute Respiratory Distress Syndrome), and ICUs receiving such patients should be experienced in the management of this condition.

7   Early mobilisation and rehabilitation are likely to reduce ICU complications. Units should have protocols in place and resources to provide these services.

8   Early (within 12-hours) enteral nutrition should be initiated under close supervision during cardio-respiratory stabilisation of patients with severe burns.

9   All severe burns patients should have access to thermally controlled single bedded cubicle.

10   There should be an ITU dietitian with specific experience and training in burns care as part of the Critical Care multidisciplinary team.

BACKGROUND

Burns trauma leads to hypovolaemic and distributive shock with generalised microvascular injury and interstitial third spacing through collagen and matrix degeneration. Burns injury is marked by dynamic and ongoing fluid shifts[1]. Burns trauma can present with additional traumatic injury, hence patients should be managed as per the ATLS Protocols.

Cone et al[8] have suggested that the extent of the burns injury is overestimated of 75% by Intensive Care providers, which can lead to over-resuscitation[3]. The increased use of sedation and analgesics have also contributed to the increased fluid volumes administered to these patients[1]. The current high volume resuscitation has shifted the post-burn resuscitation complications from renal failure to pulmonary oedema and abdominal compartment syndrome (also termed "fluid creep" by Pruitt BA Jr[5]), leading to multi-organ failure. Barrow et al[7] have suggested that delayed resuscitation beyond two hours is associated with an increase in mortality. There is a school of thought developing, that less is better, and that the pendulum should swing from high-volume to low-volume resuscitation.

Enclosed-space burns should alert the treating physician to the possibility of inhalational injury. The physical examination should include inspection for soot in the oropharynx, carbonaceous sputum, singed nasal or facial hairs, and face or neck burns. Signs of respiratory distress include wheezing, stridor, altered mental status, agitation, anxiety or obtundation; all are strongly suggestive of inhalational injury[3].

Burns induce a hyper-metabolic state which persists for up to one year following injury leading to increases in protein catabolism, lipolysis, reduced lean mass, poor wound healing and a weakened immune system. The hypermetabolic state can be moderated, and most authors recommend prevention of infectious

complications, nursing in neutral temperature environment, early enteral feeding, avoidance of overfeeding and early excision of full-thickness burns[1].

Diagnosis of sepsis is difficult in severe burns, due to the hypermetabolic effects leading to systemic inflammatory response associated with high temperature, tachycardia, tachypnoea and leucocytosis. With all the other advances in burns care, sepsis has become a leading cause of death in these patients. High index of suspicion, good hand hygiene, regular cultures including broncho-alveolar lavage, use of antibiotic impregnated CVP lines can help reduce incidence of sepsis.

A network of major Burn Centres already exists in the United Kingdom, and the proposed service specifications mostly reflect the current organisation of these services. The configuration of services should also optimise clinicians' ability to specialise by providing a sufficient volume of cases to manage. Areas of current research include methods of reducing the catabolic response to burn injury and approaches to reducing the need for blood transfusions.

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RESEARCH IN PROGRESS TO INFORM PRACTICE

- *A Trial of Restrictive Versus Traditional Blood Transfusion Practices in Burn Patients*
  http://www.clinicaltrials.gov/ct2/show/NCT01079247?term=palmieri&rank=9.

- *Assessment of the Treatment of Severely Burned with Anabolic Agents on Clinical Outcomes, Recovery and Rehabilitation* http://www.clinicaltrials.gov/ct2/show/NCT00675714?term=oxandrolone+burns&rank=1.

- *Vitamin C for Severe Thermal Injuries*
  http://www.clinicaltrials.gov/ct2/show/NCT01587261?term=vitamin+c+burns&rank=3.

- *Catecholamine Blockade Post-burn*
  http://www.clinicaltrials.gov/ct2/show/NCT01299753?term=hypermetabolism+burns&rank=5.

4.3.7   Transfer Medicine

Authors: Andy Johnston & Laura Tulloch

INTRODUCTION

Many critically ill patients require transfer within the hospital, for example from the emergency department to the operating theatre or the Critical Care Unit. These patients are at risk of deterioration during the transfer, and at risk of adverse events caused by transfer, such as tube or line displacement[1,2,3] . These events are uncommon, poorly studied, but potentially very serious. Patients may also require transfer over longer distances to receive specialised care at a different hospital where the same risks apply[4]. Patients should be transferred by an appropriately trained and staffed team with appropriate equipment.

STANDARDS

2.4   Patients must not be transferred to other Intensive Care Units for non-clinical reasons.

2.5   On admission to Intensive Care all patients must have a treatment plan discussed with a consultant in Intensive Care Medicine.

2.6   Patients must be reviewed in person by a consultant in Intensive Care Medicine within 12 hours of admission to Intensive Care.

2.17   Geographically remote ICUs must have an established review/referral relationship with a bigger centre.

3.2   All equipment must conform to the relevant safety standards and be regularly serviced.

3.3   All staff must be appropriately trained, competent and familiar with the use of equipment.

RECOMMENDATIONS

1   Transfers should follow the advice and protocols presented in the latest ICS transfer guidance[5].

2   The reason for 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   Intensive Care consultants in both the sending and receiving units must agree on the transfer, and this decision must be documented.

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

5   Patients should only be transferred by staff members of appropriate seniority who have been formally trained in transfer of critically ill patients. The makeup of the team transferring the patient should be determined by how sick the patient is and how much support they require.

6   The transfer team leader should coordinate the transfer with other team members, including the origin and destination.

7   The transfer team should be trained in the use of the equipment they have, and should have appropriate equipment to cope with any deterioration in the patient's condition during the transfer.

8   Staff transferring the patient between hospitals should have the relevant additional training on top of that required for transfer within the hospital.

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

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

11   An adequately stocked and checked dedicated transfer bag should be available for use during patient transfer. This should contain appropriate equipment for interventions that might be required in transit. The transfer bag should be checked routinely and in between uses to avoid delays when it is needed.

12   Standardised transfer documentation should be completed for both intra-facility and inter-facility transfers.

13   Transfer documentation should be scrutinised within a robust audit system, allowing substandard transfers to be investigated and lessons learnt to be shared widely.

BACKGROUND

Transfer of critically ill patients within and between hospitals is common, with many critically ill patients admitted to hospital requiring 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 because of bed shortages in the initial hospital. These transfers are associated with a small but significant rate of adverse events, often related to deterioration in transit, or problems with equipment or patient devices such as lines or tubes. The Intensive Care Society and The Association of Anaesthetists of Great Britain and Ireland (AAGBI) guidelines should inform transfer of patients[5,6].

Those 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 speciality of the team members. All transfers between hospitals should be discussed with a consultant in Intensive Care Medicine.

Consideration should be given to the formation of specialist transfer teams, as these may reduce the incidence of adverse events[2].

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4.3.8   Organ Donation

Authors: Alex Manara & Dale Gardiner

INTRODUCTION

Facilitating organ donation is a core service of every ICU and should be incorporated into all end-of-life policies of the ICU. Intensivists have a professional obligation and a key role in facilitating organ donation and promoting best practice in this area by implementing an increasingly well-defined UK professional, ethical and legal framework. To do this effectively, ICUs need to develop bespoke guidelines that address every aspect of the donation pathway based on this UK framework.

Organ transplantation is the only curative treatment for established end-organ failure. It is cost effective and improves survival and the quality of life of many recipients; however, without organ donation there can be no organ transplantation. Ideally organs for transplantation would all come from deceased organ donors, reducing our reliance on living transplantation. Organ donation is clearly beneficial to recipients and to society as a whole. It may also fulfil the wishes of the potential donor and may help families in the grieving process.

All 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

None.

RECOMMENDATIONS

Medico-legal Framework for Donation

1   End-of-life decision making should be compliant with the Mental Capacity Act 2005[1] or the Adults With Incapacity (Scotland) Act 2000, and based on the guidance provided by the General Medical Council (GMC) guidance *Treatment and care towards the end of life: good practise in decision making*[2].
2   The GMC guidance is specific with regards to organ donation stating that: "If a patient is close to death and their views cannot be determined, you should be prepared to explore with those close to them whether they had expressed any views about organ or tissue donation, if donation is likely to be a possibility" and that: "You should follow any national procedures for identifying potential organ donors and, in appropriate cases, for notifying the local transplant coordinator".
3   The Mental Capacity Act states that decisions for incompetent patients must be made in their best interests. An assessment of best interests should include the person's past and present wishes and feelings, the beliefs and values that would be likely to influence his decision if he had capacity, and the other factors that he would be likely to consider if he were able to do so. If the patient wished to donate after death, this should therefore be a consideration. The Adults with Incapacity (Scotland) Act 2000 has similar requirements.
4   Organ donation can be an unusual event in many ICUs. Guidelines in the ICU should ensure that organ and tissue donation is always considered as a routine component of end-of-life care by incorporating it into all end-of-life care plans.
5   ICUs should develop a written end-of-life care management policy that addresses the withdrawal and withholding of life-sustaining treatment. Consideration of organ donation should be included in this policy, particularly the timely identification and referral of potential organ donors.

The Hospital Team

6   Each hospital should have an Organ Donation Committee (usually at a Trust or NHS Board level) to oversee all aspects of deceased organ donation as recommended by the Organ Donation Taskforce 2008[3].

7   A consultant intensivist should be a permanent member of the hospital's Organ Donation Committee. This may be the Clinical Lead for Organ Donation (CLOD) or another consultant intensivist. A senior nursing member of the ICU team should also be a member.

8   The CLOD should ideally be a consultant in ICM and should take on the responsibilities of implementing policies and addressing local barriers to donation.

9   Every ICU should have a specialist nurse for organ donation (SN-OD) from the regional donation team identified as having responsibility for that hospital. The SN-OD should be a member of the hospital Organ Donation Committee, organise donor coordination, support the ICU staff in donor management, complete the potential donor audit, and engage in teaching and training.

Withholding/Withdrawal of Life Sustaining Treatments

10   Every ICU should have a written policy on the limitation of life-sustaining treatments, clearly separating this decision from any consideration of organ donation. It should be based on the guidance from the regulatory and processional bodies[2,4].

11   The method of treatment withdrawal should be tailored to the patient's clinical needs and in accordance with their best interests, which may include organ donation. If the patient wishes to donate, the method of treatment withdrawal should facilitate meeting their wishes whilst always complying with national professional and ethical guidance.

Donor Identification and Referral

12   Every ICU should introduce the use of clinical triggers as recommended by NICE[5] to ensure that all potential organ donors are identified and referred. The triggers for referral recommended by NICE are:

•   In patients with a catastrophic brain injury, the absence of one or more cranial nerve reflexes, **and** a GCS score of 4 or less that is not explained by sedation, **and/or** where a decision has been made to perform brainstem death tests, whichever is the earlier.

•   Where there is 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.

13   Each ICU should identify a strategy that ensures implementation of the NICE guidance. Examples of such strategies are available from NHS Blood and Transplant[6], allowing ICUs to introduce one that is suitable for local use or alternatively to develop a strategy of their own.

14   Early and timely referral of potential organ donors to a SN-OD, before confirming brain stem death or before discussing the withdrawal of life sustaining treatments with the family, has many benefits for donor families and for the ICU, and is considered ethical and good practice by the UK Donation Ethics Committee[7].

Approaching Family for Consent/Authorisation

15   Intensivists should adopt practices that address the modifiable factors associated with low consent rates.

16   A planned and collaborative approach between the ICU team and the SN-OD team should be routine practice, as recommended by NICE[5].

17   ICUs should also consider implementing the best-practice guidance published by NHS Blood and Transplant[6].

18   It is good practice to plan to decouple the conversation about brain-stem testing or the withdrawal of life-sustaining treatments from the approach to the family regarding organ donation but individual family circumstances will vary.

19   Ideally the SN-OD should be present when the family are approached for organ donation, to provide all the information required and to help support the family[6].

20   The approach for organ donation should be made whenever possible by individuals with specific training.

21   Faith leaders and translators should be available to support families when required.

Donor Optimisation

21   Intensivist-led management of brain-stem-dead donors can increase the number of organs successfully retrieved and transplanted. Intensivists should be actively involved with donor management and provide support to the SN-ODs and nursing staff to achieve best outcomes.

22   Donor-optimisation care bundles or protocols should be used[6] to guide the donor management, and to improve the quality of donated organs and increase successful retrieval of cardiothoracic organs.

Ante-mortem interventions

23   Alterations to end-of-life care (ante-mortem interventions) are essential to facilitate controlled donation after circulatory death (DCD).

24   ICUs should follow the legal advice from the Department of Health (or equivalent guidance in Scotland and Northern Ireland) specifying which ante-mortem interventions are acceptable[8].

25   Clinicians should take a balanced view of the risk of harm when considering particular interventions or courses of action, encompassing both the risk of harm or distress (to the patient or their family), and the risk of doing wrong by not acting in accordance with the patient's wishes[10].

26   Interventions to maintain cardio-respiratory stability and critical organ perfusion should be used until such time as withdrawal of life-sustaining treatment (WLST) is instigated[7].

Diagnosis of Death

27   The diagnosis of death using neurological or circulatory criteria should follow the guidance set by the Academy of Medical Royal Colleges in 2008 for both neurological and circulatory criteria[9].

28   There is the potential for the development of International Consensus Guidance on death determination, which may supplement, or be incorporated into, the Academy's Guidance in the future.

ICU Resources

29   Intensivists are usually the only specialists in the hospital with the full skill-set required to facilitate organ donation.

30   The ICU Team should help facilitate donation from outside the ICU when required.

31   Beds should be made available to facilitate donation and/or end of life care whenever appropriate. If ICU beds are unavailable, the ICU team should provide care in another appropriate part of the hospital (e.g. Emergency Dept, Recovery Room), if this can be facilitated safely.

32   ICU resources should be managed in a way that facilitates continued care of a potential donor when ICU capacity is exceeded, if at all possible.

Training of Intensivists in Organ Donation

33   Training in end-of-life care, including donation, should be provided to all ICM trainees as specified by the FICM Syllabus (Module 8).

34   Training in organ donation should focus on the law and ethics of organ donation, donor identification and referral, the diagnosis of death, donor optimisation and the family approach.

35   ICUs should assess trainees in end-of-life care management. Organ and tissue donation should be a component of this assessment.

36   Regular training should also be provided for other permanent members of the ICU Team (nursing staff, Professions Allied to Medicine).

Clinical Governance/Audit

37   All ICUs in the UK should support the national Potential Donor Audit.

38   Review of ICU's organ donation activity and potential should be a regular item on the ICU Clinical Governance agenda.

39   Clinical Governance tools, such as Root Cause Analysis, should be considered as a means of addressing persistent barriers to donation within a hospital.

BACKGROUND

There has been a 60% increase in the number of deceased-organ-donor numbers and a 35% increase in the number of organ transplants in the six years since the publication and subsequent implementation of the Organ Donation Taskforce Report[5]. This was mainly driven by an increase in identification and referral of potential donors, an activity primarily initiated in ICUs and Emergency Departments. There remain, however, many challenges to continue to build on this success. The new strategy for organ donation and transplantation recognises that this requires further contributions, not only from acute hospitals, but also from society, retrieval and transplantation services, NHS Blood and Transplant, and Commissioners[10]. Perhaps the biggest challenge will be to improve on the current consent rate of just 59%, the worst in Europe. Intensivists can contribute by developing best-practice strategies for approaching families, as well as implementing donor-optimisation bundles to improve the quality and quantity of organs retrieved from each donor.

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Chapter Five

Critical Care Service — Additional Key Components

5.1   Training, Education and Reflective Learning

5.1.1   Assessment of Competence
Author: Alison Pittard

INTRODUCTION

Competence is the ability to do something successfully or efficiently. Postgraduate medical training in the UK is competency based, utilising guiding principles from the General Medical Council (GMC). The assessment of trainees in the specialty of Intensive Care Medicine (ICM) against the competences in the curriculum established by the Faculty of Intensive Care Medicine (FICM) builds upon these principles in the quest for excellence.

STANDARDS

None.

RECOMMENDATIONS

1   Trainees should be assessed against the competencies in the latest version of the curriculum.

2   Those performing the assessments should be appropriately trained.

3   There should be adequate time allocated to undertake the assessments.

BACKGROUND

Competency-based training in Intensive Care Medicine[1] (CoBaTrICE) is an international programme that facilitates the delivery of high quality education across Europe. The UK curriculum, leading to a CCT in Intensive Care Medicine[2], embraces this concept in its desire to aspire to excellence. As patient care is at the centre of all that we do, it is imperative that we not only assess the correct competencies but also that we have a robust assessment process. The Academy of Medical Educators publishes professional standards[3] which set clear guidelines for the validation and recognition of medical educators. The GMC incorporated these standards into their Framework for the Accreditation of Educational Supervisors[4].

The assessment of competence should be integrated with the normal delivery of teaching and training, and can be in the workplace or as part of an examination process. Assessors need to be formally trained to ensure uniformity of the process wherever it is undertaken. To ensure that training, and its assessment, remains valid the GMC require Local Educational Providers to support trainers[5]. This should be incorporated into the job planning process.

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5.1.2   Assessment of Competence: Registered Nurses
Author: Melanie Kynaston

INTRODUCTION

The standard against which a critical care nurse is measured as competent is set out in the National Competency Framework for Adult Critical Care Nurses[1], which provides a pathway of progression for the nurse starting as a novice in the critical care setting to becoming a competent and safe practitioner. Competence is defined as "the combination of skills, knowledge and attitudes, values and technical abilities that underpin safe and effective critical care nursing care and interventions"[2].

STANDARDS

1.2.6   Each Critical Care Unit will have a dedicated Clinical Nurse Educator responsible for coordinating the education, training and CPD framework for critical care nursing staff and pre-registration student allocation.

1.2.7   All nursing staff appointed to Critical Care will be allocated a period of supernumerary practice

1.2.8   A minimum of 50% of registered nursing staff will be in possession of a post registration award in Critical Care Nursing

RECOMMENDATIONS

1   All newly appointed Critical Care registered nurses should be started on 'Step 1' of the competency framework[1].

2   All newly appointed Critical Care registered nurses should be provided with a supernumerary period, supported by a designated mentor/preceptor and identified lead assessor, with key 'Step 1' competencies identified as priority for that period[1,2,3].

3   All care delivered by the registered nurse whilst undertaking 'Step 1' should be supervised by the mentor/preceptor or 'buddy' identified for that shift[1].

4   A minimum of 40% of learners' clinical practice hours should be with their mentor/assessor/Practice Educator and/or delegated appropriate other[1].

5   All newly-appointed Critical Care registered nurses should enter into a learning contract with their mentor/preceptor, lead assessor and unit manager at the start of the competency framework[1].

6   All newly-appointed Critical Care registered nurses should have access to a designated 'Practice Educator' to support their development and provide access to educational programmes to underpin their knowledge[1,2].

7   Study leave should be provided for critical care related courses[2].

8   A creative learning environment should be provided, offering the registered nurse a range of learning experiences, involving patients, clients and multi-professional teams, to meet their defined learning outcomes[1].

9   Clinical placements should be provided (where necessary) to facilitate learning and development of the 'Core' competencies[2].

10   All critical care mentors/preceptors/assessors should hold an NMC recognised mentorship qualification and a post-registration Critical Care qualification[1,2,4].

11   Units should have mentor/preceptor/assessor quality assurance systems in place, to regulate quality and ensure validity and transferability of assessment processes[1,3].

BACKGROUND

The Critical Care registered nursing workforce delivers complex care and treatment plans to critically ill patients and their significant others. To achieve high-quality, safe and equitable care delivery, the workforce requires the right level of knowledge and associated skills, which need to be measured through the registered nurses' level of performance and through the evaluation of their skill acquisition[1,2].

Critical Care registered nurse education and training has been widely debated nationally. In 2008 a 'Critical Care Nurse Education Review Forum' (CCNERF) was established to identify and articulate concerns raised by service managers, lead nurses and matrons in relation to the level of competence in the bed-side workforce[2]. A survey across England was undertaken to establish the differing education and training programmes being provided by Higher Educational Institutes (HEI's) and the competency frameworks used locally by units to support competency development. The finding of the scoping exercise highlighted that there were a number of different programmes available, with a range of educational and learning outcomes. The level of knowledge and the skills acquired during the programmes varied considerably, as did the pre-course unit-based competency frameworks.

CCNERF collaborated and engaged with key stakeholders to set out recommendations to standardise Critical Care nurses' education, these included:
- Defining the standards and principles for HEI's in relation to post-registration Critical Care courses
- Design of a core curriculum to incorporate into courses
- Development of a suite of Critical Care competencies to underpin the academic programmes
- Establishing the 'pre-course' or 'entry' standard.

Together, the '*National standards for Critical Care Nurse Education'* and the '*National Competency Framework for Adult Critical Care Nurses'* provide robust assessment of the registered nurses' competence in practice, ensuring that the nursing workforce is fit for purpose and holds the right skills to provide safe and effective care and treatment to the critically ill and their significant others.

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5.2   Appraisal and Revalidation

5.2.1   Consultant Appraisal and Revalidation

Authors: Geoff Bellingan & Pascale Gruber

INTRODUCTION

Revalidation is a process by which all licensed doctors are required to regularly demonstrate that they are up-to-date and fit to practice. Revalidation is underpinned by local systems of clinical governance and annual appraisal. The General Medical Council (GMC) and Faculty of Intensive Care Medicine (FICM) have published guidance on appraisal and revalidation. The recommendations below are based on these documents.

STANDARDS

None.

RECOMMENDATIONS

1   Consultants in Intensive Care Medicine should undergo appraisal annually[1-4,7,10].

2   Hospitals should allocate sufficient resources and Supporting Professional Activity (SPA) time to enable consultants in Intensive Care Medicine to fulfill the GMC requirements of appraisal and revalidation.

3   Consultants in Intensive Care Medicine should provide updated information on their professional practice, covering clinical and non-clinical activities, in their annual appraisal[4,7,10].

4   The annual appraisal should include a review of the consultant's personal development plan[4,7,10].

5   The annual appraisal should contain a signed self-declaration of the consultant's health and probity status[4,7,10].

6   Consultants in Intensive Care Medicine should provide evidence in their appraisal that they are maintaining the relevant knowledge, skills and expertise in the field of Intensive Care Medicine. They are expected to satisfy the CPD requirements of the GMC, the Royal Colleges, the Faculty of Intensive Care and/or other specialty associations relevant to their area of practice and evidence of reflective learning[4,5,7,8,10].

7   Consultants in Intensive Care Medicine should be able to provide documented evidence of participation in at least one quality-improvement activity (clinical audit, review of clinical outcomes, case review or discussion) within a 5-year revalidation cycle[4,7,10].

8   Consultants in Intensive Care Medicine should provide information of any significant incidents or events that they have been involved in which could, or did, lead to unintended harm to patients, with reflection of the key learning points in their annual appraisal[4,7,10].

9   Consultants in Intensive Care Medicine should undertake at least one multi-source feedback (MSF) in a 5-year revalidation cycle using a validated MSF tool that meets the criteria set by the GMC. Consultants in Intensive Care Medicine are encouraged to provide team-based patient feedback in intensive care. They may also chose to provide individualised patient feedback in other areas of their clinical practice outside of Intensive Care Medicine[,6,7,9,10].

10   A review of formal complaints and compliments should form part of the consultant's annual appraisal[4,7,10].

BACKGROUND

The purpose of revalidation is to assure patients, public, employers and other healthcare professionals that licensed doctors are up-to-date and fit to practice[1]. Revalidation involves the continuous evaluation of a doctor's ability to practice, through the process of annual appraisal and local systems of clinical governance over a 5-year cycle[1]. Job planning should be differentiated from appraisal and revalidation. Job planning outlines the expectation of the consultant and employer about the consultant's responsibilities, objectives, and resource- use, to ensure that the consultant's and service's objectives are met. In contrast, appraisal and revalidation seeks to primarily identify the doctor's personal and professional development needs, and serves to assess performance. The General Medical Council (GMC) and Faculty of Intensive Care Medicine (FICM) have issued specific guidance documents on appraisal and revalidation[1-10].

Hospitals should allocate sufficient resources and Supporting Professional Activity (SPA) time to enable consultants to fulfill the requirements of appraisal and revalidation. It is, however, the doctor's responsibility to engage in the process. Consultants are expected to be able to demonstrate that they meet the standards for competent practice as outlined in the document *Good Medical Practice* (2006; revised 2013)[1]. They should be able to provide supporting evidence covering the four domains of the *Good Medical Practice Framework,* which include knowledge, skills and performance; safety and quality; communication, partnership and teamwork; and maintaining trust[3]. This framework should be used to encourage consultants to annually review the information gathered, reflect on their practice, identify areas of practice where improvements or developments could be made, and demonstrate that they are up-to-date and fit to practise[4,7,10].

As part of their appraisal, consultants should provide information on their professional practice, covering clinical and non-clinical activities (e.g. research, teaching, management and medico-legal work)[4,7,10]. The appraisal should include a review of the consultant's personal development plans, a signed self-declaration of the consultant's health and probity status, a review of formal complaints, compliments and significant incidents or events (untoward, critical or patient-safety incidents) that the consultant may have been involved in which could, or did, lead to unintended harm to patients. Reflection of the key learning points and a summary of action taken should also be recorded[4,7,10]. Consultants should be able to provide documented evidence of participation in at least one quality-improvement activity (clinical audit, review of clinical outcomes, case review or discussion) within a 5-year revalidation cycle. Where available, this should include outcome and performance data on individual and/or team practice (e.g. Intensive Care National Audit and Research (ICNARC) data or other nationally agreed performance data, with reflection on personal input)[4,7,10].

Keeping up to date with professional developments is also an integral part of good medical practice. Consultants should be able to provide evidence that they are maintaining the relevant knowledge, skills and expertise in the field of Intensive Care Medicine. Supporting information of continuing professional development (CPD) and reflective learning should be recorded and should satisfy the CPD requirements of

the GMC, the Royal Colleges, the Faculty of Intensive Care Medicine and/or other specialty association relevant to the consultant's area of work[4,5,7,8,10].

Finally, feedback from patients, medical staff and non-medical staff (managers, administrators) provide consultants with the opportunity to reflect on their behaviour and on the quality of their professional work. Consultants should undertake at least one multi-source feedback (MSF) in a 5-year revalidation cycle using a validated MSF tool that meets the criteria set by the GMC. Where appropriate, consultants may choose to provide individualised patient feedback. The FICM and ICS do not mandate use of individualised patient feedback in Intensive Care, however team-based patient feedback is encouraged[4,6,7,9,10]. Consultants may also choose to provide individualised patient feedback from other areas of their clinical work.

Whilst it is not necessary that supporting evidence covering each domain of the *Good Medical Practice Framework* is collected annually, this should be reviewed as part of the annual appraisal process. Evidence of compliance in all four domains over a 5-year cycle for revalidation enables the nominated Responsible Officer to make a recommendation for revalidation to the GMC. Consultants who are unable to meet the requirements for revalidation should refer to guidance set out by the GMC[1,2].

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5.3   Improving the Service

5.3.1   Research and Development (R&D)

Author: Tim Walsh

INTRODUCTION

Critical 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. These factors make participation in Research and Development (R&D) activities of vital importance to the UK Critical Care community.

STANDARDS

None.

RECOMMENDATIONS

1   ICUs should nominate a lead for R&D activities, who should coordinate activity and ensure it is carried out to Research Governance standards[1].

2   ICUs 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.

3   All research studies should be registered on the UK Critical Care research portfolio whenever they fulfil eligibility criteria.

4   All individuals participating in R&D activity should have completed Good Clinical Practice (GCP) training for research, and keep this up-to-date.

5   ICUs 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 ICU information resources.

6   ICUs 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.

7   ICUs participating in multiple research-studies should have clear co-enrolment policies based on the UK co-enrolment guideline[2].

BACKGROUND

R&D is the mechanism by which new knowledge is acquired to develop new treatments and therapies, 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 R&D activity, even when they are critically ill. The NIHR is the national organisation that oversees research funding and delivery in the NHS[3]. In the UK, ethical and R&D approvals are managed through a national process (Integrated Research Application Process: IRAS)[4].

National Institute for Health Research (NIHR) organisation

The NIHR supports a Critical Care research network (CRN: Critical Care[5]). 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 Critical 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 ICUs to be participating in R&D activity; each LCRN has a target that 80% of its ICUs participate in research. Devolved nations have different structures and funding organisations. LCRN Critical Care leads meet regularly (3-4 times per year) to coordinate national 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. The portfolio of current studies is accessible publically[6]. Critical 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, and where funding should be sought, has been published[7]. Support for screening and consent processes (for example, research nurse time), which is labour-intensive and time-critical for many ICU studies, is an NHS support cost and should be sought through LCRNs or local R&D departments.

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5.3.2   National Data Collection System

Authors: Lucy Lloyd-Scott & Gary Masterson

INTRODUCTION

Standardised national data collection within adult Critical Care units is vital both for comparative benchmarking (to drive up the quality of care delivered to critically ill patients) and for commissioning.

The majority of standardised national data are collected through clinical audits. Clinical audit (whether this is at the local, regional, national or international level) is an established method of assessing quality. It involves:

- Looking at practice against clinical standards/guidelines
- Comparing providers' outcomes (as reported by clinicians and/or patients).

STANDARDS

2.14   The Intensive Care team must engage, contribute and participate in a Critical Care Operational Delivery Network (ODN), including audit activity and regular peer review.

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

4.2   The ICU must participate in a national database for Adult Critical Care.

RECOMMENDATIONS

1   Critical Care units (ICU, HDU, ICU/HDU and specialist units) should collect standardised national data through a recognised national clinical audit, such as ICNARC's Case Mix Programme (CMP)[1,5] or the Scottish Intensive Society Audit Group (SICSAG)[2] to promote local and national quality improvement. These analyses should be reviewed on a regular basis for local action.

2   Critical care units in England should provide data analyses (generated from the standardised national data collection) to the Adult Critical Care Clinical Reference Group to populate national dashboards as part of specialised commissioning[3].

3   As part of Quality Accounts requirements, hospitals in England should, on an annual basis, publish a list of the national clinical audits in which they participate[4].

BACKGROUND

The collection and use of robust, standardised Critical Care data is essential to support operational and clinical decisions, including: commissioning services; evaluation of clinical care; and benchmarking against other providers, both locally and nationally[1,2,3,6]. Critical Care units should consider the need for additional staffing to ensure data are collected and submitted in a timely manner[1].

Clinicians, nurses, AHPs and managers are encouraged to review analyses produced from these data to identify areas of strength as well as areas for improvement, particularly where data show a unit is not meeting the required national target[3,6]. These analyses should be used alongside local data to produce a coherent view of the unit's performance and to identify ways to improve the care that is being delivered to patients.

Active participation in a standardised national data collection programme (such as ICNARC's Case Mix Programme) is a key service outcome which fits with the demands of domains 1, 3, 4 and 5 of the NHS Outcomes Framework[3].

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5.3.3   Patient Safety in ICU

Authors: Ganesh Suntharalingam & Tony Thomas

INTRODUCTION

Safety in Critical Care may be defined as the prevention of harm or injury that arises from the process of care, rather than from the underlying disease process.

Counter-intuitively, in spite of high staffing levels and continuous monitoring, there is a high rate of adverse events and medical error in ICU, including both errors of commission (doing the wrong thing) and of omission (failing to do the right thing). The severity of illness in Critical Care patients may mask the impact of avoidable error unless there is active surveillance, and this may lead to complacency.

A systematic programme to recognise and control risks, and reduce medical errors and avoidable adverse events, should be considered an essential part of the duty of care in Intensive Care Medicine.

STANDARDS

1.2.9   Units must not utilise greater than 20% of registered nurses from bank/agency on any one shift when they are NOT their own staff.

1.4.1   There must be a Critical Care pharmacist for every Critical Care Unit.

3.1   Intensive Care facilities must comply with national standards.

3.2   All equipment must conform to the relevant safety standards and be regularly serviced.

3.3   All staff must be appropriately trained, competent and familiar with the use of equipment.

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

4.3   Presence of a risk register and associated audit calendar.

RECOMMENDATIONS

1   The ICU should have an identified patient safety lead consultant and a named link nurse for patient safety.

2   Each ICU should have a multi-professional patient safety subgroup, to oversee delivery of recommendations 3-15 below and to ensure local ownership and engagement.

3   Safety climate should be actively monitored through a regular safety-attitude questionnaire for all staff, using a recognised and validated tool, and fed back to all staff members.

4   Staff should be provided with specific team training in human factors and non-technical skills, either generic or specific to Critical Care, depending on availability.

5   There should be standardised clinical handover of all patients at shift changes, and on admission to and discharge from Critical Care. Handover should take place after essential tasks are completed, and should follow a locally agreed verbal structure, backed up by auditable documentation.

6   There should be a structured, locally-agreed bedside ward-round checklist, including daily safety concerns and treatment goals. The checklist should be documented, with audited evidence of compliance.

7   In addition to existing best-practice strategies and care bundles (e.g. CVC bundle, VAP bundle), ICUs should systematically implement recognised error-reduction protocols where these are available, including but not limited to:

- Capnography for all airway placements
- NAP 4 recommendations for the care of tracheostomy and laryngectomy patients
- BTS guidelines for chest tube placement.

8   There should be demonstrable measures in place to protect staff from the inherent risks of Critical Care. These include: psychological stress, injuries from manual handling; sharps injuries; slips, trips and falls; and risks from managing delirious patients.

9   There should be a robust system for critical incident monitoring, with all reports regularly reviewed, supplemented by information from morbidity and mortality reviews and global trigger tools. Trends in reported incidents should be monitored.

10   Feedback should also be obtained from staff, and systems should be in place to allow serious concerns to be raised in order to pre-empt risks.

11   Patients and visitors may correctly identify individual or systemic errors and risks which are otherwise overlooked. Systems should be in place to escalate safety concerns raised via complaints or comments, and feedback should be actively solicited through questionnaires and at follow-up.

12   There should be a locally agreed standard response to serious incidents in the ICU, including 'hot' (immediate) and 'cold' (planned) debriefing, immediate steps to prevent recurrence, open disclosure to patient and family, and support measures for the 'second victim' (staff who were involved and affected).

13   There should be a risk register that is relevant and specific to the ICU and its practice (standard 4.3). The risk register, together with lessons learned from critical incident reports and staff and patient feedback, should be regularly disseminated and easily available to staff.

BACKGROUND

The frequency of medical errors and adverse events in ICUs is well-described, in the UK[1] and internationally[2], but is not yet widely recognised in day-to-day clinical awareness. Although critically ill patients are intrinsically unstable, most adverse events in ICU appear to be avoidable[3] and may have a significant impact on outcome, including death and permanent injury[3,4]. Frequent incidents include drug errors, accidental displacement or occlusion of airways and indwelling lines, and mechanical failure[4]. Drug error may be more prevalent in ICU than in any other clinical area, reflecting the number and range of medications[5]. The

incorrect but prevalent assumption that ICU is an intrinsically safe haven for patients due to high staffing and monitoring levels, may promote complacency and cultural barriers to improvement, and is based on a false premise as it fails to allow for the volume and complexity of interventions and increased potential for error. Medical error and adverse events in Critical Care are multifactorial in origin and include technical failures, organisational weaknesses, and human factors; it is increasingly recognised that the latter is pre-eminent[6]. Equipment safety is addressed in the ICS standards document '*Standard for Equipment in Critical Care*'[7]. Organisational factors include structure and resourcing on the one hand, and safe system design and processes on the other. The ICU must be organised to provide a safe physical and operational environment, with a correct balance of staffing to workload[8], and with excellent leadership, training and employment practices. Distractions and conflicting tasks may be a major contributor to error, and should be minimised. The unit should be resourced to allow adequate time for training, communication and handover, and staff rostering should minimise fatigue.

However, even a well-trained workforce operating in a safe and well-resourced environment, using familiar routines, will be subject to ordinary human failings, including variability in performance, inattention, forgetfulness and errors of omission. A thoroughly safe unit will also have efficient and well-designed processes of care, using process mapping to identify potentially unsafe or inefficient practices[9], and care bundles to ensure that groups of evidence-based interventions are reliably delivered[10]. In addition to the widely-discussed context of reducing acquired infections, such multi-faceted change programmes may also deliver quantifiable reduction in medical errors and adverse events, such as insulin maladministration and accidental airway or venous catheter removal[11]. Sequences leading to error may be complex (for medication errors in particular[12]) and may be amenable to technical solutions including electronic health records and computerised physician order entry. Communication can be improved by providing time and structured tools, particularly at known points of weakness such as handover[13] and through team training in human factors, non-technical skills and team resource management[14,15]. Multi-professional training will address inter-professional discrepancies in non-technical skills: without such training, medical staffs, in particular, tend to massively over-estimate their level of successful collaboration and communication with other groups[16].

Learning from other high-risk industries, intensive care staff may be further supported by well-designed cognitive aids' such as appropriate checklists and decision support tools. Checklists are an important element and serve not only as reminders, but as a tool for sharing vocabulary among professions and minimising communication errors[17]. Similarly, a structured ward-round tool for agreeing daily goals may promote interprofessional understanding of objectives, and measurably reduce length-of-stay[18]. Such systems are only effective when locally owned and embraced, within a positive and receptive safety climate: if methods and tools are seen as externally imposed and unwanted, or if they add to task time, then uptake tends to be poor[19] and human nature means that staff may find workarounds to bypass them[20]. By contrast, a positive safety climate which promotes staff engagement is associated with measurable decrease in error rates[21].

Learning from things that go wrong, and anticipation and pre-emption of risk, are essential prerequisites for safety. Critical incident reporting in ICU is well-described but still in evolution, and UK national standards are currently under revision[22]. Detailed current implementation advice is available[23]. In addition, global trigger tools and morbidity and mortality review should be used to supplement incident reporting and to develop a surveillance culture which actively looks for episodes of avoidable patient harm[24]. In all such modalities, accurate, routine reporting will only be achieved if staff can see that it leads to specific, relevant, transparent and timely feedback and actions. Complementary information should be actively sought from feedback and complaints, morbidity and mortality analysis, and serious incident investigations.

Finally, the development of a mature safety climate requires a culture of anticipation and pre-emption of risk, moving beyond "what went wrong?" to "what might go wrong?"[25] This requires excellent leadership and systems for actively involving staff and fully integrating safety considerations into unit planning and daily activities. Safety climate should be regularly evaluated as a tool for feedback and unit management[26]. All

safety information should be integrated, kept up to date, and available to staff through regular briefings, bulletins, and the risk register. Patients and families may provide valuable insights[27], and in return a policy of transparency and open disclosure should be regarded as a sign of a healthy safety climate, as well as part of the duty of care[28].

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5.3.4   Quality Improvement: Audit and Peer Review

Authors: Carol Peden & Jeremy Groves

INTRODUCTION

Quality in healthcare has been defined by the Institute of Medicine[1] as care that is "safe, efficient, effective, patient centred, timely and equitable". This definition was simplified in the 2008 NHS report '*High Quality Care For All*' to care that is "safe, personal and efficient". In order to achieve high-quality care a quality improvement process must be in place.

Quality improvement must be driven by measurement and regular well conducted audit in order to identify defects in care and areas for improvement. The Berwick report on patient safety in the UK[2] provided a suite of indicators, together with recommendations on staff training in safety science, that should be used by NHS organisations to assess safety improvement and reduce variation in the quality of care. Those indicators are reflected in the recommendations made here to provide a framework to assist in the delivery of quality improvement in Critical Care.

STANDARDS

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

4.2   The ICU must participate in a National database for Adult Critical Care.

4.3   Presence of a risk register and associated audit calendar.

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. The time required will depend on the size of the unit. Time to participate in audit and quality improvement programmes should also form part of the job plans of all Critical Care staff (medical, nursing, allied health professionals and ancillary).

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.

4   QI projects should be multi-professional, recognising the necessity for a team approach and the contribution of all staff groups. The projects need a clear statement of their aims, which should be measurable and have a time frame, e.g. "we will improve unit mortality by 15% as measured by our ICNARC data by December 2016".

5   Audits should be linked to 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.

6   Audit should be targeted at problems where improvements in care, can be made. This will include reviews of structure, processes and outcomes of care, for example:
- Structure, e.g. numbers of beds available
- Processes, e.g. compliance with ventilator bundle outcomes e.g. morbidity and unit mortality at 30 days
- Patient and family experience data should be included in audit
- All unit deaths should be discussed at a Morbidity and Mortality meeting. Morbidity and mortality reviews should use a structured approach so that themes for improvement can be developed[3] Questions such as "how could we have done better" should be asked.

7   Reported incidents should be reviewed regularly, with a record of actions taken and lessons learnt.

8   There should be clear structures in place for disseminating findings to staff, and deficiencies in care should lead to measurable change.

9   Critical Care Networks should have a formal, multi-professional, peer-review programme in place for the units in their jurisdiction.

10   Peer reviews should be based on published national standards, but are likely to include other areas that are agreed locally.

BACKGROUND

Quality Improvement

Quality improvement methodology can be traced back to the work of Shewhart and Deming, industrial engineers and statisticians who worked on ways to improve industrial processes, and to whose work the success of Japanese industry in the post-war period is attributable. The evidence for the superiority of any one quality improvement approach is limited, and a combination may best serve the ICU environment. Use of multiple approaches without significant user experience is to be avoided. Teams should become familiar with one or two methods which they use regularly.   Detailed explanations of different approaches such as the '*Model for Improvement*', '*Lean*' and '*Experience-based co-design'* and '*Patient and family centred care*' are out with the scope of this guideline and can be found elsewhere[4-7].

Data Collection

In order to support audit and quality improvement, units require robust data-collection systems. Data-collection 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.

Quality improvement 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[8]. Results should be made available to staff, patients and carers. QI may be served by small samples of data on a regular basis[9].

Peer Review

An external peer-review process should monitor quality and quality improvement in each unit[10]. This is likely to be organised and delivered by the regional Operational Delivery Network. The precise nature of the peer-review process should be locally agreed but is likely to have the following characteristics:

- An agreed, written policy
- A self-assessment against agreed criteria that will include relevant elements from the relevant National Service Specification and the Core Standards should be carried out prior to a peer-review visit
- An administrator from the Critical Care Network (responsible for organisation, documentation and communication), a Critical Care clinician, and a nurse will form the core members of a review team. Other members such as a physiotherapist and pharmacist may be co-opted. The team should be trained and aware of their responsibilities.
- There will be a timetable for the event
- A written report, encompassing any recommendations, should be made available to the Provider, Commissioner and Critical Care Board.

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5.3.5   Clinical Information Systems in Critical Care Areas

Author: Tim Gould

INTRODUCTION

The real challenge for the future of Clinical Information Systems (CISs) is to add value to healthcare delivery. Critical Care Units should make use of Clinical Information Systems. Within the hospital, the Critical Care unit is the example *par excellence* of where managing recording and processing large amounts of medical data becomes problematic and time consuming for physicians and nurses alike.

STANDARDS

None.

RECOMMENDATIONS

1   CISs should include Electronic Patient Records. The specification should include minute-to-minute data capture and displays from patient monitoring, including infusion devices, ventilators, cardiac output measurement, blood gas analysers and haemofiltration/dialysis devices.

2   The Electronic Patient Record System (EPRS) should be connected to the hospital's patient information system for demographic and admission/discharge data, to Laboratories for results and to Radiology for reports.

3   Physician ordering should be fully integrated and recorded, and include electronic prescribing of drugs and fluids and ordering of laboratory and radiology services. Daily summary plans should capture electronically activity data from the rest of the EPRS, with the addition of free-hand text for health-care professionals treating and visiting the patients.

4   There should be a functionality within the database to alert, within a short time frame, for 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.

5   The system should provide a capacity to evolve sophisticated electronic decision support systems, to facilitate patient safety and quality.

6   The CIS should be able to collect electronically Critical Care Minimum Data Sets (CCMDS) and ICNARC data to facilitate electronic generation of reports and audit.

BACKGROUND

The functions of a CIS are summarised clearly in '*Framework for Improving ICU Performance*'[1]. The need to document and record complex daily data, activities and decisions in Critical Care Units together with CCMDS and ICNARC data for commissioning means a CIS becomes an invaluable tool. However the focus for the future must also include: how to reduce information overload; improvement of efficiency and quality; and

elimination of medical error. There is an evolving evidence base around the use of clinical information systems to improve patient safety and quality[2].

The introduction of a CIS has been proven to reduce length of stay[3], errors in decision making[4-7], and errors in drug prescribing[8]. Using CIS has proven to be time efficient[7].

As more units adopt CISs, the large volumes of data that the doctors and nurses have to process has led to refininement of ways to: improve the clinician/data interface, reduce the errors associated with filtering and extraction, and using medical data contained within a CIS. "The configuration of the Intensive Care unit user interface contributes significantly to the task load, time to task completion, and number of errors of cognition associated with the identification, and subsequent use of relevant patient data"[7]. The majority of the existing 70+ UK users of a CIS are well practiced in sharing intellectual property around their own configuration and design through established user groups.

A patient in the ICU may require up to 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[9] and deliver a more consistent experience for all patients[6]. Evidence is well established for the superiority of CISs in Care Bundle compliance[8] and in alerting for specific patterns of disease, e.g. early detection of sepsis[10,11] and ARDS[12]. CISs are also well recognised as improving the delivery of evidence based strategies with high rates of compliance as seen in, e.g. low tidal volume ventilation[13] and tight glycaemic control[14].

The Database itself provides descriptive CCMDS, ICNARC and morbidity and mortality type data for internal audit and commissioning. However translation of real-time data into alerts or summary intelligence about performance of individuals, teams and clinical services, with instant feedback via Dashboards (displaying Care bundles) and automated alerts to smart phones or tablet computers by texts or emails modifies decision-making practices and improves the clinical effectiveness of clinicians as well as enhancing patient safety and quality[8].

If one consistent message has emerged from the literature on improving quality and safety in healthcare, it is that high-quality intelligence is indispensable[8]. Critical Care as a specialty must now embrace more formal processes to balance rising costs, complexity of care and patient safety. Systems-engineering methodologies are used successfully throughout industry and business. Application of systems engineering principles to Clinical Information Systems in the Critical Care environment will further enhance the safety and quality of care of our patients.

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5.4   Critical Care Operational Delivery Networks

5.4.1   Functions
Authors: Andrea Baldwin & Sarah Clarke

INTRODUCTION

In May 2000, the key document '*Comprehensive Critical Care*'[1] was released after national concerns were raised about insufficient Critical Care capacity following a number of high profile cases, including deaths associated with long-distance Critical Care transfers. Subsequent papers describe networks as being integral to the delivery and development of quality Critical Care services[2, 3].   The aim of Adult Critical Care (ACC) Operational Delivery Networks (ODNs) is to improve equity of access, experience and health outcomes for patients within Critical Care services, across healthcare organisations and geographical boundaries. This is done through clinical leadership and engagement and the application of service improvement methodology. ODN governance arrangements are fundamental to its functionality.

STANDARDS

2.14   The Intensive Care team must engage, contribute and participate in a Critical Care Operational Delivery Network (ODN)[4], including audit activity and regular peer review.

RECOMMENDATIONS

1   ODNs should enable effective clinical flows through the provider system through clinical collaboration for networked provision of services, utilising cross-organisational multi-professional clinical engagement to improve pathways of care. This will allow for more local determination, innovation and efficiency across the pathway.

2   ODNs should take a whole-system, collaborative-provision approach to facilitate the delivery of safe and effective services across the patient pathway, with a key focus on the quality and equity of access to service provision.

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 enable the development of consistent provider guidance and improved service standards, to continually improve the patient, family and carer experience.

5   ODNs should advise providers and commissioners on aspects of quality, as well as coordinating provider resources, to secure the best outcomes for patients across wide geographical areas. To do this they should align themselves and collaborate with other NHS organisations such as other ODNs (e.g. Major

Trauma), Senates, Area Teams and Clinical Reference Groups on strategic issues that will impact on their service.

6　ODNs should create an operational model that allows effective work programmes to enable the delivery of local and regional priorities and service specification standards, national programme of care outcomes and outcome framework targets.

7　ODNs should support capacity planning and monitoring activities within a collaborative model of care. ODNs support operational policy, facilitating and monitoring the safety and quality of Critical Care services.

8　ODNs should provide leadership support in emergency preparedness, have a role in contingency planning and should respond to need through national, regional and local determination, acting on identified challenges as they emerge, e.g. a local Critical Care bed crisis or a large-scale major incident.

9　ODNs should have a team structure and framework that provides clinical and executive management leadership to support delivery of developed network plans.

BACKGROUND

The success of Critical Care clinical managed networks led them to be recognised as an effective model for improving standards of healthcare, and led to their evolution into part of the new NHS England structure as 'Operational Delivery Networks' (ODN). These non-statutory organisations are designed to deliver a collaborative model of care to improve the experience and outcomes for specific groups of patients based on regional or local needs; they rely on the engagement, interaction and commitment of stakeholders and member organisations to deliver expected outcomes[5-7].

Cross-organisational co-operation and development of quality through effective clinical engagement are recognised as priorities to improve the care of inherently high-risk and highly vulnerable patients[8]. The national service specification for ACC ODNs requires them to deliver a level of service expected by the NHS Commissioning Board and its stakeholders[9].

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5.4.2   Structure and Funding

Authors: Andrea Baldwin & Sarah Clarke

INTRODUCTION

The NHS Standard Contract reinforces the need for Operational Delivery Networks (ODNs), and will require that their members comply with the functions and work plans of the network. The ODN host provider will have an agreement for the delivery of ODN functions and work plans, to provide assurance that the members are complying with both national standards and best practice. 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[1-3].

Successful networks create climates for innovation and improvement that lead to the delivery of safer, higher-quality, patient-centred care[4-8]. Although there has been national recognition of the positive impact of Adult Critical Care (ACC) networks, the structures and funding arrangements for the ODNs remain varied. What is important however is that networks have a team and structure that can facilitate effective engagement with its stakeholders and deliver network plans for quality services.

STANDARDS

2.14   The Intensive Care team must engage, contribute and participate in a Critical Care Operational Delivery Network (ODN)[4], including audit activity and regular peer review.

RECOMMENDATIONS

1   Each ODN should be accountable to an ODN Board with agreed terms of reference and with representation from key stakeholders (providers & commissioners). ODNs represent their peers on behalf of the local health community, not the individual host organisation.

2   Each ODN should have robust governance arrangements to ensure sustainability of functionality.

3   ODN core structures should include senior management, medical and nursing roles, with administrative support. These roles are independent of both the host organisation and the substantive employer (if that is not the host).

4   The ODN should have a clinical forum which drives the clinical work of the ODN and provides for wide senior clinical engagement from all providers of Critical Care. Additional task groups will be required to establish clinical consensus and to deliver change across professional and organisational boundaries.

5   Each provider should ensure appropriate representation at ACC ODN meetings, task groups and other forums as appropriate to the relevant group's terms of reference.

6   Each provider should ensure that internal communication meets the requirements of the ODN in line with the ODN communication strategy.

7   Each ACC provider, through the baseline contract agreement (local or national), should comply with ODN standards, policies and guidelines.

8   Each provider should adhere to requirements to measure and evaluate quality indicators and service delivery, in line with the national Adult Critical Care service specification. This specification may be supplemented by additional requirements by the local ODN; such supplemental standards should be approved by the ODN clinical group and subsequently ratified by the ODN Board.

9   Each provider of ACC will contribute to the funding of their local ODN through nationally agreed mechanisms; these may be supplemented by local agreements made in conjunction with key stakeholders through the ODN Board.

10   The ODN, through the ODN Board, will provide an annual account of network activities including a financial statement.

BACKGROUND

ODNs are clinically driven and support a culture of collaboration. Their success relies on the engagement, interaction and commitment of stakeholders and 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 flows.

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.

Current ODN funding is through a national transitional agreement, established from baseline budgets of the relevant networks existing at the end of 2012-2013, many of which were significantly reduced due to team vacancies at the time. Funding since April 2013 has since been derived through a top-slice approach of specialist commissioning CQUIN monies (0.1%) across the country[9]. This is received by ODNs via NHS England Area Teams with responsibility for specialist commissioning. Although additional Critical Care networks are being established in areas of England that did not previously have them, and the CQUIN arrangement is helpful in creating equity, it has seriously disadvantaged some former well-established and effective ODNs.

It is anticipated that future funding will change under the NHS Standard Contract to direct provider funding; this mechanism has yet to be established. National negotiations are underway, led by NHS England, to remove ODNs from a transitional status to full and sustainable functionality. This situation represents a significant financial risk to ODNs and potentially their host organisations; the important principle of risk sharing across the relevant health economy should be recognised and actions agreed.

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5.5   Commissioning

5.5.1   Adult Critical Care Minimum Dataset, Reference Costs & Clinical Reference Group
Author: Jane Eddleston

INTRODUCTION

Commissioning of Adult Critical Care Services in England, Wales and Northern Ireland has changed considerably since the mandated introduction of the Critical Care Minimum Dataset (CCMDS)[1] in 2006. CCMDS provides the currency for commissioning of our services in the form of seven Healthcare Resource Groups (HRGs) which describe activity in terms of the total number of organs supported per patient per episode[2]. Coupled to the commissioning currency, Intensive Care Medicine has since April 2013 had a Clinical Reference Group which details the mandated clinical standards required in the form of a Service Specification for use by all Commissioners of Adult Critical Care[3].

This Chapter describes the background to the subject, the relevant related standards and the currently available commissioning for Intensive Care Medicine in England, Wales and Northern Ireland from April 2014.

STANDARDS

2.14   The Intensive Care team must engage, contribute and participate in a Critical Care Operational Delivery Network (ODN), including audit activity and regular peer review.

RECOMMENDATIONS

1   Critical Care Minimum Dataset (CCMDS)[1] should be collected in all registered Adult Critical Care locations.

2   Adult Critical Care reference cost submissions should assign costs to individual HRGs.

3   The Adult Critical Care Service Specification[3] applies to all Adult Critical Care locations.

4   Commissioning of Adult Critical Care, will use the CCMDS HRGs as currency irrespective of the source of funding.

BACKGROUND

The Adult Critical Care Minimum Dataset[1] was mandated for use in Adult Critical Care in 2006. This dataset categorises patient-related activity within Adult Critical Care into one of seven Healthcare Resource Groups[2]. The HRGs reflect the total number of organs supported throughout an individual patient's clinical episode within Critical Care. Hospitals then quantify their actual costs per HRG through the annual reference cost submission.

The first Critical Care HRG reference cost submissions occurred in 2008/2009. These costs were published in 2009/2010 and quantified the total expenditure for Adult Critical Care in England, Wales and Northern Ireland at almost £1 billion.

Since 2009, separately identified contracts for Adult Critical Care have emerged slowly. This is a significant move away from block contracts where Commissioners purchase services using a risk-averse strategy whereby a sum of money is paid to cover all costs incurred by a hospital for the patients they treat, regardless of the complexity of care provided.

Historically high-cost, low-volume clinical services such as Critical Care have fared poorly in this model.

Some hospitals have negotiated bed-day contracts for Adult Critical Care. Such a model shares expenditure across the entirety of their annual activity by charging the same for each bed-day, irrespective of an individual patient's actual costings. This model is better suited to large Critical Care services with a predictable case-mix.

The current model, which is based on individual HRG tariffs (local pricing), does require hospitals to have robust processes in place to capture expenditure and assign costs based on the type of organ support provided. Such a model carries a financial risk to hospitals, and clinician involvement in deriving reference costs for such a high-cost relatively low-volume clinical service is essential. In addition to the commissioning currency the contract needs to be accompanied by a descriptor of the necessary clinical standards.

These standards are defined by NHS England's Adult Critical Care Clinical Reference Group and, are derived from professional sources and detailed in the Adult Critical Care Service Specification[3] which is updated annually.

This service specification is applicable to all adult patients requiring Critical Care, irrespective of the source of funding. Funding could be from either local Clinical Commissioning Groups (CCGs), who commission non-specialist clinical pathways such as exacerbation of Chronic Obstructive Pulmonary Disease, or from NHS England's Specialist Commissioning bodies, who commission a broad raft of clinical services which are defined in the Manual of Specialist Services[5].

Adult Critical Care Minimum Dataset
This dataset[1] describes each patient's individual Critical Care episode as one of seven HRGs[2].
The HRGs categorise each patient's episode according to the total number of organs supported during the episode. The individual organ support does not need to occur simultaneously, and the model includes several nuances. These are: advanced cardiovascular support will always supersede basic cardiovascular support and basic cardiovascular and basic respiratory support occurring at the same time will only count as the equivalent of 1 organ supported. Each HRG should have a local tariff, and reimbursement equates to the relevant HRG price multiplied by number of days in Critical Care.

Reference Cost Submission
Hospitals are required to submit reference costs for their activity annually. This submission occurs in Quarter 2 of the following financial year.

Critical Care costs are submitted using the seven Adult Critical Care HRGs format. Critical Care is a high-cost, low-volume clinical service, and accurate costing for each HRG is essential. Senior clinical input is required for this process.

As a specialty there are a number of exclusions which are likely to feature in Critical Care budget expenditure. This list is updated annually and can be found on the DH website[6].

Adult Critical Care Clinical Reference Group (CRG)

The Adult Critical Care Clinical Reference Group (ACC CRG) is one of NHS England's 75 CRGs, and sits within NHS England's *Trauma Programme of Care* Domain[4].

The CRG was established in April 2013 and fulfils several functions:
- Detailing the required standards for Adult Critical Care Services and design a National Dashboard
- Determining National Commissioning tools which are relevant to the specialty (e.g. CQUIN, QIPP)
- Identifying research priorities for the specialty
- Working alongside other CRGs where there is overlap to enhance patient pathways and experience
- Identifying workforce issues
- Horizon scanning for new technologies and therapies relevant to the specialty.

There are four professional bodies (Faculty of Intensive Care Medicine, Intensive Care Society, British Association of Critical Care Nurses, and Critical Care Networks Nursing Forum) which are affiliated to the CRG. Coupled to this are 14 clinical representatives from the Clinical Senates, four patient/carer representatives, a Commissioner and a Pharmacy Representative. In addition, other nominees can be co-opted onto the CRG for bespoke work-streams, e.g. the Intensive Care National Audit & Research Centre which is currently assigned to assist in the development of a National Dashboard.

In Scotland the commissioning process is different and involves NHS Boards, Critical Care Delivery Groups and the Scottish Government.

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5.6   Resilience Planning

5.6.1   Surge and business continuity planning
Authors: Bob Winter & Angela Walsh

INTRODUCTION

The strategic aim of surge and business continuity planning (whether in the context of normal winter pressures, a big bang or surge event,) is to prevent avoidable mortality and morbidity due to patients requiring Adult Critical Care not accessing an appropriate level of care/organ support in time.

To do this it is necessary to maximise capability in the Critical Care system, in either one or multiple sites. To avoid **triage by resource** (as opposed to **triage by outcome**) until all potential escalation options have been exhausted.

Critical Care areas are themselves high users of drugs, power, and consumables, and are dependent on high levels of staffing. This makes **normal operation highly vulnerable to interruptions in supplies, infrastructure, or staffing**, so good business continuity planning is very important in keeping patients safe and services available.

On occasion, it may also be required to support other age-groups requiring Critical Care capability/capacity as strategically required.

STANDARDS

None.

RECOMMENDATIONS

1   Hospital Unit managers and senior clinical staff should consider and develop plans and checklists for scenarios such as:

- Supply chain disruption (road/fuel crisis, extreme weather, industrial action or civil disturbance)
- Infrastructure failures (intermittent power cuts or 'brownouts', failure of water or heating)
- Interruption of normal staffing patterns (e.g. transport disruption, school closures)
- Checklists in use should include, for example, which drugs and consumables would run out first if supplies are disrupted?

2   Plans should also include options for:

- Unit evacuation, both internally and to other sites, in the event of major infrastructure failure or other events (e.g. fire) which threaten the ongoing operation of Critical Care facilities
- Capability for accomodating to Critical Care patients evacuated from another site.

3   As Critical Care capacity is frequently the bottleneck in other surge-events, managers and clinicians should have identified areas within their acute sites to allow expansion of Critical Care capacity. This may

include operating theatres, recovery 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 Critical 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 Critical 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 Critical Care services across all sites. This may be within one Trust, across a single Critical Care network, or across several. Co-ordination should be through an escalation process through NHS England, involving local area, regional and national teams.

Critical Care patients should not be a vortex for resource/delay in front-end services (for example in emergency departments so as to avoid impacting on non-critical care patient flow). Internal escalation within a site or across a Trust 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).

Recent examples of the benefits of business continuity planning include the earthquake in Northern Italy which affected the supply of Continuous Veno Venous Haemofiltration consumables, IT failure in a large Trust in the East Midlands, and a mains power supply issue to a site in North West London.

The utility of the NHS Pathways DoS was illustrated by the rapid identification of Critical Care capacity when a hospital on the East Coast was threatened with flooding. Prolonged power or other infrastructure failure bring their own challenges which require their own site and unit contingency plans.

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3. NHS England. *Pandemic Influenza, NHS guidance on the current and future preparedness in support of* *an outbreak.* www.england.nhs.uk/wp-content/uploads/2014/02/flu-guid-flu-jan14.pdf.

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Core Standards for
Intensive Care Units

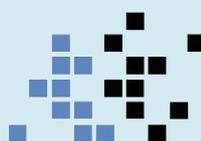The Faculty of
Intensive Care Medicine

intensive care
society
care when it matters

Royal College
of Nursing

Royal College of Speech
& Language Therapists

United Kingdom Clinical
Pharmacy Association

British Association of
Critical Care Nurses

Critical Care Network
Nurse Leads

Chartered Society of
Physiotherapy

British Dietetic
Association

Critical Care Group
of the UKCPA

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DEFINITION

An Intensive Care Unit (ICU) is a specially staffed and equipped, separate and self-contained area of a hospital dedicated to the management and monitoring of patients with life-threatening conditions. It provides special expertise and the facilities for the support of vital functions and uses the skills of medical, nursing and other personnel experienced in the management of these problems. It encompasses all areas that provide Level 2 (high dependency) and/or Level 3 (intensive care) care as defined by the Intensive Care Society document *Levels of Critical Care for Adult Patients* (2009).

ICU staff also provide services outside of the ICU such as emergency response (e.g. rapid response teams) and critical care outreach services. Where applicable the hospital must provide adequate resources for these activities.

Depending upon the designated level, function, size and case mix of the hospital and/or region that it serves, an ICU may range from four to over 50 beds. Large ICUs should be divided into pods of 8-15 patients.

These standards apply to all units capable of looking after Level 2 or Level 3 critically ill patients, whether they are called Intensive Care, Critical Care or High Dependency Units and no distinction is made between them.

1. STAFFING

1.1 Medical Staff

	Standard	Additional rationale/consideration	References
1.1.1	**Care must be led by a Consultant in Intensive Care Medicine**	The Closed Unit model of intensive care has been shown to improve mortality and morbidity. A consultant in Intensive Care Medicine is 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 written into their job plan. These Programmed Activities will be exclusively in Intensive Care Medicine and the consultant may not cover a second specialty at the same time.	Wilcox ME, Chong CKAY, Niven DJ et al. Crit Care Med. 2013, doi:10.1097/CCM.0b013e318292313a Baldock G, Foley P, Brett S.Intensive Care Med. 2001 May;27(5):865-72 Pronovost PJ, Angus DC, Dorman T, et al. JAMA. 2002;288(17):2151–2162. www.ficm.ac.uk/membership
1.1.2	**Consultant work patterns should deliver continuity of care**	Analysis of UK Intensive Care Medicine consultants, demonstrate that the majority work blocks of days at a time. This is to be commended for maintaining continuity of care. 5 day blocks of day shifts on ICU have been shown to reduce burn-out in intensivists and maintain the same patient outcomes as 7 day blocks. A minority of units still have different consultants covering for 24-hour blocks throughout the week.	Ali NA, Hammersley J, Hoffman SP, et al. Am J Respir Crit Care Med. 2011 Oct 1;184(7):803-8 FICM Workforce Advisory Group
1.1.3	**In general, the consultant/ Patient ratio should not exceed a range between 1:8 – 1:15 and the ICU resident/Patient ratio should not exceed 1:8**	The best current evidence is a consultant/ patient ratio in excess of 1:14 is deleterious to patient care and consultant well-being. However the actual ratio needs to be determined by the following factors: • Case Mix • Patient Turnover • Ratios of Trainees • Experience of Trainees • Telemedicine • Surge Capacity	Valentin A, Ferdinande P. Int Care Med. 2011; 37(10) Volume 37: 1575-1587 Ward NS,Afessa B, Kleinpell R. CCM. 2013; 41(2): 638–645 CICM. IC-01 (2011) Landrigan CP, Rothschild JM, Cronin JW, et al. N Engl J Med (2004) 351:1838–1848

	Standard	Additional rationale/consideration	References
		An ICU resident may be a medical trainee, SAS doctor or Advanced Critical Care Practitioner. It is not appropriate for a Foundation Year doctor to be left as the sole resident doctor on an ICU. There must be immediate access to a practitioner who is skilled with advanced airway techniques.	
1.1.4	**There must be a designated Clinical Director and/or Lead Consultant for Intensive Care**	Intensive Care is recognised as essential to acute and elective care provision in the modern hospital. If there is only a Lead consultant, there must be a clear line of managerial accountability. In larger hospitals, the Clinical Director should only have managerial responsibility for intensive care, although this may comprise more than 1 unit. For example, the Clinical Director may be managerially responsible for a General ICU, Neuro ICU, Paed ICU and Cardiac ICU. Each separate unit would be expected to have a lead consultant.	Valentin A, Ferdinande P. Int Care Med. 2011; 37(10) Volume 37: 1575-1587 CICM. IC-01 (2011) DH. Comprehensive Critical Care. (2000)
1.1.5	**A consultant in Intensive Care Medicine must be immediately available 24/7, be able to attend within 30 minutes and must undertake twice daily ward rounds**	The consultant must see all patients under his/her care with trainee staff at least twice daily (including weekends and National holidays) and set a management plan, in the form of a structured bedside ward round. Consultant Intensivists must be available at all times to offer consultant level care to patients as necessary. Consultant Intensivists participating in a duty rota (including out of hours) must not be responsible for delivering other services, such as emergency medicine, acute general medicine and anaesthesia (including obstetric anaesthesia), while covering the critical care unit.	Paragraph 2, Schedule 12, National (English) Terms and Conditions of the consultant Contract CICM. IC-01 (2011) Valentin A, Ferdinande P. Int Care Med. 2011; 37(10) Volume 37: 1575-1587 CICM. IC-01 (2011) AMoRC. The Benefits of consultant Delivered Care. (2012) Barger LK, Ayas NT, Cade BE, et al. PLoS Med. 2006;3(12):e487

	Standard	Additional rationale/consideration	References
1.1.6	**Consultant Intensivist led multi-disciplinary clinical ward rounds within Intensive Care must occur every day (including weekends and national holidays). The ward round must have daily input from nursing, microbiology, pharmacy and physiotherapy**	Management decisions must be made about critically ill patients in a time sensitive manner. The consultant Intensivist, as key decision maker, needs to receive an appropriate amount of information to make decisions. This requires the presence or input of the other professionals to facilitate this process. At weekends, the input does not necessarily have to be onsite, but this is encouraged.	CICM. IC-01 (2011) NICE 83 AMoRC. The Benefits of consultant Delivered Care. (2012)
1.1.7	**All treatment plans should have clear objective outcomes identified within a specific time frame and discussed with the patient where appropriate, or relatives/carers if appropriate**	All treatment plans and goals should be communicated effectively within the Multi-professional team and documented in a way that is easily accessible to all members of the team. Patient information should be given in an appropriate format suitable for the patient/carers requirements and in a language they can understand.	NICE CG83
1.1.8	**Intensive Care trainees must comply with the requirements set by the Faculty of Intensive Care Medicine**	Critical Care trainees must have appropriate experience to work in a critical care unit.	www.ficm.ac.uk/training-icm Valentin A, Ferdinande P. IntCare Med. 2011; 37(10) Volume 37: 1575-1587
1.1.9	**Intensive Care Units that receive trainees for training in Intensive Care Medicine must comply with the requirements for training set them by the Faculty of Intensive Care Medicine**	Critical care units recognised for medical training must provide training to the standards set by the FICM.	www.ficm.ac.uk/training-icm

1.2   Nursing Staff

	Standard	Additional rationale/consideration	References
1.2.1	**Level 3 patients (level guided by ICS levels of care) require 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. Enhanced Level 3 patient status takes in to account severity of illness and the related nursing demands.	Williams G, Schmollgruber S, Alberto L. *Crit Care Clin*. 2006 Jul;22(3):393-406 The European Federation of Critical Care Nursing Associations, 2007
1.2.2	**Level 2 patients (level guided by ICS levels of care) require a registered nurse/ patient ratio of a minimum 1:2 to deliver direct care**	The 1:2 ratios may need to be increased to 1:1 to safely meet the needs of critically ill patients, such as those who are confused/delirious requiring close monitoring and/or those being nursed in single rooms.	The European Federation of Critical Care Nursing Associations, 2007
1.2.3	**Each designated Critical Care Unit will have a identified Lead Nurse who is formally recognised with overall responsibility for the nursing elements of the service e.g. Band 8a Matron**	This person must be an experienced critical care nurse with detailed knowledge and skills to undertake the operational management and strategic development of the service. This person will have: • undertaken leadership/management training • be in possession of a post registration award in Critical Care Nursing • be in possession or working towards post graduate study in relevant area This person will be supported by a tier of Band 7 sisters/charge nurses who will collectively manage human resources, health & safety, equipment management, research, audit, infection prevention & control, quality improvement and staff development.	Williams G, Schmollgruber S, Alberto L. *Crit Care Clin*. 2006 Jul;22(3):393-406

	Standard	Additional rationale/consideration	References
1.2.4	There will be a supernumerary clinical coordinator (sister/ charge nurse bands 6/7) on duty 24/7 in critical care units Units with < 6 beds may consider having a supernumerary clinical coordinator to cover peak activity periods, i.e. early shifts	The responsibilities of the clinical coordinators include: • Providing clinical nursing leadership, supervision and support to teams to optimise safe standards of patient care on each shift • Coordinate and supervise nurse staffing • Continuity of patient care • Facilitate admissions and discharges to ensure efficient and effective patient flow • Communicate with the multidisciplinary team and liaise with other departments to ensure efficient, effective, safe care is delivered in a timely manner • Be visible and accessible to staff, patients and relatives • Ensure effective use of human and non-human resources • Education and training All Clinical coordinators must be in possession of a post registration award in Critical Care Nursing and be a graduate or working towards a degree.	Francis Report, 2013
1.2.5	Units with greater than 10 beds will require additional supernumerary (this person is not rostered to deliver direct patient care to a specific patient) registered nursing staff over and above the clinical coordinator to enable the delivery of safe care. The number of additional staff per shift will be incremental depending on the size and layout of the unit (e.g. multiple single rooms). Consideration needs also be given during events such as infection outbreaks	The role of additional supernumerary registered nursing staff is to support the clinical coordinator. This will include assistance with admissions, transfers, supporting and supervising nursing staff, arranging staff sickness cover and relief in single rooms. The number of additional supernumerary registered nursing staff will be built around multiples of critical care beds and geographical layout of units and as a minimum will require: 11 – 20 beds = 1 additional supernumerary registered nurse 21 – 30 beds = 2 additional supernumerary registered nurses 31 – 40 beds = 3 additional supernumerary registered nurses	

	Standard	Additional rationale/consideration	References
1.2.6	**Each Critical Care Unit will have a dedicated Clinical Nurse Educator responsible for coordinating the education, training and CPD framework for critical care nursing staff and pre-registration student allocation**	The role will be supernumerary and additional Clinical Nurse Educators will be required for larger units, i.e. 1 WTE per circa 75 staff. Consideration needs to be given to local need such as rapid staff turn-over, large numbers of junior staff. The Clinical Nurse Educator will be in possession of a post registration award in Critical Care Nursing and appropriate post graduate certificate in education or equivalent.	Williams G, Schmollgruber S, Alberto L. *Crit Care Clin.* 2006 Jul;22(3):393-406 BACCN 2009
1.2.7	**All nursing staff appointed to Critical Care will be allocated a period of supernumerary practice**	This period is to allow adequate time for registered nurses to develop basic skills and competencies to safely care for a critically ill patient. All registered nurses commencing in critical care should be commenced on Step 1 of the National Competency Framework. The supernumerary period for newly qualified nurses should be a minimum of 6 weeks; this time frame may need to be extended depending on the individual The length of supernumerary period for staff with previous experience will depend on the type and length of previous experience and how recently this was obtained. All newly registered nursing staff should be allocated a preceptor. Newly appointed staff that have completed preceptorship should be allocated a mentor.	BACCN 2009 CC3N, 2013, National Competency Framework for Adult Critical Care Nurses. 2013
1.2.8	**A minimum of 50% of registered nursing staff will be in possession of a post registration award in Critical care Nursing**	Nurse education programmes should follow the National Standards for Critical Care Nurse Education (2012) and include both academic and clinical competence assessment.	Williams G, Schmollgruber S, Alberto L. *Crit Care Clin.* 2006 Jul;22(3):393-406 CC3N, 2012, National Standards for Critical Care Nurse Education CC3N, 2013, National Competency Framework for Adult Critical Care Nurses
1.2.9	**Units should not utilise greater than 20% of registered nurses from bank/agency on any one shift when they are NOT their own staff**	All registered nursing staff supplied by bank/agency should be able to demonstrate using documented evidence that they are competent to work in a critical care environment. All agency/bank staff are to be provided with unit orientation.	

	Standard	Additional rationale/consideration	References
1.2.10	**Where direct care is augmented using non-registered support staff, appropriate training and competence assessment is required**	All non-registered staff should have a defined period of induction, training for their role which includes competency assessment and personal development plan. All staff reporting to a registered nurse should work collaboratively to provide / support the provision of high quality compassionate care and support within clearly defined professional boundaries that complies with agreed employer's ways of working. Where Assistant Practitioner roles are introduced they should be in line with the National Education and Competence Framework for Assistant Critical Care Practitioners (DH, 2008).	Francis Report, 2013 Skills for Health, 2013

1.3   Therapy Team

	Standard	Additional rationale/consideration	References
1.3.1	**Assessment of the rehabilitation needs of all patients within 24 hours of admission to Critical Care and NICE 83 eligible patients on discharge from critical care must receive a rehabilitation prescription**	Rehabilitation should be communicated verbally to the daily ward round for each patient receiving input. This should be ideally given by a Therapist of suitable seniority that they are able to understand the severity of illness for each patient and able to explain and amend treatment goals/plans as discussed at the time of the ward round.	NICE CG83
1.3.2	**All patients with a tracheostomy should have communication and swallowing needs assessed when the decision to wean from the ventilator has been made and the sedation hold has started**	Critical Care should have a Physiotherapist and access to a Speech and Language Therapist of adequate critical care experience and seniority who can help contribute/construct a suitable weaning plan for complex patients, in conjunction with the wider multi-professional team. Critical Care should have access to a wide variety of high and low tech communication aids, but these should only be prescribed by a professional who is trained to apply and adapt them as required.	Royal College of Speech and Language Therapists: Position Paper 2013
1.3.3	**All patients will be screened for delirium**	Delirium screening should be undertaken with a standardised assessment tool and use a multi-professional, multi-modal approach. Interventions should include both Pharmacological and non-Pharmacological considerations and highly trained Occupational Therapists; Psychologists; Pharmacists and Nursing staff should provide assessments and strategies for patients identified as suffering from delirium.	Ely EW, Shintani A, Truman B, et al. JAMA; 2004, Vol. 291(14): 1753-1762 Barr J, Fraser GL, Puntillo K, et al. CCM; 2013, Vol 41(1): 263-306
1.3.4	**Patients receiving rehabilitation are offered a minimum of 45 minutes of each active therapy that is required, for a minimum of 5 days a week, at a level that enables the patient to meet their rehabilitation goals for as long as they are continuing to benefit from the therapy and are able to tolerate it**	Intensive Care Unit Acquired Weakness (ICUAW) presents clinically as profound weakness that requires multi-professional treatment. Standards set in the stroke population for complex patient rehabilitation should be mirrored for this patient cohort.	NICE Quality standards for stroke 2010

	Standard	Additional rationale/consideration	References
1.3.5	**Patients should have all Rehabilitation outcomes quantified using a tool that can track progression from the Acute sector into Primary care to facilitate care needs in the community**	Outcome measure should be consistent throughout the patient's pathway and able to facilitate care needs assessments. These outcomes should be reviewed consistently at Follow-up appointments and discussed with the patient and primary carer.	Herridge MS, Tansey CM, Matté A, N Engl J Med. 2011 Apr 7;364(14):1293-304 Griffiths J, Hatch RA, Bishop J, et al. Crit Care. 2013 May 28;17(3):R100
1.3.6	**The critical care team should have a Physiotherapist of adequate experience and seniority who can help contribute/construct a suitable weaning plan for complex patients, or long stay patients, in conjunction with the wider multi-professional team**	Weaning and rehabilitation strategies need to work in conjunction in order to optimize patient's physical capacity and reserve	Gosselink R, Bott J, Johnson M et al. Intensive Care Med. 2008 Jul;34(7):1188-99
1.3.7	**Physiotherapy staffing should be adequate to provide the respiratory management and rehabilitation components of care**	Physiotherapy should be available 24 hours a day if required, dependent on patient need. Suggested staffing levels are 1 WTE physiotherapist to 4 beds. A senior clinical physiotherapist with suitable post registration experience and/or qualifications should lead the team. Physiotherapy staffing should be adequate to provide both the respiratory management and rehabilitation components of care.	NICE CG83

1.4   Pharmacy

	Standard	Additional rationale/consideration	References
1.4.1	**There must be a critical care pharmacist for every critical care unit**	The consensus of critical care pharmacists, the United Kingdom Clinical Pharmacy Association and the Royal Pharmaceutical Society is that there should be at least 0.1 WTE 8a specialist clinical pharmacist for each single Level 3 bed and for every two Level 2 beds. This minimum requirement does not take into account staffing for weekend service or annual leave etc. Organisation as a specific clinical pharmacy team specific to critical care brings additional benefits such as optimal staff skill mix and support. Pharmacy services are often overlooked despite clear evidence they improve the safe and effective use of medicines in critical care patients. As well as direct clinical activities (including prescribing), pharmacists should provide professional support activities (e.g. clinical governance and guideline development) For the larger hospital with more than one ICU, the critical care pharmacy service is best delivered in a team approach. An example of the team used for a hospital with 100 critical care beds would be band 8 specialist critical care pharmacists, comprising: a band 8C consultant pharmacist, a band 8b (as deputy), 2 to 3 at band 8a and 3 to 4 at band 7. A band 7 pharmacist is considered a training grade for specialist pharmacy services. This allows the work to be completed with high grade pharmacy expertise available to bear on critically ill patients.	NHS Modernisation Agency, 2002 Department of Health, 2004 Department of Health, 2005, Quality Critical Care: Beyond 'Comprehensive Critical Care Horn E *et al*. Crit Care Med 2006; **34**: S46–S51 Manias E *et al*. Br J Clin Pharmacol 2012, 74: 411-423
1.4.2	**There should be sufficient pharmacy technical staff to provide supporting roles**	Pharmacy technician roles are also often overlooked and yet are required for tasks such as top-up, stock control / rotation and additional specialist administrative support (e.g. budget reporting, management of drugs excluded by payment by results). They are an important resource for optimising clinical pharmacist activity e.g. by supporting medicines reconciliation.	Department of Health, 2004 Department of Health, 2005, Quality Critical Care: Beyond 'Comprehensive Critical Care
1.4.3	**Clinical pharmacists providing a service to critical care must be competent to provide the service**	Critically ill patients are at the extremes of human physiology and receive multiple medication therapies requiring a high degree of specialist knowledge and management. Staff caring for such patients must be competent to do so.	Department of Health, 2005, Adult Critical Care; Specialist Pharmacy Practice

	Standard	Additional rationale/consideration	References
		The Royal Pharmaceutical Society launched a recognition programme in 2013 making it possible to identify levels of practice of pharmacists. Critical care pharmacists can be assessed against frameworks described by the DH (2005b), UKCPA and Royal Pharmaceutical Society.	UKCPA, 2009 Francis, 2013 Royal Pharmaceutical Society UKCPA & RPS, 2013
1.4.4	**Clinical pharmacists who provide a service to critical care areas and have the minimum competencies (Foundation Level) must have access to a more senior specialist critical care pharmacist (for advice and referrals)**	Critical care pharmacists must not operate in isolation. Access to experience and expertise may be within the Trust, or perhaps externally (e.g. within a critical care network or equivalent). In England, there are a number of consultant pharmacists specialising in critical care. When highly specialist advice is required, their expertise should be sought.	Department of Health, 2005, Adult Critical Care; Specialist Pharmacy Practice Department of Health, 2005, Guidance for the Development of consultant Pharmacist Posts
1.4.5	**Clinical pharmacy services should be ideally available 7 days per week. However, as a minimum the service should be provided 5 days per week (Monday-Friday). This should include attendance at consultant-led Multidisciplinary Ward Rounds**	Appropriate care of critically ill patients requires frequent review and reassessment of therapies, this includes medication. Clinical Pharmacists attendance at Multidisciplinary Ward Rounds increases the effectiveness of the team.	Miller G et al. Clinical Medicine 2011; 11: 312–16 Lane D *et al*. Crit Care Med 2013; 41:2015–2029

1.5   Dietitians

	Standard	Additional rationale/consideration	References
1.5.1	**All patients unable to take oral intake should normally have nutrition support (enteral or parenteral) commenced on admission, to ensure adequate nutrition to facilitate rehabilitation**	There must be guidelines in place for initiating nutrition support out of hours (ideally designed by the ICU lead dietitian) If it is not appropriate to commence nutrition on admission, then the reason must be documented clearly.	Guidelines for the provision and assessment of nutrition support therapy in the adult critically ill patient: Society of Critical Care Medicine and American Society for Parenteral and Enteral Nutrition (2009)
1.5.2	**There must be a dietitian as part of the critical care multidisciplinary team**	The British Dietetic Association recommends that there should be 0.05-0.1 WTE dietitian per 1 bed and that the lead dietitian for ICU should be at least a band 7. The lead dietitian may be supported by more junior dietetic staff, who will require regular supervision.	NHS Modernisation Agency, 2002. Role of Health Care Professionals within Critical Care Services Alberda 2009
1.5.3	**The ICU lead dietitian will be involved in the assessment, implementation and management of appropriate nutrition support route, in collaboration with the rest of the MDT team**	The role is necessary to reinforce the effectiveness of nutrition support protocols and this role is associated with an increase in energy provision, a reduction in energy deficits and earlier introduction of combined approaches to nutrition support when enteral nutrition is failing	CQC Outcome 5 2010 NICE G32 2006 NICE QS24 2012 Heyland D, Heyland R, Cahill N, et al. JPEN J Parenter Enteral Nutr. 2010;34:707-715 Soguel L, Revelly JP, Schaller MD et al. Crit Care Med. 2012;20:412-419

2. OPERATIONAL

	Standard	Additional rationale/consideration	References
2.1	There must be a hospital wide standardised approach to the detection of the deteriorating patient and a clearly documented escalation response.	All deteriorating acutely ill patients must be detected and treated as quickly as possible. A national prediction scale should be used to allow peer comparison with other units.	NICE CG 50 RCP. National Early Warning Score (NEWS). (2012)
2.2	There must be documentation in the patient record of the time and decision to admit to Intensive Care	Documentation is vital to contribute to the dataset for the National Critical Care Dash Board.	GMC. Good Medical Practice (2013)
2.3	Admission to Intensive Care should occur within 4 hours of making the decision to admit	Minimising delays to definitive treatment is associated with better outcomes. In the critically ill this is best delivered on the intensive care unit.	Dellinger RP, Levy MM, Rhodes A, et al. CCM. 2013; 41(2): 580–637 Rivers E, Nguyen B, Havstad S, et al. N Engl J Med. 2001 Nov 8;345(19):1368-77
2.4	Patients should not be transferred to other Intensive Care Units for non-clinical reasons	Transferring patients for non-clinical reasons adds the risks of transfer, prolongs stay on intensive care and may be associated with distress to patients and their families. Repatriating a patient from a specialist ICU (e.g. neuro or cardiac) is considered a clinical reason for transfer.	Barratt H, Harrison DA, Rowan KM, Raine R.Crit Care. 2012. 16(5):R179
2.5	On admission to Intensive Care all patients must have a treatment plan discussed with a consultant in Intensive Care Medicine	This provision is irrespective of the time of day.	AoMRC. The Benefits of consultant Delivered Care. (2012)
2.6	Patients should be reviewed in person by a consultant in Intensive Care Medicine within 12 hours of admission to Intensive Care		AoMRC. The Benefits of consultant Delivered Care. (2012) AoMRC. Seven Day consultant Present Care. (2012) Aylin P, Yunus A, Bottle A, Majeed A, Bell D.QualSaf Health Care. 2010;19(3):213-7 Bell CM, Redelmeier DA. N Engl J Med. 2001; 345:663–668.

	Standard	Additional rationale/consideration	References
2.7	**Each patient must have an assessment of their rehabilitation needs within 24 hours of admission to Critical Care**	This provision is irrespective of the day of admission and applies equally to patients admitted at the weekend and bank holidays. All NICE 83 eligible patients must have a rehabilitation prescription on discharge from critical care. This must be updated throughout the rest of the patient's stay in hospital.	NICE 83 Aylin P, Yunus A, Bottle A, Majeed A, Bell D.QualSaf Health Care. 2010;19(3):213-7 Bell CM, Redelmeier DA. N Engl J Med. 2001; 345:663–668.
2.8	**There should be a standardised handover procedure for medical, nursing and AHP staff for patients discharged from critical care units**	Continuity of patient care must be maintained on discharge from critical care.	Ilan R, LeBaron CD, Christianson MK, et al. BMC Health Serv Res. 2012;12:11 Joy BF, Elliott E, Hardy C, et al. PediatrCrit Care Med. 2011;12(3):304-8 O'Horo JC, Omballi M, Tran TK. J Grad Med Educ. 2012;4(1):42-6
2.9	**Patients need a clear and safe pathway for escalation of care from Level 2 care to Level 3**	Patients receiving Level 2 critical care support may deteriorate. It is not acceptable or logical to provide a ceiling of Level 2 critical care in isolated sites, as this may result in harm to patients. If a unit usually provides Level 2 care, it must be capable of the immediate provision of short term Level 3 care without calling in extra staff members in order to provide optimal patient care. The unit should be capable of providing up to 24 hours of level 3 care prior to a patient being safely transferred to a more suitable unit. The staff of the Level 2 unit should have the competencies required to provide this level of care. All recommendations of this document apply to units that usually provide only Level 2 care, whether in the NHS or the private sector.	
2.10	**Transfer from Critical Care to a ward must be formalised**	The handover must include: a. A summary of critical care stay including diagnosis, treatment and changes to chronic therapies b. A monitoring and investigation plan c. A plan for ongoing treatment d. Physical and rehabilitation needs e. Psychological and emotional needs f. Specific communication needs g. Follow-up requirements	NICE 50 O'Horo JC, Omballi M, Tran TK. J Grad Med Educ. 2012;4(1):42-6

	Standard	Additional rationale/consideration	References
2.11	**Discharge from Intensive Care to a general ward should occur within 4 hours of the decision**	Patients must be moved to a more suitable environment without unnecessary delay. There should not be a non-clinical reason preventing such a move.	
2.12	**Discharge from Critical Care should occur between 07:00hrs and 21:59hrs**	Discharges overnight have been historically associated with an excess mortality. Patients perceive it as extremely unpleasant being moved from ICU to a general ward outside of normal working hours.	Priestap FA, Martin CM.Crit Care Med. 2006;34(12):2946-51 Hanane T, Keegan MT, Seferian EG, et al. Crit Care Med. 2008;36(8):2232-7
2.13	**Unplanned readmission rate to ICU within 48hrs of discharge, to a ward, should be minimal**	Readmitting a patient could imply hasty discharge or inadequate care.	
2.14	**The Intensive Care team must engage, contribute and participate in a Critical Care Operational Delivery Network (ODN), including audit activity and regular peer review**	It is recognised that Critical Care Operational Delivery Networks are an integral component of the new NHS. Benchmarking against peers is an important process that ensures good practices are maintained.	
2.15	**Level 3 units should have access to a Regional Home Ventilation and weaning unit. Arrangements should 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**	Approximately 6% of ventilated patients admitted to critical care will require a prolonged period of weaning and 1% will fail to wean. Many of these patients will have neuromuscular problems and will benefit from non-invasive ventilation. A few will require long-term ventilation by tracheostomy. These patients and others with weaning difficulties are best managed by Regional Home Ventilation services with the expertise and resources to provide home support for this group of patients with complex needs.	NHS Modernisation Agency. Weaning and long term ventilation Respiratory complex home ventilation - NHS England Service specification 2013
2.16	**Patients discharged from ICU should have access to an ICU follow-up clinic**	Following a period of critical illness, patients should be offered the support of a specialised critical care follow-up clinic. Critically ill patients have been shown to have complex physical and psychological problems that can last for long time. These patients benefit from the multi-modal approach that an ICU follow-up clinic can deliver. The clinic does not necessarily have to be provided by the hospital that the patient was treated in. It could be delivered on a Regional basis.	NICE CG83

	Standard	Additional rationale/consideration	References
2.17	**Geographically remote ICUs should have an established review/referral relationship with a bigger centre.**	Provision of mechanical ventilation and simple invasive cardiovascular monitoring for more than 24 hours is acceptable when the treating specialist is, or is eligible to become, a Fellow / Associate Fellow of the Faculty. If the treating specialist is not a Fellow / Associate Fellow of the Faculty, this provision should only occur within the context of ongoing daily discussion with the bigger centre. There should be mutual transfer and back transfer policies and an established joint review process. These units are encouraged to discuss their plans with their National Intensive Care Society and the Joint Standards Committee of the FICM/ICS.	Wilcox ME, Chong CKAY, Niven DJ et al. Crit Care Med. 2013, doi: 10.1097/CCM.0b013e3 18292313a

3.   EQUIPMENT

	Standard	Additional rationale/consideration	References
3.1	**Intensive Care facilities should comply with national standards**	Whilst it is acknowledged that not all facilities currently meet national standards, providers of Intensive Care services should establish a program of work/time line to establish when national standards will be met. This should be overseen/undertaken by the Intensive Care clinical team. All new build units must comply with HBN 04-02. Existing facilities that do not comply with HBN 04-02 should note that as part of their risk register. Trusts should indicate when facilities will be upgraded to comply with the current HBN. (HBN 27 was published in 1992, HBN 57 in 2003 and HBN 04-02 in 2013. It is imperative that critical care is delivered in facilities designed for that purpose). This should be inspected as part of the peer review process and slippage should be investigated.	HBN 04-02. *NHS Estates* (2013) Francis Report (2013)
3.2	**All equipment must conform to the relevant safety standards and be regularly serviced**	There must be a program in place for the routine replacement of capital equipment.	Standard for Equipment in Critical Care. *ICS* MHRA
3.3	**All staff must be appropriately trained, competent and familiar with the use of equipment**	There should be a training log held by the unit to demonstrate that all staff have complied with this provision. It applies to medical, nursing and AHP staff.	MHRA GMC NMC

4.   DATA COLLECTION

	Standard	Additional rationale/consideration	References
4.1	**Units must hold multi-professional clinical governance meetings, including analysis of mortality and morbidity**	There should be evidence of associated action planning. Minutes must be taken which must be incorporated into the Hospital's clinical governance process. Lessons learnt must be shared in regular multi-professional meetings. These meetings should occur on at least a monthly basis. That is there should be a minimum of 12 meetings per year.	
4.2	**The ICU should participate in a National database for Adult Critical Care**	Intensive Care Units must publish the nationally agreed dashboard, including the Standardised Mortality Rate. It is recommended that this is accessible on the unit website, which should be updated on a regular basis (annually as a minimum).	
4.3	**Presence of a risk register and associated audit calendar**	This must be regularly updated and acted upon. Evidence should be provided at the network peer review process that this is happening. Support should be given to the intensive care team by the ODN, should the Trust management not understand the implications of major risks identified.	

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CORE STANDARDS DEVELOPMENT GROUP

These standards were authored by the Core Standards Working Party of the Joint Professional Standards Committee*

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	Mr S Steen	RCN Inflight and Critical Care Forum

*   Joint Professional Standards Committee comprises the Professional Standards Committee of the Faculty of Intensive Care Medicine and the Standards, Safety and Quality Committee of the Intensive Care Society.

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