BACCN
British Association
of Critical Care Nurses

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Standards for Nurse Staffing in Critical Care

British Association of
Critical Care Nurses

Critical Care Networks
National Nurse Leads

Royal College of Nursing
Critical Care & In-flight Forum

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Executive Summary

The inception of intensive care and subsequently critical care (DOH 2002) started in 1952 in Denmark using techniques from the operating theatre whereby positive pressure ventilation was used to support patients with respiratory failure. As the specialty developed within the United Kingdom (UK), the original 'gold standard' for nurse staffing in intensive care units was set at a ratio of one nurse for each patient in 1967. which reflected the intensive support and nursing care such patients required. In recent years this standard has been challenged for a variety of reasons that include the high cost of staffing associated with critical illness management, and the suggestion that nursing staff in critical care units need to work more flexibly.

The critical care environment has changed considerably since the 1960's and the speciality of critical care has, as a consequence grown. This has been in response to advances in technology, surgical and medical techniques and procedures, and also managing an increasing older patient population with complex diagnoses and co-morbidities. This has lead to changes in staffing and the nursing team in a critical care unit can now typically comprise of registered nurses, advanced critical care practitioners, critical care outreach nurses, and practice development nurses, who are supported by assistant critical care practitioners and health care assistants.

The UK professional critical care nursing organisations have in the past developed guidance for critical care staffing, in order to assist nurses in making informed decisions with relation to staffing units; and this inaugural document represents the first occasion when all three UK Professional Critical Care Nursing associations have worked together to produce Standards for Nurse Staffing in Critical Care. These standards have evolved from previous work and are endorsed by the BACCN, CC3N, and the RCN Critical Care & In flight Forum.

These standards reflects the emerging body of evidence, that supports the higher ratio of nursing staff required to deliver safe and effective critical care and as such has been highlighted in this document. These include infection control, size and geographical layout, and number of beds in a unit, case mix, safety in relation to ventilated patients, mixed sex accommodation needs, and the individual experience of each nurse. Critical care nurses, unit managers, and commissioners, need to take account of all these variables related to an individual unit, in addition to the skill mix, experience and competence of nursing staff available.

With appropriate administrative and technological support, critical care nurses need to embrace the necessary data collection processes now required within this specialty. They also need to be proactive in adopting, contributing to, and developing team focused evidence based protocols, in order to improve outcomes for patients and their families. The future challenge for critical care nurses is to develop and measure the contribution of quality metrics, which reflect the effectiveness, and safety of nursing input for critical care patients. In doing so they will contribute to the body of evidence to support and inform relevant nurse-patient ratios in critical care.

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Standards for Nurse Staffing in Critical Care Units Determined By:

The British Association of Critical Care Nurses   **The Critical Care Networks National Nurse Leads**   **Royal College of Nursing Critical Care & In-flight Forum**

1. Every patient in a Critical Care Unit must have immediate access to a registered nurse with a post registration qualification in this specific speciality

2. Ventilated patients should have a minimum of one nurse to one patient

3. The nurse patient ratio within any Critical Care Unit should not go below 1 nurse to 2 patients

4. The level of care needs required by each patient should equate to the skills and knowledge of the registered nurse delivering and/or supervising that care

5. 1.Critical Care Units should employ flexible working patterns as determined by unit size, activity, case mix and the fluctuating levels of care for each patient, to ensure patient safety and care delivery

6. A supernumerary clinical co-ordinator, who is a senior critical care qualified nurse will be required for larger and geographically diverse units of more than 6 beds. The clinical co-ordinator's role is to ensure effective, safe and appropriate care is delivered each shift, by managing and supporting staff and patients, and acting as a communicator and liaison between the rest of the multi-disciplinary team.

7. The layout of beds and use of side wards in a Critical Care Unit must be taken into account when setting staffing levels to ensure safe patient care.

8. On-going education for all nursing staff working in critical care is of principal importance to ensure knowledgeable and competent staff care for patients. Clinical Educator posts should be utilised to support this practice.

9. Health Care Assistants (HCAs) have a key role in assisting registered nurses in delivering direct patient care and in maintaining patient safety. These roles should be developed to meet the demands of patients and of the unit. However, the registered nurse remains responsible for the assessment, planning, delivery and evaluation of patient care.

10. The Assistant Practitioners (APs) role in Critical Care can provide direct patient care under the indirect supervision of a registered nurse, who will remain responsible for the assessment, planning and evaluation of patient care. The effectiveness of the role of Assistant Practitioners in Critical Care Units requires further evaluation and research.

11. Administrative staff should be employed to ensure registered nurses are free to give direct patient care, and to support the critical care units and staff with essential data collection.

12. Critical Care nurses should be proactive in the development of multi-professional team working to optimise quality patient care and ensure a quality service.

Introduction

The British Association of Critical Care Nurses
(BACCN), Critical Care Networks National Nurse
Leads (CC3N) and the Royal College of Nursing
(RCN) Critical Care & In-flight Forum have worked
together to produce contemporary standards
for nurse staffing in critical care. The standards
are a review of past recommendations and take
into account changes in practice, and reflect the
challenges ahead. They have been developed in
order to support healthcare organisations who are
committed to providing safe critical care services,
to the most acutely ill patients in their care.

These standards have been developed as a
reference for nursing staff in critical care, managers
and commissioners associated with critical care,
in order to provide and support safe patient care,
focused upon quality, and the desired patient
outcomes. The standards should help inform the
workforce development programme necessary for
the continued evolution of critical care services.

The following information is presented as evidence
to support the standards determined by the
BACCN, CC3N, and the RCN Critical Care & In-flight
Forum. These standards have been developed
for critical care nurses in the United Kingdom.
It is acknowledged that in Wales, Scotland and
Northern Ireland there may be differing health
policy specific to these areas, however the
principles are transferable to all critical care units.

Background

The inception of intensive care and consequently critical care (DOH 2000) started in 1952 in Denmark using techniques from the operating theatre whereby positive pressure ventilation is used to support patients with respiratory failure. Prior to this patients with respiratory failure were supported using negative pressure ventilation using 'iron lungs' with limited success. (Intensive Care Society 2003). The speciality of critical care has since grown in response to advances in technology, and improved surgical and medical techniques and procedures. Life expectancy has increased, and health care providers are now caring for an increasingly ageing population, often with complex underlying conditions. Within the UK, the notion of centralising patients who required ventilation and increased observation in specialised units emerged in the early 1960's. In 1967 the gold standard for nurse staffing in intensive care units was set at a ratio of one nurse for each patient (British Medical Association 1967). Subsequent documents reinforced this standard, suggesting that a ratio of one nurse per bed equated to 7.0 nurses per bed to ensure all beds could be open (Association of Anaesthetists 1988, Intensive Care Society 1997, RCN 2003) As critical care medicine progressed intermediate high dependency units (HDU's) developed and the ratio of nurses per patient was established at two patients to one nurse (DoH 1996) .

Critical Care is considered a low volume, high cost speciality caring for the sickest patients in an acute hospital. In response to the growing pressure for critical care beds the Audit Commission examined the service in England and Wales, culminating in the most comprehensive examination of critical care since its inception (Audit Commission 1999). This report demonstrated the difference in nurse staffing numbers, grade and skill mix across units, and reported significant variation in numbers of nurses employed and the subsequent costs associated with this. Staff acknowledged that at times a ventilated sedated patient in an intensive care unit may require less registered nursing input than the agitated and confused self-ventilating patient in a high dependency unit

(Audit Commission 1999). The Audit Commission and the strategic framework documents which followed (DoH 2000, DoH 2001, DoH 2005) assert that nurse staffing for critical care patients needed to be developed more flexibly, with a move away from the rigid one to one nurse patient ratio traditionally used in intensive care. Nurses' pay accounts for up to 28 per cent of acute trusts' total expenditure and is the biggest single item of hospital expenditure (Audit Commission 2009). This recent work by the Audit Commission demonstrated that in general wards costs still varied profoundly across the UK, and mirrored the findings found by the Audit Commission Report into Critical Care in 1999 where it was reported that the nurse staffing costs varied widely. At the extreme some unit's costs were twice that of a similar sized unit (Audit Commission 1999). Such a variance in nurse staffing costs have required critical care nurses to be able to evaluate and justify decisions related to the high nurse patient staffing ratios in critical care units.

The critical care nursing professional organisations have previously developed guidance for critical care staffing, in order to assist nurses in making informed decisions in relation to staffing units (BACCN 2001, BACCN 2005, RCN 2003). This standard evolves from previous work, and is endorsed by the BACCN, CC3N, and the RCN Critical Care & In-flight Forum.

Definition of critical care

The philosophy of critical care (DoH 2000, ICS 2009) embraces a hospital wide perspective, with a focus upon levels of care from level 0 to 3 that is required by patients based upon their severity of illness, and regardless of their location . This seamless approach encompasses the needs of patients at risk of critical illness, and also patients recovering from critical illness (DoH 2000). Accordingly these patients may be managed in a variety of facilities such as a general ward, an HDU or an intensive care unit (ICU) depending upon where their needs can be best met, with the support of the multi-professional team (DoH 2000, RCN, 2003, ICS 2009).

For the purpose of this standard the term 'critical care' will refer to the actual facilities or discrete units within a hospital where adult critical care services are provided. A Critical Care Unit (CCU) is an umbrella term for an HDU or an ICU, or indeed a unit combining both these services. Patients requiring level 2 care are usually managed in an HDU whilst the sickest patients requiring level 3 care, are cared for in an ICU (Mackenzie 2004, ICS 2009).

HDU provides an intermediate level of care between that which is available on a general ward and that on an ICU. Detailed monitoring and intervention is provided to patients with or at risk of developing single organ failure, with the exception of those needing advanced respiratory support. HDU is also appropriate for patients who will benefit from extended post-operative care, following major or complicated surgery. It can also serve as a 'step down unit' for patients who no longer require intensive care but who are not yet well enough to be returned to a general ward (DoH 1996, ICS 2009).

ICU manages patients with potentially reversible conditions who can benefit from more detailed observation and invasive treatment than can safely be provided on general wards or high dependency areas. ICU is appropriate for patients requiring advanced respiratory support alone or support of two or more failing organ systems. ICU offers facilities for the diagnosis, prevention and treatment of multiple organ failure (DOH 1996, ICS 2009).

Critical Care Units may be general, mixed speciality or speciality units (Audit Commission 1999). For the purpose of these standards the levels defined for adult critical care relate to the Intensive Care Society Standards and Guidelines for Levels of Critical Care for Adult Patients. The Critical Care Stakeholders Forum, and the Department of Health through the Critical Care Information Advisory Group (CCIAG) also support the standards (ICS 2009). The Codes assigned by CCIAG for the different types of critical care specialities are shown in Table 1.

Table 1

01	General Intensive Care Unit; adult intensive care, including wards labelled as surgical or medical ICU, but excluding the specialised units identified below. General Intensive Care Units may provide a mixture of HDU and ICU level care
02	Cardiothoracic Intensive Care Unit; this includes those units labelled as separate cardiac or thoracic units
03	Liver Intensive Care Unit
04	Neurological Intensive Care Unit
05	High Dependency Unit
09	Cardiac Care Unit; otherwise referred to as a Coronary Care Unit
10	Combined High Dependency and Coronary Care Unit; the beds and staff for the two units are geographically in the same area
11	Combined Coronary and Intensive Care Unit; the beds and staff for the two units are geographically in the same area
12	Combined High Dependency and Intensive Care Unit; the beds and staff for the two units are geographically in the same area
13	Post Operative Recovery Unit; this includes a theatre recovery area
14	Spinal Injury Intensive Care Unit; this is a unit designated for critical care rather than a spinal injury ward
15	Burns Critical Care Unit; this includes all special care burns facilities other than short term post-operative care areas
16	Renal Unit; this includes an in-patient kidney dialysis unit, but excludes general nephrology or urology wards

Definition of critical care nurse

The World Federation of Critical Care Nurses provides a universal definition, which is applicable to critical care in the UK. (Table 2). The skills and knowledge of a critical care nurse are applied across the domains of early recognition and intervention, risk management, recovery and rehabilitation in the care of critically ill patients (Ontario Critical Care Nurse Training Standards 2005). When survival is not possible the nurse supports the patient and family through the process of dying and early bereavement (DoH, 2001). A proficient critical care nurse utilises: advanced problem solving, decision making and communication skills to provide proactive, safe and effective care when undertaking continuous complex monitoring and assessment, administering, co-ordinating and evaluating high-intensity therapies, responding promptly to sudden changes in a patient's condition and in providing information and emotional support to patients and relatives (ACCCN 2002, RCN 2003).

Critical care nurses make a significant contribution to the development of the evidence base for critical care nursing practice. Thus enhancing the quality and experience of patient care, through involvement in professional activities such as, the development of self and others, data collection, audit, service improvement and research and development initiatives (DoH 2000; DoH 2001).

Critical Care nursing is a dynamic speciality, which positively and proactively responds to meet the ever changing, complex and challenging demands of the critically ill population and the overall healthcare system. This has resulted in the development of a diverse range of nursing roles, such as the bedside staff nurse, nurse manager, advanced practitioner, nurse educator, nurse researcher, critical care outreach nurse and consultant nurse. These roles also present opportunities for the development and career progression of critical care nurses (DoH 2001, DoH 2008).

Table 2

Definition of A Critical Care Nurse
World Federation of Critical Care Nurses (2005)
A critical care nurse is a registered practitioner who enhances the delivery of comprehensive patient centred care, for acutely ill patients who require complex interventions in a highly technical environment; bringing to the patient care team a unique combination of knowledge and skills. The roles of critical care nurses are essential to the multidisciplinary team who are needed to provide their expertise when caring for patients and their relatives (WFCCN 2005).

Review of the literature

Methodology

In order to systematically gather evidence and facilitate the development of the standard statement, a number of bibliographic databases were searched. To further focus the scope of the search, parameters were also identified and included restricting papers to the English language, human subjects, and papers published since 2003. This was intentional to build upon the last comprehensive and significant review of the literature related to staffing in critical care 1990 – 2003 (Coombs and Lattimer 2007). Databases searched were Medline, CINAHL, Cochrane database, OVID, Blackwell Scientific, Kings Fund, Department of Health, and the National Research Register. The following search terms were used:

- Critical care nursing
- Nursing
- Nurse staffing
- Skill mix
- Adverse events
- Health care assistants and critical care
- Length of stay
- Critical care
- Intensive care
- Technology
- Infection control

The terms were also combined to further extend the range of the search. Databases of notable peer reviewed journals were also searched for scientific and non-scientific papers relating to critical care and nursing. To encompass all other aspects of evidence and information related to nurse staffing in critical care searches were also carried out via the internet, RCN legal teams, and the National Patient Safety Agency (NPSA). Information from the expert group of contemporary knowledge and information related to policy and recent innovations in critical care were also included.

For the literature search approximately 3000 entries were reviewed, dating from 1st January 2003 to present date. Within the search, entries were screened for relevance to critical care and nursing, and in particular for outcomes suggesting that the nursing contribution to organisational

factors, contributed positively or negatively to patient outcomes in critical care settings. From this, approximately 250 abstracts or full text articles were reviewed. Further review of these articles yielded six quality reviews of studies related to staffing in critical care, which could help in developing staffing standards (Table 3). The literature search was not confined to the United Kingdom; however international evidence must be interpreted with caution, in relation to critical care in the NHS and the UK. Critical Care units in the UK function differently to other countries, for example medical staff and support staff such as respiratory technicians are often greater in number in other countries than in UK units. (Wunsch and Angus et al 2008, BACCN 2005). It is recognised that nursing roles in critical care in the UK are distinct from other countries, as nurses have increased responsibility for the management of patient care and organisation of the unit (RCN 1997).

Developing an understanding of the unique contribution that nurses make to patient outcomes within critical care has been the source of many studies. However to date, there appears only limited definitive work linking nursing alone, to positive or negative patient outcomes within critical care. Where evidence does exist, there appears difficulty in extrapolating the results to a general population of critical care patients and environments. The literature on occasions gives conflicting views regarding some outcome measures. Such conclusions are also supported within several notable systematic reviews that have sought to explore causal links between organisational factors including nursing, and patient outcomes in critical care (Table 3).

West et al (2009) in the most recent review of research evidence related to nurse staffing in critical care, emphasise the need for further research and offers the following hypothesis to be tested in future research:

"overwork and staff shortages will interfere with task performance, including surveillance, monitoring, early detection of adverse events and preventative measures e.g., hand washing, pulmonary hygiene, early ambulation".

West et al (2009) also found that study design including sample size and single versus multi unit reviews, as well as the statistical methodology used, leads to difficulty in interpreting some of the findings when studying adverse outcomes in critical care. Other review authors comment upon the predominance of observational studies and a lack of robust clinical trials focussing upon establishing causal relationships. More recent research related to critical care suggests that nurse staffing needs to be based on patient acuity rather than an absolute number of patients (Kiekkas et al 2008). It also demonstrates that a greater number of registered nurses is associated with improved patient safety and efficiency (Thungjaroenkul et al 2008). Pronovost et al (2002) suggest that practical and ethical considerations may be an insurmountable barrier to conducting clinical trials into identifying optimum organisational factors; this may include nursing and nursing skill mix.

Systematic Literature Reviews into Organisational Factors and Critical Care Patient Outcomes.

Table 3

Author(s)	Date	Focus	Number of articles in final review.	Conclusion	Comments by author(s)
West E et al	2009	Identification of empirical evidence linking nursing resources to patient outcomes. Framework to guide further research	15	Some evidence exists linking patient outcomes, safety and ICU staffing. However generalisation remains problematical and would benefit from further research.	Studies vary in quality, which may affect interpretation of results.
Coombs and Lattimer	2007	Literature review of Safety, effectiveness and of organising care for critically ill patients:	58	Limited evidence for the safety, effectiveness and cost effectiveness for differing models of organising care for the critically ill.	Some correlation between nurse staffing levels in intensive care and incidence of adverse events. Literature adopts a uni professional bias, more research is required on multi disciplinary team working, the organisation of care, and long term outcomes of care.
Numata Y et al	2006	Staffing levels and hospital mortality	9	No clear association identified between hospital mortality and low nursing numbers	Variable confounding factors. Hospital mortality may lack sensitivity in detecting negative outcomes associated with low staffing numbers.
Carayon P and Gurses MP	2005	Identification of human factors within nursing activity, which impact upon patient safety and quality of care.	22	Some causation possible in relation to unit, job, patient, and situation.	Four aspects of nursing activity related to patient safety identified; the unit, job, patient and situation would benefit from further research.
*Pronovost PJ et al	2002	Relationship between physician staffing and patient outcomes in ICU.	27	Increased numbers of intensivists in the ICU led to significant reductions in ICU, and hospital mortality and LOS.	Research into the effects of multidisciplinary staffing models on patient outcomes should be a high priority.
Carmel S, and Rowan K	2001	Organisation of intensive care (including nursing).	63	Organisational factors may impact upon mortality after case mix adjustment	

Whilst the results from this review were focussed upon medical staffing, it is felt important to include as an example of a review into organisational factors that did show a positive correlation between outcome and staffing.

Developing nurses staffing standards and policy related to quality outcomes

The literature review was attempting to identify any positive or negative outcomes associated with the nursing resource alone. In relation to patient outcomes, there are different viewpoints that measure negative and positive outcomes. For example, patients may see dignity, survival and no infections as key quality outcomes, among others. However nurses may perceive outcomes such as pressure ulcer acquisition, less adverse incidents (minor to major) and attention to the fundamentals of care as also important. Managers may perceive indicators such as length of stay equally as important. Whilst nurses and other clinicians may view all of the above and communication a key part of the nurses role. Hence differing interventions could lead to a positive outcome, and it is within this concept that examining and measuring aspects of patient care (Table 4) could point the way to the unique contribution of nursing.

Whilst it cannot be argued that communication does play a vital part in patient outcome, and communication could be viewed as not specific to nursing, responsibility is often delegated solely to them (Pilcher 2009). The complexity of care and activity in Critical Care Units requires expert communication and co-ordination each shift to ensure staff and patients are supported, supervised and managed in order to deliver effective appropriate and safe care. Evidence from some studies (Ball and Mc Elligott 2003, Valentin and Capuzzo et al 2009) indicates that larger (more than 6 beds) and/or geographically diverse units require a supernumerary nurse or clinical co-ordinator each shift who is a senior critical care qualified nurse to act as the communicator, supervisor and liaison in order to deliver this.

In relation to measuring effectiveness and policy development, empirical evidence, quality measures, and professional judgement can all contribute to developing safe and effective models of care. Within this concept, ultimate patient outcomes, unit and hospital mortality in addition to adverse outcomes can be considered, in addition to the consequences of nursing and organisational factors. Adverse outcomes have been described previously as including a 'failure to rescue' (Silber et al. 1992). Utilising this theme Ball and McElligot (2003) sought to move away from evaluating patient outcomes related to just nursing numbers. This study examined the difference nurses made to the recovery of critical care patients, and the nurses' ability to prevent patient deterioration.

Set nurse patient ratios do not take account of nursing skill mix, the environment, case mix and the ability and competence of the individual nurse. Ball and McElligot (2003) found that nurses did work flexibly in a changing clinical environment. The ability to work flexibly required the individual nurse to have theoretical and clinical knowledge and exposure to critical care. If the nursing resource was stretched due to increased patient dependency, reduced skill mix and geographical unit layout, nurses were unable to provide vigilance and proactive care.

Research from the USA and the UK indicates that a richer nursing skill mix reduces adverse patient events and can be related to critical care (Kane et al 2007, Rafferty et al 2006, Needleman 2002). Research in relation to patient outcomes and nursing in general hospital wards has shown a link between the number of nurses, patient mortality and length of stay. Fewer nursing numbers is linked to higher mortality and increased length of stay, though these are early results which need further investigation to understand the relationship between nursing numbers and patient care (Ford 2009). The future emphasis for care to be delivered in the NHS is focused on quality patient care and patient safety. Defining and measuring the quality of nursing care, is to be developed as part of the quality metrics (indicators) to reflect issues of safety, effectiveness, patient experience, and compassion. (DoH 2008a) delivered by a well-trained workforce (DoH 2008b). Nurses are the only consistent profession to be in constant 24-hour surveillance of patients in hospital. Ensuring adequate nurse numbers, improving access to education and competence is necessary to deliver quality patient care and safety (Hinshaw 2008, Talsma et al 2008).

Table 4

Proposed Quality Metric Measures of Nursing Care Relating to Outcomes in Critical Care
• Provision of the fundamentals of Nursing Care • Reduction in the incidence of Healthcare Associated Infections (HCAI) • Improved communication is associated with reducing incidents and minimising risk • Protocol based care to improve patient outcomes • Team based competencies and standardised training programmes for critical care nurses and support workers • Ventilation and its association with critical care costs and adverse events • Adverse outcomes associated with nursing care • Proportion of available nursing time taken up by non-nursing tasks • Patient experience

Reduction in the incidence of healthcare associated infections (HCAI) and staffing levels

There is a growing evidence base to link the extent of nursing intervention and reduction of HCAI's within critical care. Hugonnet and Villaveces et al (2007) in a large case cross over study identified an increased incidence of HCAI amongst 366 patients admitted to a medical ICU and who stayed for 7 days or more. This one centred study demonstrated that 144 of the patients studied, developed HCAI. The study population appears to have similarities to UK ICU patients in relation to the mean APACHE score on admission, patients' age and presenting condition. Hugonnet et al (2007) discuss that a significant strength of their study is the case crossover methodology, which they feel is a promising alternative to the Randomised Controlled Trial methodology. Further research utilizing a larger cohort of patients indicated a correlation between nurse patient ratios and incidence of HCAI. (Hugonnet and Chevrolet et al 2007a). In this study the median 24 hour nurse - patient ratio was 1.9, however a higher ratio of staffing levels was associated with a >30% infection risk reduction. The researchers concluded that an estimated 26.7% of all infections could be avoided if the nurse – patient ratio was maintained at >2.2 . Patients with HCAI's were found to have a higher mortality, and an increased length of stay, which impacts on the cost of caring for patients in critical care.

Units within the United Kingdom still rely upon temporary staffing e.g agency/bank nurses for a proportion of the available resource. Within the USA, such nurses are referred to as 'float' nurses. Alonso et al (2003) reported an increased incidence of blood stream infections when float nurses nursed patients who had a central venous catheter in situ for more than 60% of the time. Hence there may be a need to ensure nursing establishments reduce the use of temporary staff. This is not thought to reflect individual practice, but uncertainty within the environment and a lack of detailed awareness of relevant procedures and policies for a given unit.

Artificial ventilation is associated with increased critical care costs and adverse events

Artificial Ventilation is associated with increased critical care costs throughout the stay of the patient on ICU and any interventions that reduce the length of ventilation will reduce length of stay and overall costs (Dasta et al 2005). Increased incidences of self-extubation in children is associated with nurse staffing levels of less than 1:1 (Marcin et al 2005) and increases in length of stay. Crunden et al (2005) reported significantly reduced length of stay following introduction of the ventilator care bundle, whilst Ramachandran et al (2005) reported the efficacy of protocol driven weaning. Reducing the length of time that a patient is sedated and ventilated has been associated with reduced costs and reduced length of stay. Schweickert et al (2004) concluded that the daily interruption of sedatives in critically ill patients reduces intensive care unit length of stay and also decreases the incidence of complications of critical illness. Nursing staff in Critical Care are central to delivering this type of protocol based approach to care.

Evidence also suggests that increased length of stay may be associated with adverse incidents that have involved the patient's airway. Needham et al (2004) in a multi-centred study amongst North American ICU's found that there was a correlation between staffing levels and the impact on the patient following airway associated adverse incidences, when reviewing entries to a risk reporting database. The researchers found that more than half of the incidents reported were preventable and that the length of stay increased proportionally. Bouza et al (2007) studied 344 patients over 12 months in an ICU, reporting 34 episodes of unplanned extubation. Eight occurred in patients who were mechanically ventilated, and not weaning, 26 episodes were in patients who were scheduled for weaning. This study showed that 41% of all of these patients required re-intubation, and 59% of the unplanned extubations took place when there was not a caregiver at the bedside, 46 % of cases took place at night. Thomas and McGrath (2009) analysed airway associated

incidents reported to the NPSA from Critical Care Units in England and Wales over 2 years. Of 615 incidents where an endotracheal or tracheostomy tube was displaced 80 were associated with nurse distraction, 22 with staffing shortages, and 13 with the use of side rooms and reduced vigilance. There is now increasing emphasis on patient safety led by the NPSA in the UK. Unplanned extubations have the potential to cause harm to a patient, and the legal implications for a critical care unit of such an event are described within these standards. Such evidence emphasises the requirement for patients who require airway and mechanical support to have immediate access to nursing staff competent in managing this at all times

Protocol based care improves outcomes

Titrating therapy against protocols is a significant role for the nurse in improving patient outcomes and contributes to reducing risks associated with critical care, particularly when implemented in conjunction with other patient safety initiatives. (Winters and Dorman 2006, Rauen et al 2008, Martinez et al 2009). For example, Shorr et al (2007) in a comparative study found that there were more survivors following implementation of a protocol to manage sepsis in the critically ill presenting at the Emergency Room than before, and this was also associated with less costs. The management of sepsis by way of a protocol, is an area of clinical intervention that can be co-ordinated. Picard et al (2006) described the development and implementation of a sepsis protocol by a multidisciplinary team, amongst critical care patients in a North American Hospital, outlining how nurses have responsibility for identifying and co-ordinating the care of patients with Severe Sepsis.

Ferrie et al (2007) found that use of a bowel protocol can reduce incidence of Diarrhoea in an Australian study, thereby reducing workload and assisting patient comfort and dignity. Jain et al (2006) reporting a North American study into the effects of implementing a four pronged quality improvement programme, which included protocol based care reported reduced incidence of HCAI due to Ventilator Associated Pneumonia, and Bacteraemia. The programme also saw reductions in length of stay and adverse events. The researchers felt that the roles of protocol based care provided consistency of approach and that multidisciplinary team working were significant factors in the results. Such protocol based care can also empower and motivate nursing staff by developing a decision making culture, allowing nursing staff to determine when interventions are required and act accordingly (Pilcher 2009). This theme is now demonstrated and supported by the NPSA, in the Patient Safety First Campaign. One of the work streams for this is focused on critical care in relation to the care bundles for ventilator care and central line care. (*http://www.patientsafetyfirst.nhs.uk/ Content.aspx?path=/interventions/Criticalcare/*)

Team working and improved communication is associated with risk avoidance

Improved communication is associated with risk avoidance, underlining the key role that nurses play in the team. Cultural practices in team behaviour may also affect morbidity and mortality. (Pilcher 2009) A review of literature by Gruenberg et al (2006) also focussed upon communication issues in relation to palliative care, ethics, and social and psychological care. The researchers concluded that by focusing communication improvement strategies on these areas, it might be possible to reduce the average length of stay for some patients. This suggests there needs to be a focus on non clinical interventions as well as clinical to improve the care of patients.

The value associated with Multidisciplinary Teams (MDT) working with increased competence and quality care is widely recognised where there is a unique contribution of individual professions working together for the benefit of patients. (Borrill et al 2001, ICS 2003, Manley and Hardy 2005, Durbin 2006, Curtis 2006). Continuing improvements of critical care service will over time bring together measures of quality and cost to assess economy, efficiency and effectiveness of individual staffing groups. These improvements do need to focus on the experiences and outcomes of patients following critical illness. Therefore there is a need to consider outcomes from the viewpoint of patients and carers and draw from a broader range of qualitative sources such as user surveys and complaints data. The future health service workforce must be responsive to patient need and be developed in a planned and informed way (Coombs and Lattimer 2003, DoH 2008b). The approach to quality patient care demonstrated in the literature adopts a multidisciplinary perspective, with a need to explore and evaluate the impact of interdisciplinary team working and whole system approaches to workforce planning. Critical care units will also need to consider the issues including training and education, career pathways and the development of supportive hospital infrastructures required for role and team reconfigurations.

Legal issues relevant to staffing in critical care

Legal cases associated with staffing in critical care remain the same as described in the BACCN Position Statements On Nurse Patient Ratios in Critical Care (2001, 2005: Langslow 1996, Oddi and Heurita 1990). No recent cases have been found which supersede these. These cases relate to level of competence and vigilance required for safe practice in critical care and still stands as legal basis if issues with staffing and competence occur (Table 5 and 6).

Table 5

Disconnection from Ventilation and Competence (UK: Adomako ([1993] 4 all ER 935, cited in Langslow 1996)

The patient became disconnected from the ventilator, whilst under anaesthetic for eye surgery. The outcomes of the case centred on competence and safe practices for the anaesthetised patient. It was agreed that it would be a gross breach of duty for an anaesthetist to leave a patient unattended during an operation, and that a practitioner who is competent in managing the care of an intubated patient must care for the patient. (Langslow 1996). This case relates to critical care patients who need constant observation as they are intubated and mechanically ventilated. (Langslow 1996, Mackinnon et al 1998). Mackinnon et al (1998) argue that as it is common practice to have one registered nurse per patient per shift in both United Kingdom and Australian ICU's, as a basis for patient safety. To deviate from this standard could potentially put the patient at risk from respiratory and cardiac arrest if accidental extubation or disconnection from mechanical ventilation occurred. In these cases, as a deviation from common practice had occurred, a strong case could be made for legal redress (BACCN 2001, 2005).

Table 6

Disconnection from Mechanical Ventilation and Vigilance Von Stentina case (USA) (Oddi and Huerta 1990)

The ramifications of inadvertent disconnection of patients from mechanical ventilation were highlighted in the Von Stentina case in the United States (Oddi and Huerta 1990). Von Stetina suffered severe brain damage whilst a patient in Intensive Care due to ventilator malfunction or disconnection. At the time of the incident the ICU had a nurse patient ratio of 1:4 for 12 patients. This decrease in nurse patient ratio was due to the admission of five additional patients during the course of one shift. During this shift Von Stentina became disconnected from mechanical ventilation, which resulted in hypoxic brain damage. The hospital was subsequently found guilty of negligence, and Von Stetina awarded in excess of $12,473,250 in damages. In this case there was no attempt to prove that the nurses callously or even negligently ignored the patient, as they were able to prove that every available nurse was actively involved in the delivery of necessary care to patients (Mackinnon et al 1998). Nevertheless, it highlights the very real dangers for patients of a reduction in nurse-patient ratios, and the potential financial penalties that may be placed upon Trusts if nurse-patient ratios are compromised. (BACCN 2001, 2005)

Health care assistants and assistant practitioners in critical care

Non Registered Nurses play an important role and add value to the care of patients in the critical care environment, however their roles are increasing in complexity (Spilsbury and Meyer 2004). Evidence shows that whilst they add value to the critical care setting, their exact role would benefit from national guidance similar to the recent report into the use of support workers in maternity services (Sandall et al 2007). The need for parity in the expectations and competencies of these roles nationally has already been reported. (McGloin and Knowles 2005, BACCN 2003, Ormondy et al 2004).

The Assistant Practitioner role can be an effective and sustainable addition to the critical care team (Hind et al 2000, DoH 2008c). It is anticipated that with the support of NHS trusts, employers and the commissioners of education, these practitioners will increase the efficiency of critical care services and make optimum use of the skills of the whole team. Where these roles are introduced, it is important to recognise their benefit toward patient care, but not to the detriment of reducing skill mix of registered nurses to meet financial pressures. It has been demonstrated that better care and outcomes for patients are recognised where there is a higher proportion of registered nursing hours (Needleman et al 2002, Thungjaroenkul et al 2008). Where the Assistant Practitioner role exists there must be appropriate training, assessment and supervision, which will impact upon time required for such supervision to be provided by registered nurses. If Assistant Practitioners and appropriately trained Health Care Assistants do provide direct patient care the registered nurse will remain responsible for the supervision, planning and evaluation of patient care.

Administrative support staff in critical care

Significant amounts of nursing time continue to be taken up on non-nursing administrative tasks. One study of 'nurses in charge', demonstrated that up to 24% of nursing time is taken up in administration as a result of covering shifts (Harrison and Nixon 2002). A study by Gurses et al (2009) found significant amounts of time taken up by answering telephone calls, looking for misplaced equipment and also insufficient bedside stock. This suggests that wider organisational factors can impinge upon the nursing workload. Administrative staff should be provided to support and assist nursing staff with the necessary data collection required in critical care. Registered nursing staff need to be able to focus on delivering direct patient care. Critical Care Units therefore must provide administrative staff and non-registered nurses to carry out non-clinical duties.

Severity scoring systems and nursing workload

To optimise nursing time and resources, scoring systems and severity scoring based upon physiological presentation may prove beneficial. However a general tool for measuring patient dependency taking account of case mix and skill mix has yet to be rigorously validated in critical care. Padilha et al (2007) recommended using the TISS-28 scoring system for identifying individual nursing resources within separate units. Kiakkes et al (2007) found that differences in nursing workload correlated with the APACHE II score on admission. Caution needs to be exercised in viewing patients individual needs against such scores, and such scoring systems require decision support systems to help match patient acuity with workload (Kiakkes and Sakellaropoulos et al 2008, Rischbieth 2006).

Association of UK university hospitals (AUKUH) acuity/dependency tool

This acuity/dependency tool has been developed and validated for hospitals to measure patient acuity and dependency, to assist in workforce planning (Hurst et al 2008). Nurse sensitive indicators, patient flow and seasonal changes are added into the tool. The tool has been developed from the work of Keith Hurst and the Association of UK University Hospitals (AUKUH) and is based on the Levels of Care devised by DoH 2000. Level 2 and level 3 patients are included in this, acuity tool, which can be applied in critical care areas. After pilot site testing, the Chief Nursing Officer of England, in November 2007 launched the tool. The AUKUH tool indicates numbers of nurses required only and does not take account of skill mix, or the number of registered to non registered nurses needed for differing patient populations. The BACCN, CC3N and the RCN Critical Care & In-flight Forum support the concept of the acuity/dependency scoring system by the AUKUH, but propose it should not be used to determine staffing levels alone in critical care units until further work and validation has been undertaken in a larger range of critical care units.

Education for critical care nurses

Review of the literature shows that it is not only the staff to patient ratio that is important in providing safe and effective critical care, but also the expertise of staff. (Numanta et al 2006, Blegan et al 2001, Newhouse et al 2005, McGillis et al 2004, Currey and Botti 2006). Critical Care is a technologically advanced and dynamic area of practice and therefore requires nurses to gain and maintain expertise. The World Federation of Critical Care Nurses (WfCCN 2005) and the European Federation of Critical Care Nursing Associations (EfCCNa 2004) have both produced position statements on education and we support the recommendations made by these organisations educational principles/recommendations relevant to the UK (Table 7).

The speciality of critical care is complex and encompasses a variety of clinical areas and levels of acuity (ICS 2009). Pre-registration education programmes do not adequately prepare nurses to practice in this speciality and therefore, induction programmes, periods of supernumerary practice, preceptorship and an ongoing incremental programme of professional development are vital to all critical care nurses irrespective of experience. Different levels of education are also important for this dynamic workforce. Recent innovations have seen the introduction of Critical Care Assistant Practitioners, Outreach Practitioners and Advanced Practitioners (DoH 2008c, DoH 2008) as well as the registered nurse who performs the vital bedside care, all of who require varying levels of ongoing education. The government, professional and educational bodies and employers must recognise the importance of specialised programmes of development for critical care nurses and help facilitate the creation, delivery and commissioning of these. The WfCCN (2005) and the EfCCNa (2004) make suggestions regarding the curriculum content and these can be seen in Table 8, whilst the central educational principles are described in Table 9.

Critical care nurses must be appropriately trained and educated so that they possess the necessary level of knowledge, skills and confidence to deliver safe and effective care to critically ill patients and their families. Systems should be put in place within the clinical area to support the induction and ongoing personal and professional development of nursing staff. However, whilst great value is placed upon workbased learning, it should be viewed as complementary to and not a substitute for formal incremental competency based preparation programmes provided through, or validated by higher education institutions. Where work based or in-house courses exist organisations are encouraged to seek formal academic accreditation. A well-educated workforce is a healthcare provider's greatest asset and is associated with quality nursing care and improved patient outcomes. (DoH 2008b)

Table 7

Educational principles/recommendations
1. Patients and families have the right to receive individualised critical care from appropriately qualified professional nurses. 2. Critical Care nurses must possess appropriate knowledge and skills to assess and effectively respond to the needs of critically ill patients, changes in society and advancing technology. 3. Nurses with specialised knowledge and skills should play a part in the education of critical care nurses even when a multidisciplinary education approach is utilised. 4. The preparation of critical care nurses must be based on current information and research and nurses must learn how to access and utilise information. 5. Critical care education must be coherent and structured and be delivered by qualified nurses with relevant expertise and at a range of academic levels. These would include master and doctorate levels. 6. Life –long learning should be encouraged in every critical care nurse. (WfCCN 2005, EfCCNa 2004)

Table 8

Outline curriculum for critical care
European Federation of Critical Care Nursing Associations (2004) Position Statement on Post-registration Critical Care Nursing Education within Europe. EfCCNa World Federation of Critical Care Nurses (2005) Declaration of Madrid: Position Statement on the Provision of Critical Care Nursing Education. WfCCN Buenos Aries.
As a minimum educational programmes for critical care nurses should contain the following subjects made relevant to contemporary critical care: • Anatomy and physiology • Pathophysiology • Pharmacology • Clinical assessment, examination and diagnostic reasoning • Illnesses and alterations of vital body functions • Plans of care and nursing interventions • Medical interventions and prescriptions with resulting nursing care responsibilities • Psychological, social, cultural and spiritual aspects of care • Use of and application of technology • Patient and family education • Legal and ethical issues • Professional nursing issues • Use of current research findings • Evidence based multidisciplinary care • Caring for the carer • Communication and interpersonal skills • Information technology • Infection control and microbiology • Health promotion • Risk management and leadership

Table 9

> ### Educational principles for critical care
>
> 1. Since the disbanding of the English National Board there has been no nationally recognised, overarching, outline curriculum for Critical Care Education Programmes in the UK. Instead locally agreed programmes have been developed. Whilst we recognise the need for local initiatives we recommend the content of the WfCCN (2005) and EfCCNa (2004) be followed. Programmes should be developed in conjunction with, and provided by Higher Education Institutes or other professionally accredited organisations.
>
> 2. Post-registration critical care programmes should include both theoretical and practical components. There should be emphasis on the application of theory to practice and assessment of clinical competence. Those responsible for designing the curriculum should be cognisant with the European Credit Transfer System, which is based on student workload, the achievement of learning outcomes and competence. This is an important consideration because of the internationalisation of the workforce. (EfCCNa 2004). Whilst locally developed, "in-house" courses might be useful and of high quality they are rarely transferable (Scholes 2006).
>
> 3. Post-registration critical care programmes should incorporate a modular and flexible design. There should be a range of modules including core and specialist critical care subjects and professional subjects such as research appraisal, information retrieval and utilisation, decision-making and leadership. Whilst this document has been developed by nursing organisations it is acknowledged there is a trend towards, and need for, inter-professional education and this should be considered in the design of modules (DoH 2001a). There is a need for modules to be developed and offered at different academic levels and delivered via a variety of methods. Education providers must implement educational strategies to facilitate access to post-registration courses for critical care nurses from a range of geographical locations (WFCCN 2005). Variety in teaching, learning and assessment strategies should be utilised to foster analytical, problem solving and decision making skills in post-registration students.
>
> 4. The need to assess competence of critical care nurses is paramount. Post-registration critical care programmes should take account of any nationally recognised competency frameworks. Students on post-registration programmes should be allocated an individual clinical supervisor/mentor and should have regular contact with the supervisor. Supervisors/mentors need to be appropriately trained and meet the standards of regulatory bodies such as the NMC (2006). They should also be able to demonstrate ongoing professional development. In order to encourage adult centred learning use should be made of learning contracts to enable students and supervisors to target learning needs. This should be done in conjunction with academic staff to evaluate achievement.
>
> 5. There should be close collaboration between the higher education institutes and practice to monitor the practice area as a learning environment. Educational audit should be undertaken on a regular basis to ensure learning opportunities and resources are sufficient for pre and post-registration students to meet their learning outcomes and competencies (RCN 2003, NMC 2006). Where this is not the case alternative placements should be offered to the student and the manager prior to the student commencing the programme should agree this.

6. Continuing professional development for post-registration students should take into consideration, previous experience, level of expertise, contribution to service delivery and prior academic study. Decisions to support students on to a post-registration programme should involve the manager and academic personnel. Other methods of gaining accreditation should be considered such as Accreditation of Prior Learning (APL) and Accreditation of Prior Experiential Learning (APEL). Where these alternatives are in place they should be robust in design and assessment to ensure that students have appropriate knowledge and skills. Decisions to support student's continuing professional development must take into account their need to meet the NMC PREP CPD Standards (NMC 2006a).

7. To ensure the right number of appropriately qualified staff, managers and employers should support a full programme of professional development guided by a training needs analysis and overall workforce development strategy. This should strike a balance between providing formal programmes delivered in partnership with higher education institutions and more informal systems of work-based learning, giving recognition to the richness and breadth and depth of learning, to be gained from a diverse range of experiences. The provision of high quality training and development is linked to improved patient care and the recruitment and retention of staff (RCN 2003). Workforce development plans for critical care education provision should be agreed across the employing organisation and the critical care network (RCN 2003).

8. Nursing staff newly appointed to a unit, irrespective of their grade, should be provided with a competency-based induction programme and a period of supernumery status, to equip them with the knowledge and skills required to deliver safe and effective care. This should be tailored to their previous experience in critical care, knowledge of the employing organisation and of the critical care facility (DoH 2000, DoH 2001, RCN 2003). In particular, new registrants will require a longer and more concentrated period of supervision and support, to facilitate their transition from student to accountable critical care practitioner. Induction programmes should be formalised within critical care areas and preferably across a critical care network (DoH 2000, RCN 2003). It is recognised that induction programmes, combined with other systems of support, help the newcomer adapt to the emotional, and technical demands of the critical care environment and positively impact upon recruitment, retention and patient safety (DoH 2001, RCN 2003; Coombs and Lattimer 2007, Scholes 2006)..

9. New nursing staff should be appointed preceptors, to support their initial orientation and continued development beyond the induction period (RCN 2003). The NMC (2006b) recommend preceptors undertake a formal mentorship, practice teacher or equivalent preparation programme. In addition, although the NMC generally suggest preceptors have a minimum of 12months experience in the specific clinical area, for this speciality the expert panel recommend preceptors have at least 2 years critical care experience and hold a recognised post-registration critical care nursing qualification.

10. A critical care unit must have a dedicated nurse educator to provide education, training and quality improvement activities for the unit nursing staff. This person(s) must have a recognised post-registration critical care nursing qualification (DoH 2001, ACCCN 2003, RCN 2003, WFCCN 2005, ACCCN 2006). A critical care unit should have an appropriate post-registration teaching preparation programme, to meet Agenda For Change (AFC), knowledge and skills job profile requirements. A nurse educator can support all learners, mentors and preceptors in practice, facilitating a learning culture and work-based learning environment in which evidence-based practice can be developed to meet the needs of patients (RCN 2003, Scholes 2006).

11. To develop a learning culture where lifelong learning becomes the norm and both individuals and teams constantly strive for clinical effectiveness, managers and employers need to identify support and resources to help staff succeed in their personal and professional development (DoH 2001a, WFCCN 2005). Support mechanisms include initiatives such as, mentorship, preceptorship, protected study time, supervised practice, practice placements, clinical teaching and clinical supervision.

12. All nursing staff should have an annual Knowledge and Skills Framework (KSF) development review, linked to appraisal, resulting in the production of a personal development plan (DoH 2004). Nursing staff should demonstrate personal and professional development by continuous updating of professional and clinical knowledge and maintenance of a personal portfolio (RCN 2003, NMC 2006a). Professional development programmes, tailored to meet the needs of different levels of staff, can support the development of professional expertise, career progression and succession planning and should include elements of education, research, leadership and practice development (DoH 1999, DoH 2001a).

13. Decisions regarding the appropriate skill mix of nursing staff employed within a critical care unit will depend on the individual unit and the dependency of patients. However there should be a standard requisite for the knowledge, experience and qualifications required for specific critical care roles, to ensure staff are fit for purpose, that is, they possess the appropriate competencies to undertake the responsibilities of a job (DoH 1999, DoH 2001, RCN 2003, DoH 2004). This also serves to provide a transparent career-planning guide for staff and supports DoH (2000) recommendations for an incremental programme of development towards higher levels of critical care. This process may be assisted by the requirements set out in the AFC national job profiles.

14. Pre-registration programmes should accommodate sufficient theory and clinical experience in acute and critical care to ensure nurses are fit for practice upon registration (White 1999, DoH 2000, DoH 2001, Wood et al 2004). Collaboration in the development and evaluation of training programmes for pre-registration students and establishment of formal links with higher education institutes will help critical care leaders develop the future workforce. A link lecturer should be identified to provide support and advice on educational developments and programmes (RCN 2003).

15. Pre-registration students must have supernumerary status in critical care areas. Their level of involvement in patient care should be directly supervised and linked with their learning outcomes. It is appropriate to identify pre-registration students, as distinct from other staff by wearing a different uniform and a name badge stating their position (RCN 2003). Critical care areas are unsuitable for first year student clinical placements and as final management placements.

16. Pre-registration nursing students, in critical care areas, must be supported and assessed, by mentors who meet the NMC standards to support learning and assessment in practice (NMC 2006). Mentors must be supported in their role by both education and service providers, through a network of support and supervision mechanisms (WFFCN 2005, NMC 2006b).

Building critical care facilities

The hospital building notes DoH guidance HBN 57 (DoH 2003) outlines the main principles in planning facilities for critically ill patients including the provision of sufficient space in bed areas. To reduce the risk of healthcare associated infection it is advocated that each patient is cared for in individual rooms. This has implications for ensuring vigilance in nursing patients safely and will require increased numbers of support staff to assist registered nurses. Many critical care clinicians have suggested that this is not a realistic option, as there is insufficient clinical staff to supervise each patient safely using single rooms. There is, however, agreement that there should be a proportion of single rooms in each unit, at least 50% of the beds available (DoH 2003).

Commissioning and funding of critical care services

The introduction of Payment by Results (PbR) is aimed at creating one model for commissioning and funding of services, and eventually critical care services. By introducing national tariffs based on the level of care required by the patient, payments should better reflect the actual cost of care a patient receives in a critical care unit. It is argued this will be a fairer system by reimbursing costs and preventing both gaming and under funding. It is anticipated that 80% of funding will be paid in advance based on the previous year's costs. The remaining 20% of funding will be paid out in instalments during the year. This will provide adequate resources for Trusts to provide emergency care in conjunction with their current level of activity. Morris and Young (2007) identify that the funds provided to Trusts for critical care services will largely depend on accurate data collection, as this will determine the level of tariff to be paid and govern the development of critical care services. There is no provision within PbR for commissioning of nursing staff as a separate entity. Staffing costs will stay entrenched within the whole costs and form between 50% and 60% of the funding. Currently the methods by which critical care services are commissioned by Primary Care Trust

(PCT's) are in a state of transition, as commissioning aligns itself to adopt PbR. Full PbR will see the development of 7 Healthcare Resource Groups (HRG's). The 7 HRG's will take into account the extent and number of organs supported during the care of individual patients. Remuneration by PCT's for individual patients will therefore depend upon the extent of organ support received by a patient and not solely on the type the bed (ICU or HDU) that the patient occupies. Until PbR is fully adopted, funding for critical care is excluded from PbR and individual NHS Trusts will continue to negotiate contracts for critical care provision based upon one of two systems. (Table 10)

Table 10

Current Funding Systems for Critical Care
Block contracting: Individual NHS Trusts agree a contract based upon a requirement to provide a number of level 2 and level 3 beds within a financial year. Trusts assess the previous year's patient activity in existing beds, reviewing service developments requiring capital and revenue and then decide how many beds will be funded. In an attempt to manage financial risk, PCT's may only remunerate NHS Trusts with a proportion of the total cost initially for the beds and release the remainder when occupancy levels exceed a given threshold. This system may not take into account the variable workload or potential case-mix.
Contracts between PCT's and Trusts constructed using a per diem (per day) charge for the level of care the patient has received. NHS Trusts are remunerated for the exact number of care episodes they have provided at level 2 or 3 care. This mechanism is more simplistic, however poor data collection and validation may impede the process. E.g. Any data for calculating remuneration utilises patient administration systems must ensure those systems are accurate. Equally NHS Trusts must be confident that the individual price for a level 2 or 3 bed accurately reflects actual expenditure.

The introduction of PbR has implications for critical care nurses, the key points of the Critical Care Minimum Data Set are summarised in Table 11. Nursing needs to positively embrace a culture of robust and accurate patient data information in order that full remuneration can be ensured. Unique patient identification including addresses, patient's GP's and also postcodes will need to be collected on all patients accurately. In addition daily assessment of the clinical variables that will provide data for calculating the extent and level of organ support will be needed. Nurses will also need to promote and use electronic systems, which could include using Clinical Information Systems and electronic charting to facilitate data collection, which may impact on workload.

As nursing is the largest individual cost associated with running level 2 and 3 beds, deciding how many nurses are required in a nursing establishment will need to take into account peaks and troughs in service demand. An individual NHS Trust will calculate a charge for level 2 and 3 beds, currently referred to as a 'reference cost'. This reference cost can then be benchmarked against a national reference cost to see if individual NHS Trusts benchmark favourably. Nurses who are not permanently delivering direct care; (i.e. on the 24 hour duty rota) such as Clinical Educators, and Critical care Outreach are included in reference costs, which needs to be considered when developing posts within budgets. Where NHS Trusts exceed the national reference cost, a review of how the service is delivered may be required.

Year on year efficiencies will also need to be identified and delivered as NHS funding currently sees year on year efficiency measures built into budgets.. If data collection accurately reflects activity, then NHS Trusts will receive remuneration for the care they are providing. Any efficiencies made may see an opportunity for inward investment into services.

In common with the rest of the NHS, critical care services are the subject of processes to modernise how critical care is funded. This modernisation programme is complex and currently sees

transitional arrangements negotiated between commissioners and providers of care. Critical care nursing will need to adapt, most notably by embracing a culture of data collection, so that full remuneration for services can be ensured. Nurses will be best placed to capture this data on a daily basis, and will also have a vital role to play in managing costs and identifying efficiencies.

Table 11

Key Points Relevant to the Critical Care Minimum Data Set (CCMDS)

- The 34 fields of the CCMDS provide key administrative and clinical data approved for collection by NHS Trusts admitting adult patients who require level 2 or 3 critical care.
- There are 14 mandatory fields (the HRG subset) within the full 34-field data set
- Collection of such standardised data should facilitate analysis of critical care activity and capacity planning both within and between NHS Trusts
- It is essential that the mandatory 14 field collection is completed as comprehensively and accurately as possible by all Trusts as this data will inform the appropriate level of tariff and hence resourcing of critical care services in the future.
- The clinical professions have driven the development of the CCMDS, taking expert advice from information specialists and using data derived from HRG research work. Members of the Critical Care Information Advisory Group (CCIAG) sponsored by the Department of Health and the NHS Modernisation Agency are responsible for this work, which began with widespread consultation in April 2002
- Professional support has included the Intensive Care Society (ICS), the Intensive Care National Audit and Research Centre (ICNARC), the Royal College of Nurses (RCN), the British Association of Critical Care Nurses, BACCN

Morris J, Young K. (2007) The Critical Care Minimum Data Set (CCMDS) http://www.dh.gov.uk/en/ Healthcare/Emergencycare/ Modernisingemergencycare/DH_4126508

Same sex accommodation in critical care settings

Department of Health Guidance (2009) suggests that whilst it may be impractical to deliver complete separate single sex care in critical care units, certain principles should be maintained. It is suggested that in order to maintain dignity for patients in mixed units, high levels of observation and nursing attendance are needed. To deliver this, managing mixed-sex patients should not be based on environmental constraints, or staff convenience, and units should have high enough staffing levels to allow for the level of care of patients, and a constant nurse presence within the room or bay to maintain privacy and dignity.

Technology and critical care staffing

Technology has advanced rapidly since the inception of critical care to improve patient care and comfort, safety and to support the workload of staff. An example is the rapid developments in artificial ventilation in order to improve comfort and weaning processes for the patient (Crocker 2009). It could be assumed that a reduced nurse to patient ratio in intensive care can be realised due to the sophisticated monitoring equipment utilised. For example monitor alarms may be seen as a replacement rather than an adjunct to expert nursing surveillance. An Australian study found that clinical staff visually checking the equipment, patient, or chart detected the majority of incidents (83%), whereas monitor detection accounted for only 8% of critical incident reports (Beckman et al 1996). Similarly, a study undertaken in Hong Kong ICU's found that 51% of incidents were detected by direct observation, versus 27% by monitor detection (Buckley et al 1997). Coombs and Lattimer (2007) identify the work of both Funk et al (1997) and Stukshis et al (1997) to support the association between skilled personnel and fewer complications in the critically ill patient. In these studies, the presence of a dedicated heart monitor observer was associated with fewer episodes of sustained arrhythmias. These factors have led the investigators to conclude that despite the advances in technological expertise, there was still no substitute for the properly trained professionals providing direct patient care (Buckley et al 1997, Mackinnon et al 1998, Kluger and Bullock 2001). A growing development in the USA is the concept of the virtual Intensive Care Unit. Expert clinicians utilise state of the art technology: cameras, microphones, and high speed computer data lines which come together to monitor patients in virtually any number of ICU rooms in one large, of several remote hospitals. The aim is not to take the place of the nurse or doctor at the bedside, but to monitor data and trends, adding a second layer of safety and quality to improve patient outcomes. (Myers and Reed 2008). However as technology grows this emerging practice does have implications for critical care nurses and the way in which patient care is delivered (Stafford and Myers et al 2008, Croker and Timmons 2009, McGrath 2009)

Critical care units are now embracing computerised clinical information systems (CIS), particularly to replace paper documentation. Some studies have demonstrated that the use of CIS in critical care reduces medication and ventilation errors, and that nurses spent less time on documentation, redirecting this to direct patient care (Fraenkel et al 2003, Popernack 2006, Bosman et al 2004). To ensure technology develops to support patient care and the multidisciplinary team workload, nursing staff need to be involved in technology developments related to equipment and computerised documentation.

Conclusion

The review of the literature and aspects of critical care related to staffing critical care units has shown that the contribution of nursing can be difficult to measure, and therefore support nurse/patient staffing ratios. However the literature also shows that there is a growing body of evidence which associates a higher number of registered nursing staff to patients relates to improved safety, and better outcomes for patients. Nursing staff in critical care units need to take account of many factors when reasoning for the required number of registered nurses in a unit. These have been highlighted in this document and include infection control, size and number of beds in a unit, case mix, the unit layout, safety in relation to ventilated patients, mixed sex accommodation needs, and the individual experience, competence, supervision and educational needs of staff. Nursing staff in critical care also need to be aware of the introduction of commissioning funding and PbR, and ensure they support accurate data collection to ensure costs are reflected accurately. The BACCN, CC3N and the RCN Critical Care & In-flight Forum support the concept of the acuity/dependency scoring system AUKUH, but propose it should not be used to determine staffing levels in critical care units until further work and validation has been undertaken in a larger range of critical care units.

In order to protect nursing services which are vulnerable at times when efficiency measures need to be implemented, critical care nurses need to value and measure the nursing contribution. It is suggested that future models of delivering acute health care will be in hospital, encompassing an increasing population of patients with complex problems. (Farrington- Douglas and Brookes 2007, Black 2006)   Patients requiring non-acute care and rehabilitation will have such care delivered in community and home settings. Having more acutely ill patients in hospitals requires appropriately trained critical care nurses. The focus for the future is care delivered to patients and the public that is high quality care, and now places greater emphasis on safety, effectiveness and patient's experience of care (DoH 2008a, Maben and Griffiths 2008, Griffiths and Jones et al 2008). Accurate and meaningful outcome measures for nursing (metrics) will be central to measuring this new focus on quality, which presents critical care nurses the challenge and unique opportunity to lead on measuring quality. Critical care nurses need to determine the quality of nursing care provided by measuring the input of nursing on patient outcomes and safety. Recent guidance in co-ordinating, monitoring, and measuring patient outcomes after critical illness (NICE 2009) is one area in which critical care nurses could start to provide evidence of long term outcomes after critical care. These quality measures can reflect nursing care's effectiveness and safety, providing both a challenge and an opportunity for critical care nurses to contribute to the body of evidence in support of maintaining high levels of nurse patient ratios.

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