Foreword

NCEPOD now operates under the umbrella of the National Patient Safety Agency (NPSA) as an independent confidential enquiry whose main aim is to improve the quality and safety of patient care. Evidence is drawn from the specific areas of hospital activity in England and Wales, both NHS and Private, related to the enquiry in question, and we are very grateful to all those who take part, both advisors, local reporters and those who complete the individual case reporting forms. I would also like to express my sincere thanks to our clinical co-ordinators and all the permanent staff of NCEPOD for the enormous amount of work and enthusiasm which they have put into the production of this report and without which we could not hope to create such detailed analysis and comment upon clinically related hospital activity.

"An Acute Problem?" is the second study related to our enlarged responsibility for including medical cases. It has been designed to link together the provision of critical care facilities with the care of severely ill medical patients throughout our hospitals. The pattern of inpatient care is changing rapidly and NCEPOD's role is to facilitate and inform that change. This study is as much about facilities and resources as about clinical practice and highlights the levels of care appropriate to patient requirements. Although in many cases, overall numbers of hospital inpatient beds are being reduced, the increased complexity of medical care and the expectations of the public mean that there are many more critically ill patients in hospital. In one major teaching hospital in the United States, which now has only 400 inpatient beds, 33% of these are devoted to high dependency and critical care, such are the requirements of patients. However, provision of an appropriate environment for acute care is only part of the story and, as this report highlights, the traditional way in which many consultant physicians work does not involve significant components of acute care. Unlike the surgical on-call team, which often now undertakes no elective work, the medical on-call team tends to divide itself, so that the consultant physician continues with elective outpatient work and is rarely involved in the acute admission process or indeed when the team's patients are deteriorating on the wards. Some physicians certainly have a close interest in acute medicine but the existence of the Medical Admissions Unit with dedicated staff, together with specialisation into other areas of medicine, tends to distance many consultant physicians from acute work. Although available out of hours as the consultant on call, many physicians rely heavily on their junior staff and rarely expect to have to return to hospital out of hours.

As a result, doctors in training are both providing and leading the provision of acute care and to an extent this has extended into the 'Out of Hours Medical Team' and the 'Hospital at Night' projects. This has recently been exacerbated by the changes in working hours following implementation of the European Working Time Directive so that junior doctors, having contributed significantly to out of hours service delivery, are less available for training and, therefore, less experienced and confident than in the past. As a result, in complex cases, there is an inevitable risk that these doctors may provide care which is less than optimal and yet they are unused to seeking advice or supervision, particularly out of hours.

In most hospitals, medical services are severely overstretched and the medical SHOs in particular, have to spread themselves thinly over what is often a significant number of acutely ill patients. Furthermore, the support they receive from their house officers is often small, since, to comply with working hours regulations, the housemen in many hospitals go off duty during the evening, leaving the SHOs to manage on their own for the rest of the night shift. Severely ill patients often exhibit clear signs of clinical deterioration on the wards for some time and although nurses may pick up these simple clinical indicators and call for help, the inevitable delay resulting from SHOs working largely on their own may further delay the instigation of appropriate treatment.

It might appear that the solution is the provision of comprehensive and adequate critical care facilities to allow rapid admission of all sick and deteriorating medical patients. But here again there are problems with

delays in review by the acute care team and subsequent admission to intensive or high dependency care. In many of these cases the delay is related to a lack of critical care beds or staffing shortages, which result in significant numbers of beds actually being closed on a temporary basis. However, even when patients have been admitted, almost 25% are not seen by an intensive care consultant within the first 12 hours of admission, so that the problem of lack of consultant input occurs both in intensive care and in the ward situation.

It has been suggested that one method of addressing many of the above deficiencies would be the comprehensive introduction of intensive care outreach. Many such services are run by intensive care nursing staff and are often not available on a 24 hour basis. Some hospitals do not have an outreach service at all or one that only covers selected patients, particularly postoperative surgical care. Although a Department of Health funded study on outreach is currently occurring, the report is not due until 2007 and even then, if outreach is to provide more immediate care of acutely ill patients, it would need to be fully resourced and staffed and, importantly, have an adequate supply of critical care beds into which the patients could be transferred.

Another proposed solution is the development of acute physicians, and acute medicine is, of course, a recognised medical sub-specialty. Although this may be considered an ideal solution to the above problems, it is undoubtedly a long-term strategy and in the interim we must look for improved ways of managing the problems of acutely ill patients. It is encouraging that the curriculum for Foundation Year training concentrates specifically on the care of the acutely ill patient and that there are many proposals for generic years at the start of run-through specialist training which would contain acute skills, common to both medicine, critical and intensive care, anaesthesia, emergency medicine and radiology.

It is important to acknowledge that acute patient care in today's NHS depends very largely on the hard work and dedication of all grades of staff and that in areas of this report we should emphasise the 90% of patients who receive good care as much as the 10% who do not. In the past, NCEPOD reports have largely concentrated on identifying the reasons for inadequate care, subjecting these to expert analysis and then making recommendations for improvement. This has proved exceedingly effective, for example in the provision of additional "NCEPOD theatres" to cope with the increasing surgical trauma load and in many other areas of pre and postoperative care. It is our hope that by identifying shortcomings in key areas of acute medical care and offering constructive criticism and pragmatic and affordable solutions, NCEPOD will help to do for acute medicine what it has achieved for acute surgery in the past. To some this report may appear critical and uncompromising in its observations but if we are all concerned, as we must be, with improvements to the quality and safety of patient care, armed with these recommendations and working together in a multiprofessional way with Trust management, the improvements which we all strive for can be achieved.

Dr. Peter Simpson
Chairman - NCEPOD

Recommendations

Recommendations are listed by chapter

4. Pre-ICU care

- **Trusts should ensure that consultant job plans reflect the pattern of demand of emergency medical admissions and provision should be made for planned consultant presence in the evenings (and perhaps at night in busier units).**
- **A consultant physician should review all acute medical admissions within 24 hours of hospital admission [8]. Regular audit should be performed against this standard.**
- **Trusts should ensure that consultant physicians have no other clinical commitments when on take. This may be through the development of acute physicians [8]. This will allow for greater involvement in the assessment and treatment planning of new admissions and the review of deteriorating inpatients.**
- **More attention should be paid to patients exhibiting physiological abnormalities. This is a marker of increased mortality risk.**
- **Robust track and trigger systems should be in place to cover all inpatients. These should be linked to a response team that is appropriately skilled to assess and manage the clinical problems.**

5. Patient observations and review criteria

- **A clear physiological monitoring plan should be made for each patient. This should detail the parameters to be monitored and the frequency of observations.**
- **Part of the treatment plan should be an explicit statement of parameters that should prompt a request for review by medical staff or expert multidisciplinary team.**
- **The importance of respiratory rate monitoring should be highlighted. This parameter should be recorded at any point that other observations are being made.**
- **Education and training should be provided for staff that use pulse oximeters to allow proper interpretation and understanding of the limitations of this monitor. It should be emphasised that pulse oximetry does not replace respiratory rate monitoring.**

6. Referral process

- **Consultant physicians should be more involved in the referral of patients under their care to ICU. The referral of an acutely unwell medical patient to ICU without involvement or knowledge of a consultant physician should rarely happen.**
- **It is inappropriate for referral and acceptance to ICU to happen at junior doctor (SHO) level.**
- **Any delay in admission to critical care should be recorded as a critical incident through the appropriate hospital incident monitoring and clinical governance system.**
- **All inpatient referrals to ICU should be assessed prior to ICU admission. Only in exceptional circumstances should a patient be accepted for ICU care without prior review.**

7. ICU admission process

- Trusts should ensure that consultant job plans reflect the pattern of demand for emergency admission to ICU and provision should be made for planned consultant presence in the evenings (and perhaps at night in busier units).
- Patients should rarely be admitted to ICU without the prior knowledge or involvement of a consultant intensivist.
- A consultant intensivist should review all patients admitted to ICU within 12 hours of admission [9]. Regular audit should be performed against this standard.

8. Patients who died

- Training must be provided for junior doctors in the recognition of critical illness and the immediate management of fluid and oxygen therapy in these patients.
- Consultants must supervise junior doctors more closely and should actively support juniors in the management of patients rather than only reacting to requests for help.
- Junior doctors must seek advice more readily. This may be from specialised teams e.g. outreach services or from the supervising consultant.

9. Outreach

- Each hospital should have a track and trigger system that allows rapid detection of the signs of early clinical deterioration and an early and appropriate response.
- Although this recommendation does not emerge from the findings in this report, NCEPOD echoes other bodies and recommends that trusts should ensure each hospital provides a formal outreach service that is available 24 hours per day, seven days per week. The composition of this service will vary from hospital to hospital but it should comprise of individuals with the skills and ability to recognise and manage the problems of critical illness [7,10,25,36].
- Outreach services and track and trigger systems should not replace the role of traditional medical teams in the care of inpatients, but should be seen as complementary.

10. Quality of medical records and audit

- All entries in the notes should be dated and timed and should end with a legible name, status and contact number (bleep or telephone).
- Each entry should clearly identify the name and grade of the most senior doctor involved in the patient episode.
- Resuscitation status should be documented in patients who are at risk of deterioration [40]. Each trust should audit compliance with this recommendation by regular review of patients who suffered a cardiac arrest and assessment of whether a ‘do not attempt resuscitation’ order should have been made prior to this event.

11. Pathology

- More care should be given to the formulation of the cause of death for presentation to the coroner and transfer into the medical certificate of cause of death.
- On this group of patients, consented autopsies should be sought more often to evaluate complex clinical pathology.
- In coronial autopsies on ICU patients, increased histopathological sampling should be undertaken to improve disease identification, with the consent of relatives, once the coroner’s requirement is satisfied.
- Pathologists should become more involved in the mortality meetings on ICU patients.

1. Introduction

The management of emergency medical admissions and critically ill medical patients has undergone considerable scrutiny in recent years. There is a body of work that supports the view that the needs of this group of patients are poorly served by the current system [1,2,3].

In a confidential inquiry into quality of care before admission to the Intensive Care Unit (ICU), two external reviewers assessed the quality of care in 100 consecutive admissions to ICU [1]. 20 patients were deemed to have been well managed and 54 to have received suboptimal management, with disagreement about the remainder. Case mix and severity were similar between the groups, but ICU mortality was worse in those who both reviewers agreed received suboptimal care (48% compared with 25% in the well managed group). Admission to the ICU was considered late in 37 patients in the suboptimal group. Overall, a minimum of 4.5% and a maximum of 41% of admissions were considered potentially avoidable. Suboptimal care contributed to morbidity or mortality in most instances. The main causes of suboptimal care were failure of organisation, lack of knowledge, failure to appreciate clinical urgency, lack of supervision and failure to seek advice.

In another UK study of patients either dying unexpectedly on a general ward or requiring admission to the ICU during a six month period, 317 of the 477 hospital deaths occurred on the general wards of which 20 (6%) followed failed attempts at resuscitation [2]. 13 of these unexpected deaths were considered potentially avoidable: gradual deterioration was observed in physiological and/or biochemical variables, but appropriate action was not taken. During the same period, 86 hospital inpatients were admitted on 98 occasions to the ICU, 31 of whom received suboptimal care before the ICU admission either because of non-recognition of the severity of the problem or inappropriate treatment. Mortality rates were significantly higher in these patients than in well managed patients in both the ICU (52% v 35%) and hospital (65% v 42%), $p<0.0001$. The authors concluded that patients with obvious clinical indicators of acute deterioration are not infrequently overlooked or poorly managed on the ward.

Even more disturbingly, studies of events leading to 'unexpected' in-hospital cardiac arrest indicate that many patients have clearly recorded evidence of marked physiological deterioration prior to the event, without appropriate action being taken in many cases [4,5].

The difficulties of providing care to emergency medical admissions and acutely unwell inpatients and the deficiencies that have been highlighted above are recognised by the Royal College of Physicians [6,7,8,9]. Over the past few years a number of reports have been produced by the Royal College of Physicians that have made many recommendations in this aspect of acute care. Reports pertinent to this area are: *Interface of accident and emergency and acute medicine* [6], *Interface between acute general medicine and critical care* [7], *Acute medicine: making it work for patients. A blueprint for organisation and training* [8], and *Good medical practice for physicians* [9].

Some time has elapsed since the publication of some papers showing problems in acute care [1,2] and subsequent reports suggesting improvements [6,7]. Thus, the situation may or may not have improved [3]. In addition, there is a widely held belief that the relatively recent changes in junior medical staff working, as a result of the European Working Time Directive and changes in the structure of training, are resulting in fragmentation of the team structure and loss of learning opportunities. These changes have obvious potential impact on patient care and the need for consultant supervision. As NCEPOD is in a unique position to examine the process of care and identify remediable factors, it was therefore felt that the care of acutely unwell medical patients was a very important topic for further study.

2. Method

Study aim

The aim of the study was to review the care of medical patients referred for Level 3 care rather than the intensive care practice.

In *Comprehensive Critical Care* [10], the Department of Health recommended that the division into intensive care and high dependency care based on individual units be replaced by a classification that focused on the level of care that individual patients need, regardless of location:

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 postoperative 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.

Medical intensive care patients were defined as those referred to intensive care by a physician and, if they survived, were subsequently discharged to the care of a physician.

Data collection

Data collection took place for one month from 1st June until 30th June 2003. All patients 16 years and over admitted to a general ICU during this time were included. Patients were not included if they were admitted to a specialty specific intensive care unit such as cardiac or neurosurgical, and patients were also excluded if they were classified as Level 3 but not admitted to an ICU.

To identify appropriate patients, all participating ICUs were asked to flag each admission to the ICU during the study period. Each flagged patient was then monitored until one of the following triggers occurred:

- The patient died on the ICU - in which case extracts of the casenotes were requested, to be reviewed by an NCEPOD advisor.
- The patient was transferred to another Level 3 care facility, either within the same hospital or another hospital.
- The patient was downgraded to Level 2 care.
- The patient was discharged from the ICU.
- The patient was still alive in ICU 30 days after admission and still classified as Level 3.

Following one of the above events, clinical questionnaires were sent to the two relevant clinicians. The physician referring the patient to ICU completed one questionnaire; this questionnaire related to the pre-admission aspects of patient care. The intensive care consultant to whom the patient was referred on the ICU completed a second questionnaire; this questionnaire related to the post admission aspects of patient care and, if applicable, discharge from Level 3 care. Blank questionnaires were distributed by the NCEPOD local reporter, or an alternative contact within the ICU.

If a patient was admitted to an ICU following transfer from another hospital, data were collected only from the intensive care consultant in the admitting ICU. This was because it was not possible to match the casenotes from different hospitals.

Hospital participation

The study aimed to include general ICUs in all hospitals in England, Wales, Northern Ireland, Guernsey, the Isle of Man, and the Defence Secondary Care Agency and those hospitals in the independent sector that participate in the work of NCEPOD. All primary care trusts, community hospitals and specialist centres were excluded from the study.

For each participating hospital, an organisational questionnaire relating to the ICU and provision of outreach services was sent to the hospital's medical director for completion.

Copies of all three questionnaires can be found in Appendix 3.

Sample size

The sample size estimated for this study was 6,000 patients. This sample size was based on the number of available general ICU beds [11] multiplied by 7 as an estimate of bed occupancy per month.
It was expected that 20-30% of the admitted patients would die on the ICU during the study period[12]. This sample also included patients that had been re-admitted to the ICU for Level 3 care within the one month study period.

Quality & validation

The data from all questionnaires received were electronically scanned into a preset database.
Prior to any analysis taking place, the data were cleaned to ensure that there were no duplicate records and that erroneous data had not been entered during the scanning procedure. Where data from paired questionnaires did not match, e.g. date of outcome, then the local reporter was contacted to confirm the correct details. Following this, any fields that contained spurious data that could not be validated were removed.

All information that might identify a patient, hospital or clinician was removed from the questionnaires and the photocopied extracts of the casenotes, before any clinician, including the NCEPOD clinical co-ordinators, advisors or expert group, saw them.

Data analysis

All data were analysed using Microsoft Access and Excel by the staff at NCEPOD. Quantitative analysis of the data from all questionnaires was performed along with further qualitative analysis following review of the casenotes of the deceased patients by an advisory group. Where tables indicate 'not answered' this means that no information was provided for this particular analysis. Where 'insufficient data' is indicated this means that the advisors could not make a decision based on the information available. Where 'unknown' is shown in tables this is the box ticked by the hospital clinician completing the questionnaire.

Advisor groups

A multidisciplinary group of advisors were recruited to review the questionnaires and associated casenotes of the patients that died on the ICU. The groups of advisors comprised of intensive care physicians, general physicians, nurses and pathologists.

For each case reviewed, the advisor completed a separate questionnaire, the questionnaire assessment form (QAF), which is shown in Appendix 3. This allowed both quantitative and qualitative analysis of the advisor's opinion.

Expert review

An independent group of experts comprising intensive care physicians, general physicians and a nurse reviewed the combined analysis of the data; both from the questionnaires and the extra information from the advisory groups. This group determined the key factors that are presented in this report.

3. Data overview

Introduction

Data presented in this report have been acquired from a number of sources. Initially, the two consultants caring for the patient completed questionnaires on the care given by their teams. Further data were then obtained from the NCEPOD advisors who reviewed the deceased cases. This section aims to provide an overview of the data received and an insight into the study population.

Hospital participation

261 hospitals were identified as having a Level 3 adult, general, intensive care unit.

197 hospitals submitted at least one clinical questionnaire and we had an overall participation rate of 88% (229/261).

The reason for the non-participation of the remaining 32 hospitals is shown in Figure 1.

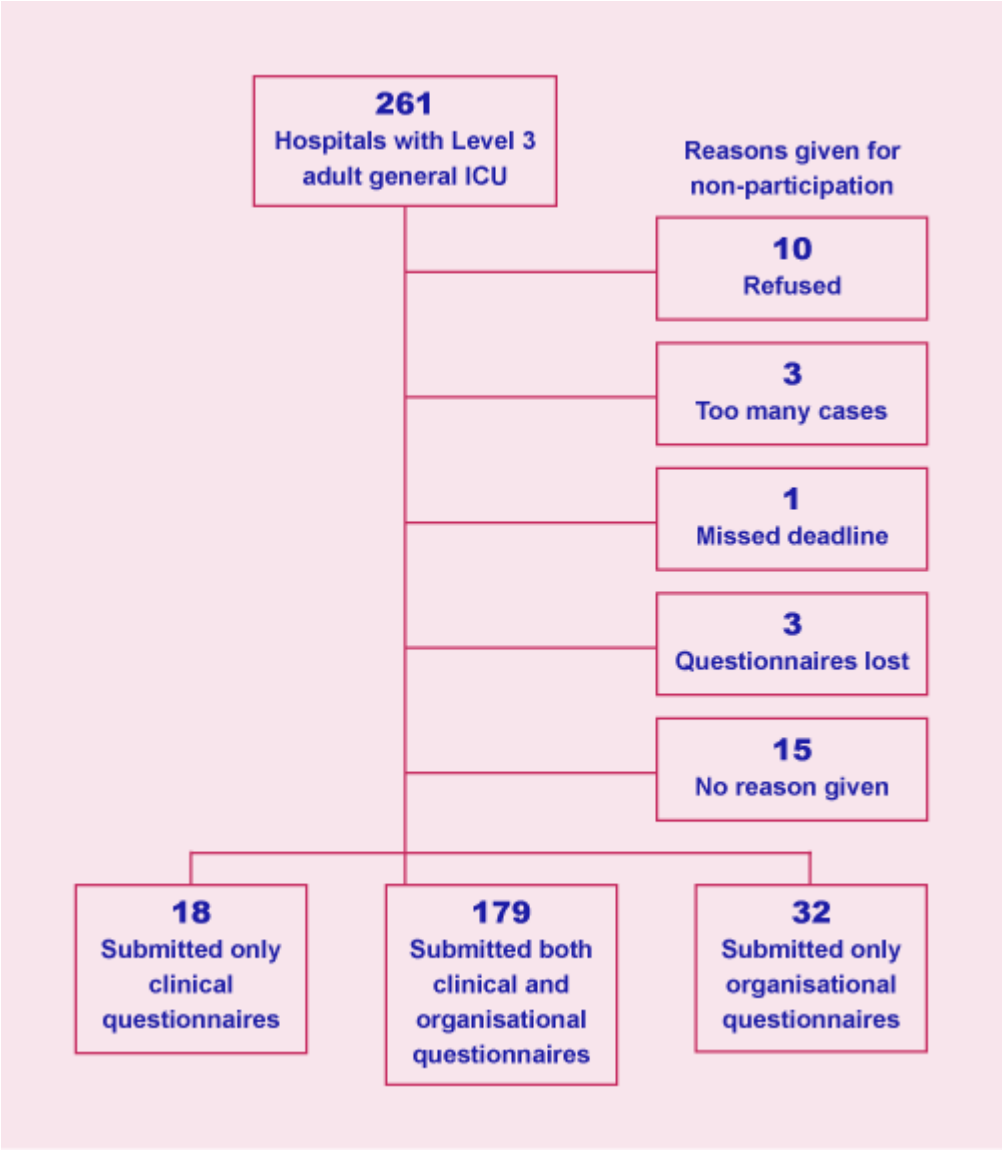

Figure 1. Reason for non-participation

Initially the estimated sample size was 6,000 patients admitted to ICU with 20-30% of patients expected to die during the data collection period. As data collection began and the lists of suitable patients and

questionnaires were returned to NCEPOD, it became apparent that the expected sample size would not be reached. To evaluate this further, hospitals were contacted and asked to provide additional information on the total number of admissions to their ICU during one year and the number of these admissions that were general medical admissions.

42 hospitals provided this extra information. Based on this, the average number of admissions to an ICU over one year was 468. Of these, only 40% were medical admissions. Therefore the average number of medical admissions per unit would have been approximately 15 in a one month period. This figure was more consistent with the numbers associated with the study period.

By taking the above findings into account, it was proposed that the original estimate had been overestimated by approximately 60% and a more realistic sample size to be expected was in the region of 2,400 cases. It was likely that the overestimation arose from the fact that the multiplication factor of 7 and the number of estimated beds were not for medical patients only.

These calculations did not take into account different sizes of units, bed numbers or the time of the year that the study was run, all of which may have impacted on the final sample size. However, it did provide a crude indication to the number of cases expected.

Clinical questionnaires

Figure 2 provides an overview of the number of questionnaires returned. 1,235 questionnaires were received from referring physicians and 1,596 from intensive care clinicians. More intensive care questionnaires were received because single intensive care questionnaires would have been received if the patient had been transferred from another unit, and this may indicate the higher proportion of these questionnaires compared with single referring physician questionnaires.

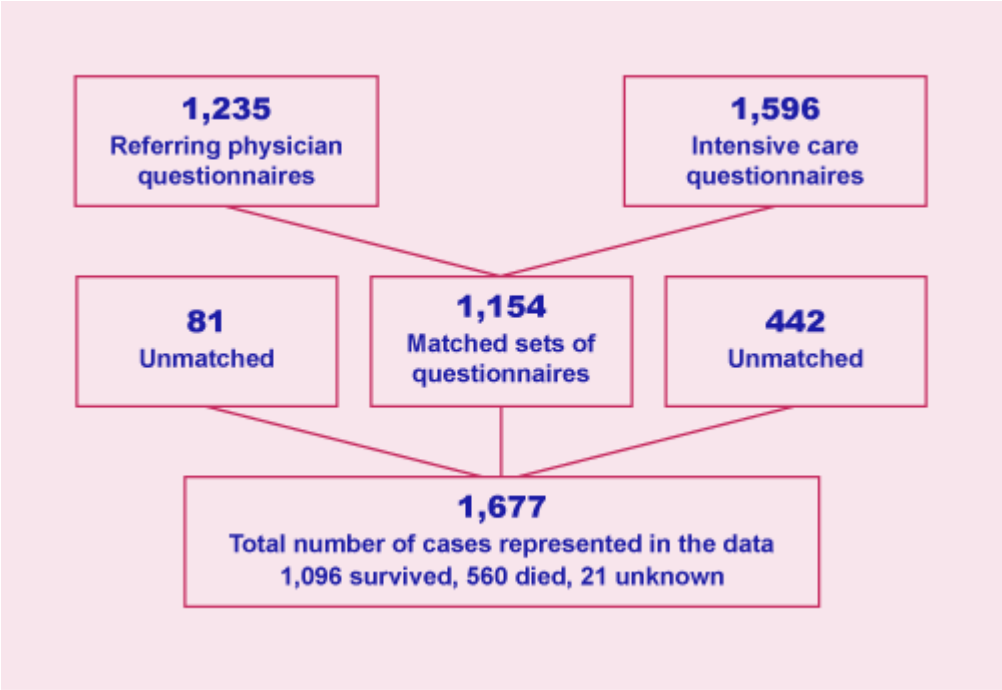

Figure 2. Overview of questionnaires returned

Organisational questionnaire

Of hospitals having a Level 3 adult general intensive care unit, 81% (211/261) returned this questionnaire. Of the 50 that did not return it, 18 had returned a clinical questionnaire.

Age and sex

Figure 3 demonstrates the distribution of age of patients included in this study. The median (range) age of this group of patients was 60 (16 to 95) years and 55% were male.

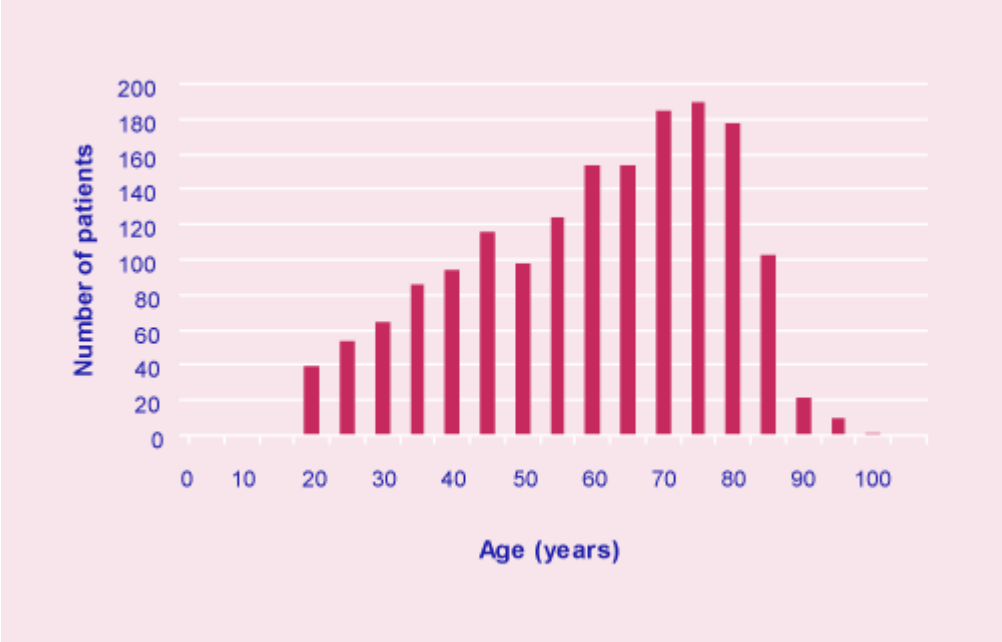

Figure 3. The age distribution of the study population (note that entry to the study was restricted to patients aged 16 or over) *n=1,665*

Admission method to hospital

Of the 1,235 cases with a completed referring physician questionnaire, 1,154 (93%) were emergency admissions and 34 (3%) were elective admissions. The question was unanswered in 47 (4%) of cases.

Source of admission to the ICU

Of patients admitted to the ICU, 43% (683/1,596) were admitted from the accident and emergency department of the same hospital and 537/1,596 (34%) were admitted to the ICU from a ward in the same hospital. Figure 4 demonstrates the range of admission sources as detailed on the intensive care questionnaire.

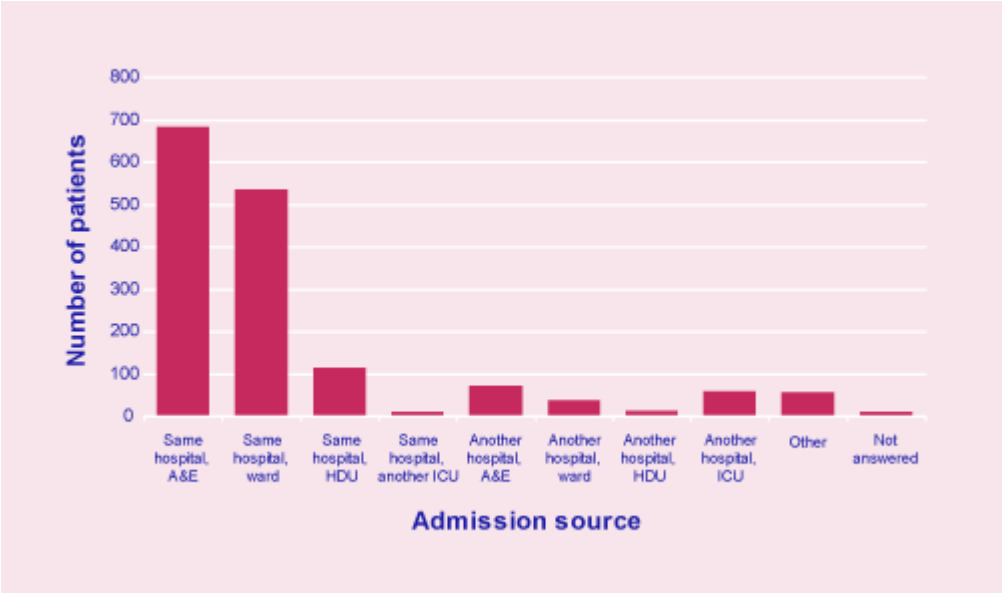

Figure 4. Source of admission to the ICU *n=1,596*

Figure 5 shows that the most common clinical reason for referral to ICU was respiratory disease, followed by cardiovascular and neurological disease. This data was taken from the ICU questionnaire.

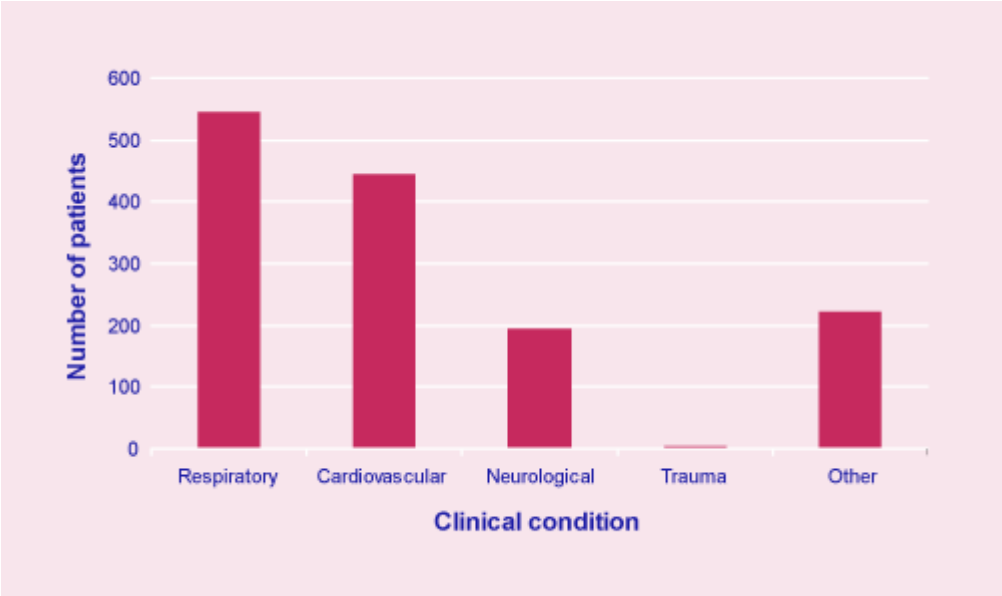

Figure 5. Clinical reason for referral to ICU*n=1,596*

Severity of the patient's condition

The Barthel Index [13], the APACHE II score [14], the Modified Early Warning Score [15] and the Glasgow Coma Score [16] were all requested as a means to assess the severity of the patient's condition. The data provided on these parameters were reviewed with some caution for two main reasons:

- The high number of accident and emergency admissions meant that an accurate understanding of the patient condition prior to hospital admission was unknown. For example, many patients would have had a low Barthel Index on arrival at hospital but may have scored much higher a matter of hours earlier. Similarly, it was not always possible to calculate the Modified Early Warning Score.

- As there were no time intervals stated in the questions relating to the APACHE II score and the Glasgow Coma Score, it was difficult to interpret these data clearly. In both cases the clinician was asked for their first score on admission to ICU but this may have been at one hour or 24 hours and there was no consistency to when it would have first been recorded.

Where the scores had not been provided but enough clinical factors were available to calculate the score, this was done by NCEPOD. Charted below are the findings from the four scores where the score was available.

The Barthel Index is an assessment of the ability of individuals to perform activities of daily living [13]. The maximum score, indicating a fully active and independent person, is 20. There were 73% (905/1,235) of cases where the Barthel Index had been completed in full on the physician questionnaire, 15% (183/1,235) of cases where it was incomplete and 12% (147/1,235) of cases where the question was not answered. Figure 6 shows the distribution of scores by number of patients for those that were completed in full.

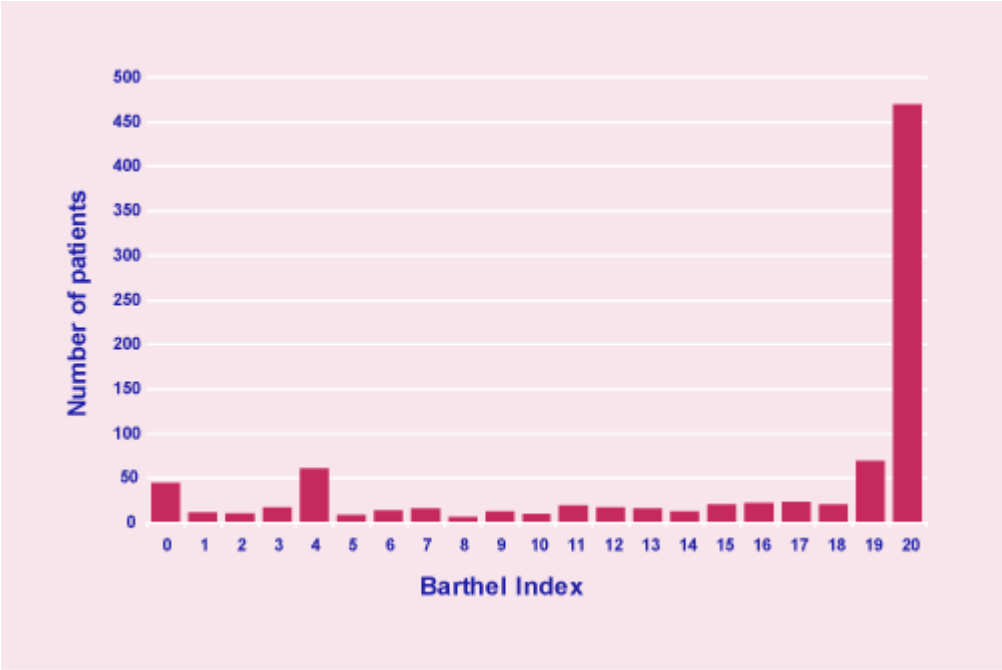

Figure 6. Barthel Index *n=1,235*

The APACHE II score is a severity of illness score that measures the degree of acute physiological impairment, but also takes into account age and chronic health problems [14]. The APACHE II score was provided, or calculated from the physiological variables provided on the intensive care questionnaire, in 78% (1,241/1,596) of cases. The physiological variables were incomplete in 22% (354/1,596) cases and absent in one. Figure 7 shows the distribution of scores by number of patients for those that were completed in full.

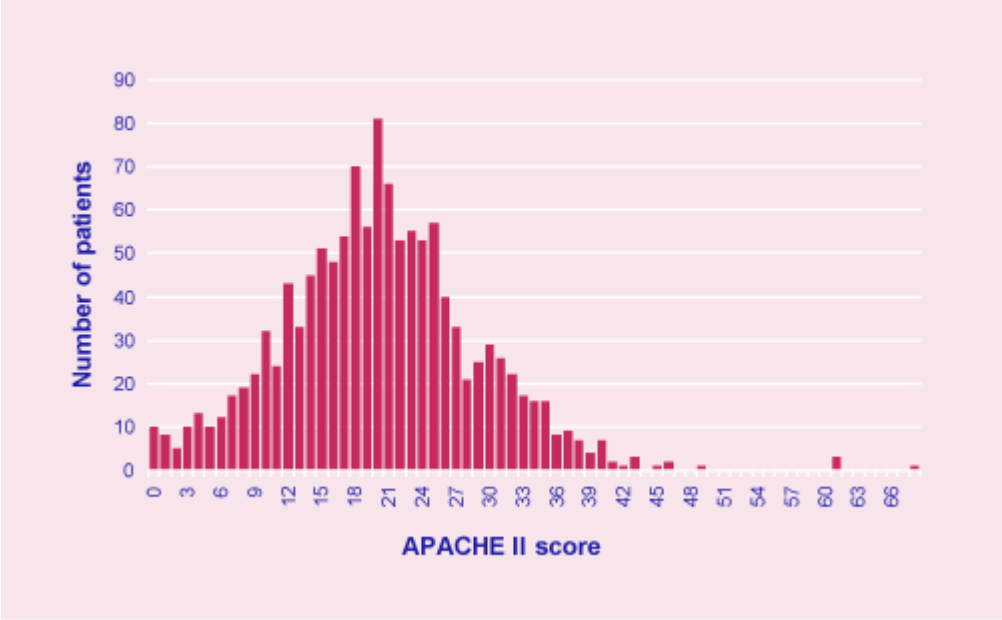

Figure 7. APACHE II score *n=1,596*

There were 64% (795/1,235) of cases where the Modified Early Warning Score [15] had been completed in full on the physician questionnaire, 22% (275/1,235) of cases where it was incomplete and 13% (165/1,235) of cases where the question was not answered. Figure 8 shows the distribution of scores by number of patients for those that were completed in full.

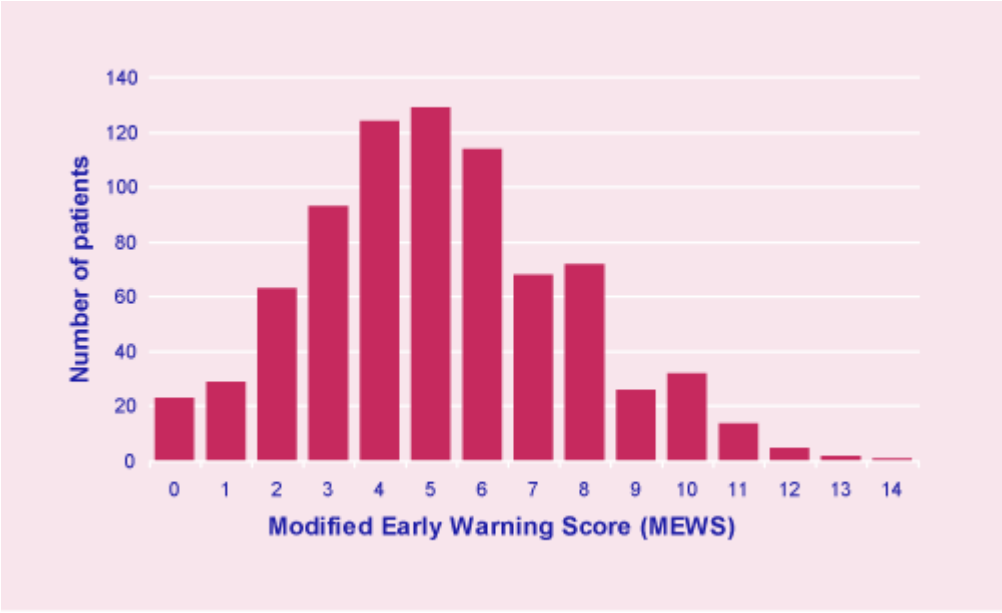

Figure 8. Modified Early Warning Score *n=1,235*

The Glasgow Coma Score [16] was provided in 90% (1,431/1,596) of cases on the intensive care questionnaire. The score was incomplete in three cases and not answered in 162 cases. Figure 9 shows the distribution of scores by number of patients for those that were completed in full. The unusual distribution of Glasgow Coma Score is probably a reflection that many sedated patients were incorrectly assigned to a Glasgow Coma Score of three, rather than the pre-sedation Glasgow Coma Score, as it is unlikely that such a high number of patients actually had such a low coma score.

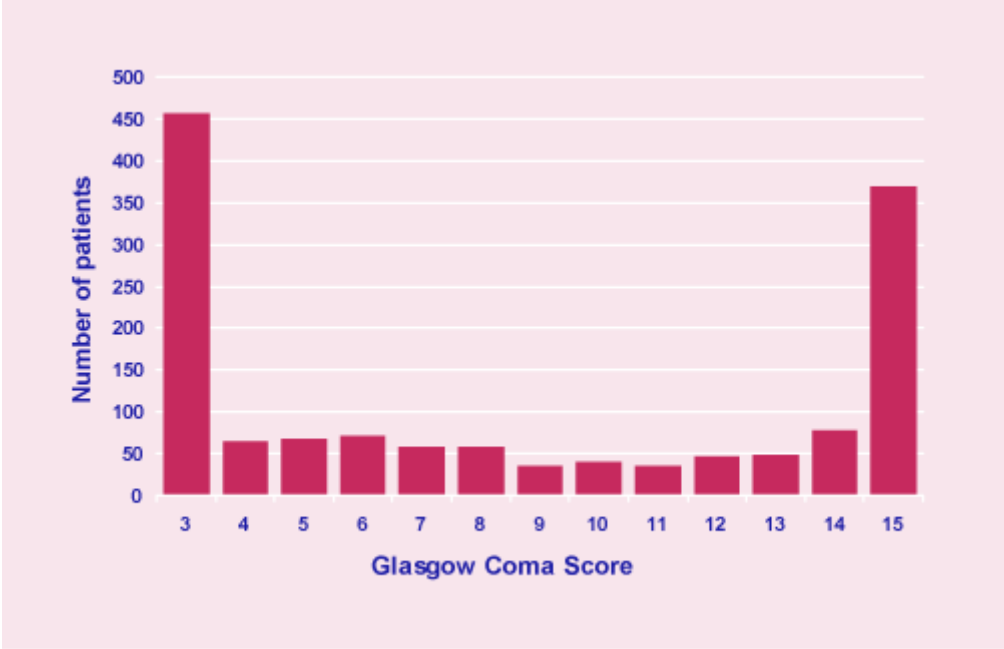

Figure 9. Glasgow Coma Score *n=1,596*

As the data were available for most, though not all, patients for each score, it is believed that the sample presented is representative of the population.

4. Pre-ICU care

Key findings

- **The quality of the initial hospital admission history and examination was acceptable in 90% of cases. It is worrying that one in 10 patients have an incomplete history and examination.**
- **Despite an acceptable history and examination, initial treatment was often delayed, inappropriate or both.**
- **Although the data are difficult to collect from casenotes it seems likely that, despite RCP recommendations, consultant physician involvement in the first 24 hours remains low. Data were available to assess the timing of patient review by a consultant physician in just 40 of the 439 deaths for which casenotes were available. Amongst these 40 cases, a consultant physician did not review 17 patients within 24 hours of admission to hospital.**
- **Patients often had prolonged periods of physiological instability prior to admission to ICU. In patients who had been in hospital more than 24 hours prior to ICU admission, 66% exhibited physiological instability for more than 12 hours.**

Introduction

The medical notes relating to the initial admission (defined as up to, but not including the post-take ward round) were analysed by the NCEPOD advisors. Due to data protection requirements, notes were only requested in cases where the outcome was death within the study period. Of the 560 patients who died, 439 sets of notes were available to the advisor groups (78%).

Admission history

The advisors found that overall the initial history, examination, differential diagnosis and treatment planning was of an acceptable standard (Tables1-4). In one in 10 cases the initial history and examination was judged to be unacceptable or incomplete by the advisors and no initial treatment plan could be identified. In addition to the assessment of clinical examination and history, the standard of care given in the initial period after hospital admission was scored using the system given in Table 5. 58% of cases were classified as receiving prompt and appropriate therapy. It is concerning that up to 42% of cases received inappropriate or delayed therapy. Frequent examples were the use of inappropriately low concentrations of oxygen in profoundly hypoxic patients and the delayed administration of sufficient fluids to hypotensive patients. These findings reveal that despite a largely adequate hospital admission process (history, examination, diagnosis and plan) there are concerns over timely and appropriate interventions. The reasons for this are not clear but may include organisational factors which introduce delays into treatment plans and the reliance on doctors still undergoing training to initiate the correct therapy and drive care forward. It may be felt that the advisors were being particularly harsh and being wise after the event. However, the findings of deficiencies in history, examination, treatment planning and initial therapy were much worse in a similar study performed recently [3] and we feel confident that the level of deficiency has not been overstated.

Table 1. Standard of history taken		
Acceptable history taken	**Total**	***(%)***
Yes	312	*(90)*
No	33	*(10)*
Sub-total	**345**	
Insufficient data	94	
Total	**439**	

Table 2. Completion of clinical examination		
Clinical examination complete at first contact	**Total**	***(%)***
Yes	297	*(87)*
No	43	*(13)*
Sub-total	**340**	
Insufficient data	99	
Total	**439**	

Table 3a. Diagnosis at initial review		
Diagnosis reached at initial review	**Total**	***(%)***
Yes	326	*(93)*
No	24	*(7)*
Sub-total	**350**	
Insufficient data	89	
Total	**439**	

Table 3b. Accuracy of diagnosis		
Diagnosis correct	**Total**	***(%)***
Yes	276	*(90)*
No	30	*(10)*
Sub-total	**306**	
Insufficient data	20	
Total	**326**	

Table 4a. Initial treatment plan made		
Initial treatment plan made	**Total**	***(%)***
Yes	299	*(87)*
No	46	*(13)*
Sub-total	**345**	
Insufficient data	94	
Total	**439**	

Table 4b. Initial treatment plan followed		
Treatment plan followed	**Total**	***(%)***
Yes	269	*(96)*
No	11	*(4)*
Sub-total	**280**	
Insufficient data	19	
Total	**299**	

Table 5. Standard of care during the initial period following admission		
Appropriateness of the treatment	**Total**	***(%)***
Prompt and appropriate	253	*(58)*
Prompt but inappropriate therapy	28	*(6)*
Appropriate but apparent delay	35	*(8)*
Inappropriate and delayed	28	*(6)*
Insufficient information to comment	95	*(22)*
Total	**439**	

In addition to the initial medical admission, we sought to collect information about medical staff involvement; specifically the grade of medical staff that reviewed the patients and the time delay from admission to first consultant physician review. Unfortunately the quality of the medical records was such that this information was difficult to obtain. There were 2,234 reviews among 439 patients. The grades of the reviewers were recorded in only 37% of reviews. Table 6 shows the grade of medical staff that undertook patient reviews in the three days prior to ICU admission. As can be seen, more than 50% of patient reviews were performed by PRHOs or SHOs.

Table 6. Grade of patient reviewers in the three days prior to ICU admission		
Reviewer grade	**Number of reviews**	***(%)***
Consultant	96	*(8)*
Registrar	458	*(36)*
Staff Grade / Associate Specialist	25	*(2)*
SHO	558	*(44)*
PRHO	147	*(11)*
Sub-total	**1,284**	
Not recorded	950	
Total (amongst 439 patients)	**2,234**	

First consultant review

Time to first consultant review was poorly recorded. Of the 439 sets of notes reviewed we were only able to extract this information in 40 cases. A consultant physician reviewed 23 of the 40 patients (58%) within 24 hours of admission to hospital. 28 of these 40 patients had a ward stay of greater than 24 hours prior to ICU admission (and therefore had a greater potential to be reviewed within 24 hours). A consultant physician reviewed 11 of these 28 patients (39%) within 24 hours of admission to hospital. The Federation of the Royal Colleges of Physicians of the UK recommend that 90% of acute admissions should be reviewed by a consultant within 24 hours [9], and the recommendations contained in *Acute medicine: making it work for patients* states that all patients should be reviewed by a consultant within 24 hours [8]. From the limited data available it appears that care is not reaching this standard, although caution should be exercised due to the large number of casenotes not amenable to study due to poor record keeping.

Time between first physiological instability and referral to ICU

Even with appropriate review and intervention, some patients will continue to deteriorate. This decline needs to be rapidly recognised to allow optimal management. To assess the rapidity of response to continued deterioration the casenotes and charts were reviewed against a standardised list of physiological abnormalities (Table 7) [17,18]. These are criteria commonly used as medical emergency team calling criteria and were used to quantify the time delay between each patient first triggering one of these criteria and subsequent referral to critical care.

Table 7. Standardised list of physiological abnormalities used in assessing the rapidity of response to continued deterioration
Clinical criteria
Cardiorespiratory arrest
Respiratory rate: <8 breaths per minute
Respiratory rate: >30 breaths per minute
SaO_2 <90% on oxygen
Difficulty speaking
Pulse rate: <40 beats per minute
Pulse rate: >130 beats per minute
Systolic blood pressure <90mmHg
Repeated or prolonged seizures
Any unexplained decrease in consciousness
Agitation or delirium
Concern about patient status not detailed above

As can be seen from Figure 1, there were considerable time delays between gross physiological instability and subsequent ICU referral for the 162 cases where data was available. This graph shows data for patients who had an inpatient stay of greater than 24 hours prior to admission to ICU.

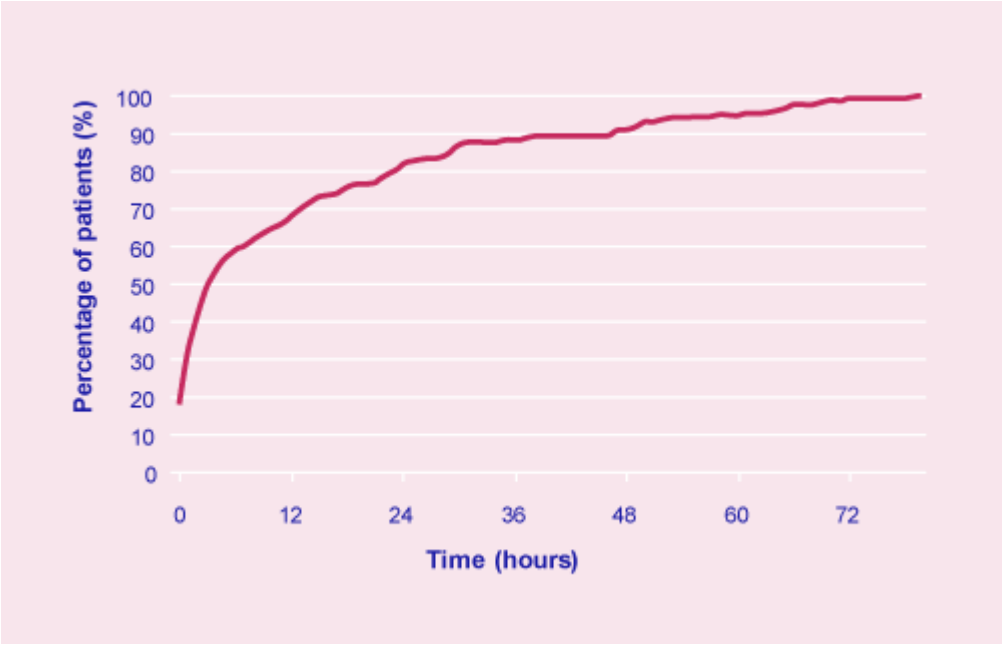

Figure 1. Time between gross physiological instability and subsequent referral to ICU *n=162*

Of these patients, 66% had clearly identifiable gross physiological abnormalities for greater than 12 hours prior to referral to ICU.

Deterioration in the group of patients who were in hospital for 24 hours or less prior to ICU admission appears to have been more rapidly recognised, with only 6% having clearly identifiable gross physiological abnormalities for greater than 12 hours prior to referral to ICU.

A recent study has looked at antecedent factors prior to cardiac arrest, death or emergency admission to ICU in a sample of hospitalised patients [19]. Whilst the patient population is different, this study shows that a high proportion of patients have recognisable physiological derangement prior to an adverse event. Indeed, 60% of patients had antecedent factors prior to cardiac arrest, death or emergency admission to ICU.

An earlier study also produced very similar findings. In over 60% of patients admitted to intensive care potentially life-threatening abnormalities were documented during the eight hours before their admission [20].

It is clear from the above that there are problems with the recognition of deteriorating patients and the level of senior input. NCEPOD has previously found similar problems with lack of recognition of severity of sickness and of low levels of consultant input into emergency care in both surgery and anaesthesia [21,22]. Despite the considerable changes in the structure of acute care in recent years, the findings in this study relating to recognition of severity of illness and consultant supervision are remarkably similar to this previously published work.

Although the data are difficult to collect, the apparently low involvement of consultant physicians both in the first 24 hours of admission and in the critical phase of patient care prior to ICU admission are concerning. Virtually all consultant physicians have their major commitment in time and their major strength in expertise in a specialty, such as gastroenterology or cardiology (which often carries in itself a significant out-of-hours workload) and it is difficult for them to devote the time both to the practice of acute medicine and to keep up to date [23]. This has led the Royal Colleges of Physicians to advocate the development of acute medicine as a specialty [8]. NCEPOD supports this, and there are already well over a hundred acute physicians in practice in this country dedicated to the management of the ‘unselected medical emergency admission’. Patients are triaged to other medical specialists according to need. However, it may take up to a decade for this pattern of care to reach its potential, and until then it is essential that consultant physicians have job plans that allow sufficient time to commit to the care of acutely ill medical patients and have continuing professional development dedicated to this. While they may be unlikely to be able to maintain the full range of practical skills themselves, they should have sufficient authority to ensure that management plans are delivered speedily and by the appropriate team members.

It is often said that physiological derangement is common in emergency admissions to hospital and that a significant number of these patients make a full recovery. Whilst this is undoubtedly true it must be remembered that physiological derangement is a marker of poor outcome and that there is a good correlation between the number of physiological abnormalities and subsequent mortality. In a recent study it was found that mortality increased with the number of physiological abnormalities ($p<0.001$), being 0.7% with no abnormalities, 4.4% with one, 9.2% with two and 21.3% with three or more [24]. It is therefore imperative that patients exhibiting physiological abnormalities receive prompt and appropriate interventions and receive early input from senior doctors.

Case study

A patient in their mid-seventies was admitted as an emergency with diarrhoea and general malaise. The only significant past medical history was hypertension, treated with an ACE inhibitor. On admission they were noted to be dehydrated, with a blood pressure of 110/60 mmHg and a pulse rate of 100 beats per minute. Their respiratory rate was measured at 36 breaths per minute. Serum creatinine was 154 µmol/l. They were admitted by the medical SHO who prescribed intravenous fluid (1,000mls over 8 hours) and antibiotics. The impression noted in the admission clerking was "? infection". Four hours after admission the BP was noted to be 85/50 mmHg. Maintenance intravenous fluids (3000mls) were prescribed and given over the next 24 hours despite the low blood pressure that persisted. In the first 24 hours after admission the nursing staff requested medical staff review on five occasions. Four of these reviews were by the PRHO and one by the SHO. Despite continuing hypotension no additional therapy was instituted. One entry (24 hours after admission) by the PRHO states that the blood pressure is 70/30 mmHg but that the patient appears stable. Analysis of blood gases at that time revealed the following; pH 7.31, $PaCO_2$ 3.7 kPa, PaO_2 13.5 kPa, base excess –11.1 mmol/l, lactate 4.3 mmol/l. At that time urine output was noted to be negligible. SHO review confirmed these findings and the differential diagnosis of septic shock was made. An additional 500 mls of colloid were infused over the next two hours. No other treatment was initiated nor advice sought. The patient remained hypotensive, tachypnoeic and confused overnight. The patient was reviewed by the SHO on several occasions, with no changes to treatment. Indeed one nursing entry states "Dr. not unduly worried at present – continue with present regime". A deterioration in consciousness at 48 hours after initial hospital admission prompted referral of the patient to the outreach service. At this point the patient was more acidotic, tachypnoeic and shocked. Admission to the ICU was expedited but despite initiation of organ support the patient continued to deteriorate and died 12 hours after ICU admission.

It is clear that the PRHO and SHO did not appreciate the significance of the physiological derangements in this patient nor the clinical urgency of the situation. Earlier, more adequate resuscitation may have prevented the deterioration in this patient.

Case study

A patient in their mid-fifties was admitted to the hospital as an emergency surgical admission with a diagnosis of acute pancreatitis probably related to chronic high alcohol intake. They were managed on a surgical ward for five days where it was noted that their pancreatitis seemed to be resolving and the problems became primarily related to decreased conscious level and confusion and tachypnoea. At this point physician input was sought and after an SpR review the patient was transferred to the care of the medical team for further management. The patient became more drowsy and hypoxic over the next twelve hours. In the first 24 hours after transfer to the medical team he was seen once by an SpR and twice by an SHO – both noted the deterioration but no therapy was instituted. Outreach review occurred 18 hours after transfer to the medical team. The outreach team noted the physiological disturbances and suggested "urgent senior medical review". Later that evening (now 36 hours after transfer of care) the nursing staff were concerned about the continued deterioration of the patient and the high MEWS score and asked the night nurse practitioner to review. The nurse practitioner confirmed the urgency of the situation and asked for advice from the PRHO and outreach team. No more senior advice was sought. By the next morning, the patient was unrousable, hypotensive and tachypnoeic. The SpR in medicine sought urgent assistance from critical care at this point. Despite ICU admission and supportive care the patient died 48 hours later.

This patient was transferred to the care of the medical team as, despite improvements in the pancreatitis, they developed a worsening conscious level and respiratory dysfunction. They remained on the medical ward for 48 hours prior to ICU admission and were not seen by a consultant physician. Earlier input of a senior doctor should have occurred.

Recommendations

- **Trusts should ensure that consultant job plans reflect the pattern of demand of emergency medical admissions and provision should be made for planned consultant presence in the evenings (and perhaps at night in busier units).**
- **A consultant physician should review all acute medical admissions within 24 hours of hospital admission [8]. Regular audit should be performed against this standard.**
- **Trusts should ensure that consultant physicians have no other clinical commitments when on take. This may be through the development of acute physicians [8]. This will allow for greater involvement in the assessment and treatment planning of new admissions and the review of deteriorating inpatients.**
- **More attention should be paid to patients exhibiting physiological abnormalities. This is a marker of increased mortality risk.**
- **Robust track and trigger systems should be in place to cover all inpatients. These should be linked to a response team that is appropriately skilled to assess and manage the clinical problems.**

5. Patient observations and review criteria

Key findings

- **Notes seldom contained written requests regarding the type and frequency of physiological observations.**
- **Instructions giving parameters that should trigger a patient review were rarely documented.**
- **Respiratory rate was infrequently recorded.**
- **27% of hospitals did not use an early warning system.**
- **44% of hospitals did not provide an outreach service.**
- **The provision of outreach services was geographically uneven, with a bias toward provision of outreach in English hospitals.**

Introduction

Early recognition of patients with worsening medical conditions will allow a more timely and potentially appropriate response. This is the central theme to many recent educational initiatives including IMPACT (Ill Medical Patients' Acute Care and Treatment), CCrISP (Care of the Critically Ill Surgical Patient), ALERT (Acute Life-threatening Events - Recognition and Treatment) and the programme of critical care outreach and 'track and trigger' systems being promoted by the NHS Modernisation Agency [10] and the Department of Health [25].

Observation recording

Early recognition relies on the correct physiological observations being performed at an interval appropriate to the condition of the patient. 439 sets of notes of deceased patients were available for analysis. Table 1 shows that it was unusual for a request to be made for the type and frequency of physiological observations. This is a potential source of error and delayed recognition of clinical deterioration.

Table 1. Type and frequency of physiological observations requested for patients										
	Number of patients by requested frequency of observations				Total *n* = *439*					
	Hourly	**Four hourly**	**Other**	**Not specified**	**Observations requested**	***(%)***	**Not requested**	***(%)***	**Unknown**	***(%)***
Pulse	6	1	8	13	**28**	***(6)***	**337**	***(77)***	**74**	***(17)***
Blood pressure	6	2	9	16	**33**	***(8)***	**335**	***(76)***	**71**	***(16)***
Respiratory rate	2	2	7	7	**18**	***(4)***	**345**	***(79)***	**76**	***(17)***
Urine output	25	0	8	29	**62**	***(14)***	**303**	***(69)***	**74**	***(17)***
Fluid balance	5	1	10	40	**56**	***(13)***	**306**	***(70)***	**77**	***(17)***
Central venous pressure	4	0	1	14	**19**	***(4)***	**335**	***(76)***	**85**	***(20)***
SpO_2	6	2	8	14	**30**	***(7)***	**334**	***(76)***	**75**	***(17)***
Other	4	0	6	2	**12**	***(3)***	**355**	***(81)***	**72**	***(16)***

However, whilst it is rare to document a physiological observation plan it is clear that nursing staff did perform observations. Table 2 illustrates the total number of observation points for each parameter in the three days prior to ICU admission. This is expressed as observations per patient per day. Table 3 shows the number of patients in hospital at each timepoint prior to ICU admission. As expected, the rate of observations per patient per day increased, as ICU referral became closer, except for the day of referral to ICU. It is most likely that the trend did not continue for the day of referral to ICU due to the proportionately large number of patients arriving in hospital on that day, giving a large number of incomplete days on which to base the rate. It is clear that pulse and blood pressure and temperature were most frequently recorded and that respiratory rate was the least recorded variable. This is especially worrying, as respiratory rate has been shown to be an early and sensitive indicator of deterioration [5]. This has been shown in all inpatients irrespective of specialty [26] and has been validated in acute medical admissions [27].

The use of pulse oximetry monitoring has increased considerably during recent years. As can be seen in this study, it was used with greater frequency than respiratory rate monitoring. Whilst pulse oximetry can add additional information it is also open to misinterpretation [28]. This study revealed that junior doctors and staff nurses were untrained in pulse oximetry, lacked knowledge of basic principles, and made serious errors in interpretation of readings. In addition, there is a common misconception that pulse oximetry measurements obviate the need for respiratory rate monitoring.

Table 2. Observations per patient per day for the three days prior to ICU admission		
Observation	**Day**	**Rate per patient**
Pulse	Three days before referral to ICU	3.17
	Two days before referral to ICU	4.24
	One day before referral to ICU	4.36
	Day of referral to ICU	3.66
Blood pressure	Three days before referral to ICU	3.87
	Two days before referral to ICU	4.72
	One day before referral to ICU	5.09
	Day of referral to ICU	3.66
Respiratory rate	Three days before referral to ICU	1.70
	Two days before referral to ICU	2.48
	One day before referral to ICU	2.62
	Day of referral to ICU	2.12
Temperature	Three days before referral to ICU	2.93
	Two days before referral to ICU	3.34
	One day before referral to ICU	3.29
	Day of referral to ICU	1.49
Oxygen saturation	Three days before referral to ICU	2.54
	Two days before referral to ICU	3.71
	One day before referral to ICU	3.86
	Day of referral to ICU	3.20

Table 3. Number of patients in hospital	
Patients present in hospital (Answers may be multiple)	**Number of patients**
Three days before referral to ICU	109
Two days before referral to ICU	128
One day before referral to ICU	190
Day of referral to ICU	356

Physiological monitoring plan

If patients are not responding to therapy, and continue to deteriorate, it is important to provide clear instructions to the nursing staff when to call for assistance for further review of the patient. Table 4 shows that it was very uncommon for instructions to be given to the nursing staff for parameters that should trigger these reviews. In the absence of instructions detailing factors that should prompt a review of the patient it is not surprising that clinical deterioration can exist for some time before remedial action is taken. This is of particular concern as a large number of observations are now carried out by health care assistants and/or nursing auxiliaries who may not appreciate the clinical relevance of abnormal signs[25].

Table 4. Provision of instructions to nursing staff for assistance and further review of patient

Nurse instructions to alert medical staff	**Total**	***(%)***
Yes	18	*(5)*
No	366	*(95)*
Sub-total	**384**	
Insufficient data	55	
Total	**439**	

One potential explanation for the lack of a physiological observation plan and parameters for further review would be the use of outreach services and early warning systems, as these systems would provide default values that may trigger a review. However, these systems are patchy and often do not cover all patients.

Table 5 shows that 73% of hospitals used some form of 'early warning system' or 'track and trigger system'. The aim of these track and trigger systems is to allow early identification of patients who have physiological abnormalities and to facilitate rapid and appropriate management. The system most often used is the 'early warning score' (modified or not). It is notable that respiratory rate forms an integral component of these track and trigger systems and that, as shown in Table 2 this is poorly recorded. This has the potential to reduce the utility of this approach. The finding that one in four hospitals did not use a track and trigger system combined with the lack of parameters for further review of patients gives cause for concern.

Table 5. Hospitals' use of early warning systems		
Early warning system used	**Number of hospitals**	***(%)***
Medical emergency team	3	*(1)*
Patient at risk team	19	*(9)*
Early warning score	28	*(14)*
Modified early warning score	89	*(42)*
Combinations of above	8	*(4)*
Other	2	*(1)*
System not specified	4	*(2)*
Sub-total	**153**	***(73)***
No early warning system used	58	*(27)*
Total	**211**	

Track and trigger systems may stand alone and feed into the normal ward care structure or may exist in conjunction with a critical care outreach service. Outreach services have been suggested as a means of improving the care of patients since the publication of *Critical to success* [12]. In this document the Audit Commission gave the 'highest priority recommendation' that acute hospitals develop an outreach service to support ward staff in managing patients who were at risk. The concept of outreach services was promoted in the publication *Comprehensive Critical Care* [10] and has been subsequently further supported by the Royal College of Physicians [7]. Furthermore, Alan Milburn (then Secretary of State for Health) recommended that "we should see outreach services developing in every hospital" [29]. However, the development of outreach services has been largely unplanned and is not uniform as Table 6 shows. It is of concern that there appears to be a great disparity between England and the rest of the areas covered by NCEPOD with respect to the provision of outreach.

Table 6. Outreach services available in the United Kingdom					
	Outreach service				
Country	**Yes *(%)***	**No *(%)***	**Sub-total**	**Not answered**	**Total**
England	108	65	173	2	175
Independent hospitals	5	7	12	1	13
Wales	3	9	12	0	12
Northern Ireland	0	9	9	0	9
Guernsey	0	1	1	0	1
Isle of Man	0	1	1	0	1
Total	**116 *(56)***	**92 *(44)***	**208**	**3**	**211**

Recommendations

- **A clear physiological monitoring plan should be made for each patient. This should detail the parameters to be monitored and the frequency of observations.**
- **Part of the treatment plan should be an explicit statement of parameters that should prompt a request for review by medical staff or expert multidisciplinary team.**
- **The importance of respiratory rate monitoring should be highlighted. This parameter should be recorded at any point that other observations are being made.**
- **Education and training should be provided for staff that use pulse oximeters to allow proper interpretation and understanding of the limitations of this monitor. It should be emphasised that pulse oximetry does not replace respiratory rate monitoring.**

6. Referral process

Key findings

- **A high percentage of patients were referred to critical care by staff in training; 21% of referrals were made by SHOs.**
- **Consultant physicians had no knowledge or input into 57% of referrals to critical care.**
- **Delays between referral to critical care and review (5%) and between decision to admit to critical care and admission (16%) were common.**
- **A significant factor in delay was the lack of appropriate staff and ICU beds.**
- **18% of patients were admitted to ICU without prior review by the intensive care service.**

Introduction

To ensure optimum management of acutely ill patients it is important that the process of referral from the ward for critical care is well managed. This should allow timely referral of patients likely to benefit from critical care admission and should also minimise referral of patients for whom intensive care is thought to be inappropriate. These are difficult decisions and consultant involvement in the referral process is essential.

The referrer

Table 1 shows the health professional who referred the patient to the critical care service. Where it was possible to discern from the casenotes, 64% of patients were referred by SHOs or SpRs and consultant referral only took place in 23% of cases.

Table 1. Grade of referrer to ICU

Health professional who referred patient	Total	*(%)*
Consultant physician	256	*(23)*
Registered nurse	10	*(1)*
SHO	238	*(21)*
SpR year 1 or 2	255	*(23)*
SpR year 3+	229	*(20)*
Staff Grade / Associate Specialist	68	*(6)*
Other	74	*(7)*
Sub-total	**1,130**	
Not answered	105	
Total	**1,235**	

The direct referral of critically ill patients by staff in training may be appropriate and desirable in some settings, e.g. a young patient with severe acute asthma. However, in other settings more consultant physician involvement in assessment of the patient and the process of referral is probably required. This is particularly important in complex medical patients with multiple comorbidities, in whom decisions about the most appropriate treatment plan are difficult. This may take the form of a bedside review by the consultant or a telephone conversation between resident junior medical staff and the consultant who knows the patient. Table 2 shows that in the patients not referred to critical care by consultants, consultants were informed prior to referral in 43% of cases. This means that 422 patients were referred to critical care by junior doctors, without prior knowledge of a consultant physician.

Table 2. Patient referral to ICU by junior doctors

Physician notified	**Total**	***(%)***
Yes	320	*(43)*
No	422	*(57)*
Sub-total	**742**	
Unknown	181	
Not answered	56	
Total	**979**	

Case study

A patient in their early seventies with a history of severe chronic obstructive pulmonary disease was admitted as an emergency complaining of increasing breathlessness. The patient used oxygen at home and was unable to walk more than five metres on the flat due to dyspnoea and had a history of ischaemic heart disease and severe peripheral vascular disease. On admission the patient was drowsy, tachypnoeic and unable to speak. On high flow oxygen, arterial blood gas analysis showed pH 7.05, $PaCO_2$ 13.1 kPa, PaO_2 6.0 kPa. Initial therapy, instituted by the medical SHO, included steroids, bronchodilators, 24% oxygen and intravenous fluids. After the institution of controlled oxygen therapy the arterial oxygen saturation fell to 68%. As the patient remained drowsy and in respiratory distress the medical SHO referred the patient to the ICU. The ICU SHO admitted the patient and instituted non-invasive ventilatory support for this presumed acute exacerbation of chronic obstructive pulmonary disease. The patient had a cardiac arrest two hours later. Resuscitation was attempted but proved unsuccessful.

This case illustrates the difficulties of providing care without senior doctor input. Whilst the patient was very unwell (and may have met criteria for ICU admission because of acute physiological disturbance), they had significant comorbidities that made decision-making more difficult.
A consultant physician ought to have been involved in the decision to refer this patient or not, on the basis that the outlook was extremely poor. Similarly, an intensive care consultant should have participated in the decision to admit this patient and subject them to the process of intensive care.
In addition, the use of low concentrations of oxygen in an already hypoxic patient and the use of non-invasive ventilation in a patient with this degree of respiratory failure appear inappropriate.

The review

As discussed earlier, one possible measure to improve care of acutely unwell patients is the involvement of an outreach service. In this study 56% (116/208) of hospitals had an outreach service. However, only 23% of patients referred to critical care were reviewed by an outreach service (Table 3). The reasons for this apparent discrepancy are not clear but it may reflect the fact that outreach services have developed in an unstructured manner with no clear strategy. Indeed, few outreach services are available 24 hours per day, 7 days per week and often focus on patients from defined specialties, mainly surgical. It is therefore premature to rely on outreach services to meet the needs of acutely unwell inpatients, although the Royal College of Physicians and its members have suggested this approach [7,30].

Table 4 shows that 82% of patients were reviewed by the intensive care service prior to admission. This is a surprisingly low figure and whilst there may be good reasons to expedite ICU admission for severely ill patients, this should rarely be at the expense of a direct patient review. Table 5 shows that this review rate was not influenced by time of day.

Table 3. Patients reviewed by outreach services

Outreach review	Total	*(%)*
Yes	237	*(23)*
No	780	*(77)*
Sub-total	**1,017**	
Unknown	130	
Not answered	88	
Total	**1,235**	

Table 4. Patients reviewed by ICU staff prior to admission

Intensive care review	Total	*(%)*
Yes	858	*(82)*
No	191	*(18)*
Sub-total	**1,049**	
Unknown	126	
Not answered	60	
Total	**1,235**	

Table 5. Time of ICU review prior to referral to ICU										
Did patient have intensive care review?	**Number of patients by time slot**									
	Day	***(%)***	**Evening**	***(%)***	**Night**	***(%)***	**Unknown**	***(%)***	**Total**	***(%)***
Yes	284	*(85)*	306	*(81)*	182	*(82)*	86	*(74)*	858	*(82)*
No	49	*(15)*	71	*(19)*	40	*(18)*	31	*(26)*	191	*(18)*
Sub-total	**333**		**377**		**222**		**117**		**1,049**	
Unknown	36		36		21		33		126	
Not answered	13		9		5		33		60	
Total	**382**		**422**		**248**		**183**		**1,235**	

Delays

Delays, both in time to ICU review and time to ICU admission, were examined. Table 6 shows that delays between referral and review were reported by the referring physician in 5% of the cases.

Table 6. Delays between referral to ICU and ICU review		
Delay between referral and review?	**Total**	***(%)***
Yes	45	*(5)*
No	895	*(95)*
Sub-total	**940**	
Unknown	146	
Not answered	149	
Total	**1,235**	

The cause of delay was not specified in 20/45 cases and was attributed to lack of resources in 14/45 cases (primarily ICU beds and staff). The remainder were due to clinical reasons. Table 7 demonstrates that the time of day has little impact on the delay to ICU review.

Table 7. Delays in review by time of day										
Review delay?	**Review time slot**									
	Day	**(%)**	**Evening**	**(%)**	**Night**	**(%)**	**Unknown**	**(%)**	**Total**	**(%)**
Yes	12	*(5)*	19	*(6)*	10	*(5)*	4	*(5)*	45	*(5)*
No	299	*(96)*	325	*(95)*	189	*(95)*	82	*(95)*	895	*(95)*
Sub-total	**311**		**344**		**199**		**86**		**940**	
Unknown	34		41		24		47		146	
Not answered	37		37		25		50		149	
Total	**382**		**422**		**248**		**183**		**1,235**	

Table 8a shows the delay between decision to admit a patient to ICU and the actual admission.
As can be seen there is a problem with delayed admission in 16% of cases. Many of these cases were due to the need for stabilisation or investigation but worryingly 36% (59/162) were due to a lack of a critical care bed. The referring physician was asked to assess whether or not any delay had an adverse effect on patient outcome (Table 8b). This was thought to be likely in only one case. Critically ill patients have little physiological reserve and need prompt and appropriate therapy if they are to stand the best chance of recovery. The lack of perceived impact of delayed critical care review and admission is therefore surprising and may reflect poor expectations of a critical care service that has for years been underprovided.

Table 8a. Delays between decision to admit patient to ICU and actual admission		
Delay between ICU acceptance and admission?	**Total**	***(%)***
Yes	162	*(16)*
No	872	*(84)*
Sub-total	**1,034**	
Not answered	58	
Unknown	143	
Total	**1,235**	

Table 8b. Referring physician's assessment of whether delay affected outcome		
If delay, was outcome affected?	**Total**	***(%)***
Yes	1	*(1)*
No	139	*(99)*
Sub-total	**140**	
Unknown	15	
Not answered	7	
Total	**162**	

The advisor groups were asked to consider appropriateness and timeliness of critical care referral. Tables 9a and 9b show this data. It can be seen that in 92% (387/421) of cases, referrals were considered appropriate. The remainder were considered inappropriate due to poor predicted outcome. In addition, it was found that 22% (81/370) of referrals were not made in an appropriate timescale.
These were almost entirely considered to be patients who would have potentially benefited from early referral to critical care.

Table 9a. Appropriateness of critical care referral		
Referral appropriate	**Total**	***(%)***
Yes	387	*(92)*
No	34	*(8)*
Sub-total	**421**	
Insufficient data	18	
Total	**439**	

Table 9b. Timeliness of referral		
Referral at correct time	**Total**	***(%)***
Yes	289	*(78)*
No	81	*(22)*
Sub-total	**370**	
Insufficient data	69	
Total	**439**	

Recommendations

- **Consultant physicians should be more involved in the referral of patients under their care to ICU. The referral of an acutely unwell medical patient to ICU without involvement or knowledge of a consultant physician should rarely happen.**
- **It is inappropriate for referral and acceptance to ICU to happen at junior doctor (SHO) level.**
- **Any delay in admission to critical care should be recorded as a critical incident through the appropriate hospital incident monitoring and clinical governance system.**
- **All inpatient referrals to ICU should be assessed prior to ICU admission. Only in exceptional circumstances should a patient be accepted for ICU care without prior review.**

7. ICU admission process

Key findings

- **Evening was the busiest time for new medical admissions to ICU, followed by night and lastly day.**
- **One in four patients were admitted to ICU without consultant intensivist involvement.**
- **Amongst the 40% of cases, where data were available, approximately one in four patients were not reviewed by a consultant intensivist within 12 hours of admission to ICU.**

Introduction

Table 1 shows the pattern of admissions to ICU over a 24 hour period. When controlling for the length of each period it can be seen that the busiest time with respect to new admissions was the evening, followed by the night and the daytime slot.

Table 1. Frequency distribution of time of ICU admission

Time of admission	Outcome						
	Died	Survived	Unknown	Total	Admission/hour	Died*(%)*	Survived*(%)*
Day	254	457	11	722	72.2	*(36)*	*(64)*
Evening	170	312	5	487	81.2	*(35)*	*(65)*
Night	126	314	3	443	73.8	*(29)*	*(71)*
Sub-total	**550**	**1,083**	**19**	**1,652**			
Not answered	10	13	2	25			
Total	**560**	**1,096**	**21**	**1,677**			

Grade of staff accepting patients

Table 2 shows the grade of health worker who accepted the patient for admission to critical care and also shows this by the referring grade. Table 3 shows the influence of time of day on grade of health worker accepting admission. It appears 27% of patients referred for critical care are admitted to ICU without consultant intensivist involvement. This figure is influenced by the time of day and increases to 37% overnight. Further analysis of Table 2 shows that in 146 patients the most senior staff involved in the decision to refer and admit to ICU were SHOs and SpR1/2s. This represents 15% of cases where the grades of staff were returned. The lack of involvement of consultants in intensive care must be questioned, as should the appropriateness of allowing doctors in training to make sole decisions relating to ICU admission.

Table 2. Grade of health worker who accepted patient for ICU admission by referring staff										
	Grade of referring staff									
Grade of accepting ICU staff	**Consultant**	**Staff / Associate Specialist**	**SpR 3+**	**SpR 1/2**	**SHO**	**Nurse**	**Sub-total**	**Other**	**Not answered**	**Total**
Consultant	191	45	125	151	135	6	**653**	46	411	**1,110**
Staff / Associate Specialist	6	3	9	5	5	0	**28**	1	11	**40**
SpR	23	7	56	66	47	2	**201**	12	66	**279**
SHO	6	1	9	7	26	1	**50**	3	15	**68**
Nurse	2	3	2	2	3	1	**13**		5	**18**
Sub-total	**228**	**59**	**201**	**231**	**216**	**10**	**945**	**62**	**508**	**1,515**
Other	7	1	2	2	3		**15**	1	3	**19**
Not answered	8	3	5	5	6		**27**	5	30	**62**
Total	**243**	**63**	**208**	**238**	**225**	**10**	**987**	**68**	**541**	**1,596**

Table 3. Grade of health worker who accepted patient to ICU by time of day										
	Accepting time slot									
Accepting grade	**Day**	***(%)***	**Evening**	***(%)***	**Night**	***(%)***	**Not answered**	***(%)***	**Total**	***(%)***
ICU consultant	435	*(82)*	354	*(72)*	214	*(63)*	107	*(62)*	**1,110**	*(73)*
Staff / Associate Specialist	5	*(1)*	18	*(4)*	11	*(3)*	6	*(3)*	**40**	*(3)*
SpR	63	*(12)*	91	*(18)*	78	*(23)*	47	*(28)*	**279**	*(18)*
SHO	16	*(3)*	21	*(4)*	22	*(7)*	9	*(5)*	**68**	*(4)*
Registered nurse	12	*(2)*	4	*(1)*	2	*(1)*	2	*(1)*	**18**	*(1)*
Other	2	*(<1)*	6	*(1)*	10	*(3)*	1	*(1)*	**19**	*(1)*
Sub-total	**533**		**494**		**337**		**172**		**1,534**	
Not answered	8		12		10		32		**62**	
Total	**541**		**506**		**347**		**204**		**1,596**	

Table 4 shows whether or not an ICU consultant was present at the time of admission. Table 5 shows the influence of time of day on consultant presence for new admissions. Overall, an ICU consultant was present for 51% of admissions. Again this figure is influenced by time of day and an ICU consultant was present for only 17% of admissions that occurred overnight (Table 5).

Table 4. Presence of consultant at time of admission		
ICU consultant present on admission?	**Total**	***(%)***
Yes	754	*(51)*
No	713	*(49)*
Sub-total	**1,467**	
Unknown	79	
Not answered	50	
Total	**1,596**	

Table 5. Presence of consultant on admission by time of day										
	Admitting time slot									
Consultant present?	**Day**	***(%)***	**Evening**	***(%)***	**Night**	***(%)***	**Not answered**	***(%)***	**Total**	***(%)***
Yes	399	*(82)*	279	*(50)*	69	*(17)*	7	*(54)*	**754**	*(51)*
No	88	*(18)*	279	*(50)*	340	*(83)*	6	*(46)*	**713**	*(49)*
Sub-total	**487**		**558**		**409**		**13**		**1,467**	
Unknown	24		41		12		2		**79**	
Not answered	15		24		10		1		**50**	
Total	**526**		**623**		**431**		**16**		**1,596**	

Figure 1 shows the time (in hours) between ICU admission and review by an ICU consultant. It seems unarguable that the gold standard would be to have all referrals to ICU reviewed and immediately assessed by a trained consultant in intensive care medicine. This is unlikely to be achieved. Timely review by an ICU consultant is therefore the best that can be delivered in the current model of care. As can be seen, 76% of patients (473/635) were reviewed by an ICU consultant within 12 hours of ICU admission. This means that one in four patients had been admitted and subject to the process of intensive care for 12 or more hours without direct consultant input. This is well short of the most recent published standard for time to consultant intensivist review [9]. Worryingly, there were still patients who had not been reviewed within 24 hours of ICU admission.

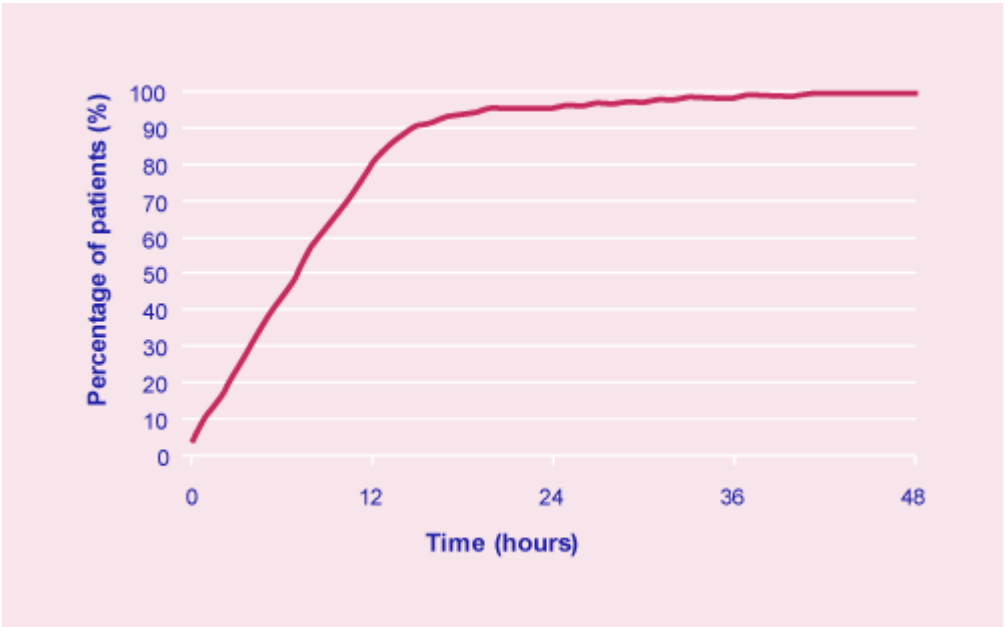

Figure 1. Time between ICU admission and first consultant review *n=635*

Recommendations

- **Trusts should ensure that consultant job plans reflect the pattern of demand for emergency admission to ICU and provision should be made for planned consultant presence in the evenings (and perhaps at night in busier units).**
- **Patients should rarely be admitted to ICU without the prior knowledge or involvement of a consultant intensivist.**
- **A consultant intensivist should review all patients admitted to ICU within 12 hours of admission [9]. Regular audit should be performed against this standard.**

8. Patients who died

Key findings

- **Management of the airway, breathing, circulation, monitoring and oxygen therapy were generally rated highly. However, even in these categories a high proportion of cases (11, 16, 14, 13 and 14% respectively) were rated at the very poor end of the spectrum.**
- **The most worrying domains were ability to seek advice, appreciation of clinical urgency and supervision; 30%, 21% and 28% of cases respectively were rated at the very poor end of the spectrum.**
- **ICU admission was thought to be avoidable in 21% of cases.**
- **Care was classified as less than good practice in 47% of cases.**
- **In 41 cases where care was classified as less than good practice the deficiencies were considered to be of such significance that they might have contributed to death. This represents 33% of cases classified as less than good care and 11% of all cases reviewed that had sufficient data.**

Introduction

The advisor group reviewed all available notes for those patients who subsequently died after admission to ICU. Of the 1,667 patients included in this study, 560 deaths occurred. From these 560 patients, 439 sets of case records were provided to NCEPOD. In addition to quantative assessment, the advisors were asked to provide expert opinion on aspects of each case.

Appropriateness of referral

Table 1 shows that 92% of referrals to ICU were thought to be appropriate. In the remaining 8% of cases the advisors felt that referral was inappropriate due to very poor predicted outcome and the fact that ICU admission was not likely to be of benefit. In these cases it was felt that the medical team responsible should have been able to make the decision that critical care was not appropriate and to document this decision in the notes following discussion between a senior doctor and the patient and/or family.

Table 1. Appropriateness of referral to ICU

Referral appropriate	Total	*(%)*
Yes	387	*(92)*
No	34	*(8)*
Sub-total	**421**	
Insufficient data	18	
Total	**439**	

The decision to refer patients to ICU is often difficult, based on the perceived likely benefits to the patient and the limited critical care resource that is available. These decisions are difficult and should ideally be informed by consultant medical staff. Table 2 shows the grade of staff that referred patients to ICU who were classified as expected to die or had a definite risk of dying.

Table 2. Patients classified as expected to die or definite risk of dying on admission to ICU by practitioner who referred them			
Referring practitioner		**No. of patients expected to die**	***(%)***
Not referred by consultant physician	Referred by registered nurse	1	
	Referred by SHO	36	
	Referred by SpR Yr 1-2	30	
	Referred by SpR Yr 3	30	
	Referred by Staff / Associate specialist	8	
	Other	7	
Sub-total		**112**	***71***
Consultant physician notified in these cases?	Yes	45	
	No	57	
	Unknown	10	
Referred by consultant		**41**	***26***
Referring practitioner not supplied		**4**	***3***
Total		**157**	

As can been seen from Table 2, 71% (112/157) of patients classified as expected to die, were referred to ICU by non-consultants. In this group of 112 patients, consultants were involved in the decision or process of referral in only 45 cases (40%). The low level of consultant physician input in this very sick group of patients must be questioned. It could be argued that consultant physicians should be involved in all patient referrals to critical care. One argument against this is that it would potentially introduce unnecessary delays and may not increase the appropriateness of referral. However, the structural changes in acute medicine that are being proposed by the Royal College of Physicians should increase the availability of consultants to participate in this process [8]. Furthermore it would seem difficult to argue that consultants, with the benefit of training and experience, would not make more appropriate decisions about the process of care than doctors still in training.

The involvement of consultant staff in intensive care in difficult decisions regarding admission of patients who may not benefit from the process of intensive care is also crucial. Table 3 shows that there was a higher degree of consultant input from critical care than medicine but that 23% of patients classified as likely to die were accepted to ICU without consultant involvement.

Table 3. Patients classified as expected to die or definite risk on admission to ICU by grade of accepting physician	
Accepting grade	**Number of patients where death was expected**
Intensive care consultant	108
Staff Grade / Associate Specialist	4
SpR	17
SHO	7
Registered nurse	2
Other	3
Sub-total	**141**
Not answered	5
ICU questionnaire not available	11
Total	**157**

It is of vital importance that acutely unwell patients receive prompt therapy. Patients who require critical care often have limited physiological reserve and delays in providing appropriate therapy can worsen outcome. In the opinion of the advisors, 22% of this patient population were not referred to critical care at the correct time and were considered to be patients who could have potentially benefited from earlier referral (Table 4). Although this could be criticised as subjective opinion, it should be remembered that a significant number of patients had documented prolonged physiological disturbance (see chapter on Pre ICU care). There was no difference in the timeliness of referral by consultant or other grades.

Table 4. Timing of referrals to critical care								
Referral at correct time?	**Referring consultant**	***(%)***	**All others**	***(%)***	**Sub-total**	**Not answered**	**Total**	***(%)***
Yes	55	*(79)*	165	*(77)*	220	69	289	*(78)*
No	15	*(21)*	48	*(23)*	63	18	81	*(22)*
Sub-total	**70**		**213**		**283**	**87**	**370**	
Insufficient data	3		22		25	13	38	
Not answered	3		22		25	6	31	
Total	**76**		**257**		**333**	**106**	**439**	

There are a number of patients who will not benefit from the process of intensive care, primarily due to lack of reversibility of pathophysiological process and lack of physiological reserve. It is also the reality that the supply of ICU beds is limited. It is therefore of great importance to carefully select patients who are to be admitted to ICU. In this population it was felt that 88% of admissions were appropriate (Table 5a). The remainder were thought to be inappropriate due to poor predicted outcome. As can be seen there was a small, but not statistically significant difference, in the appropriateness of admission when broken down by grade of referring staff. It should be of no surprise that consultants would be better placed to assess the appropriate level of care for their patients. Table 5b shows the grade of ICU staff who accepted the patients felt to be inappropriate admissions. As can be seen, 36% of these patients (17/47) were accepted by non-consultants, with consultant intensivists accepting the remaining 64%.

Table 5a. Appropriateness of admission to ICU								
Admission appropriate	**Consultant**	***(%)***	**All others**	***(%)***	**Sub-total**	**Not answered**	**Total**	***(%)***
Yes	68	*(93)*	205	*(86)*	273	88	361	*(88)*
No	5	*(7)*	34	*(14)*	39	10	49	*(12)*
Sub-total	**73**		**239**		**312**	**98**	**410**	
Insufficient data	3		18		21	8	29	
Total	**76**		**257**		**333**	**106**	**439**	

Table 5b. Grade of ICU staff who accepted patients felt to be inappropriate admissions	
Accepting grade	**Total**
Consultant	30
SHO	2
SpR	14
Staff Grade / Associate Specialist	1
Sub-total	**47**
Not answered	2
Total	**49**

Clinical management of cases

One aspect of the advisors expert opinion was whether or not there were clearly identifiable opportunities for different management. In particular were any of the admissions to ICU considered avoidable? Table 6a shows that 21% of admissions were considered avoidable and Table 6b shows the reasons for this decision. In 21 cases it was felt that different care (including earlier recognition of clinical deterioration) could have resulted in clinical improvement and avoided the need for ICU care. In 58 cases it was felt that due to the lack of reversibility of disease process, a treatment limitation order could have been made which would have included non-escalation to ICU care. This figure for potentially avoidable admissions is in keeping with the literature [1].

Table 6a. ICU admissions that were avoidable		
Admission avoidable?	**Total**	***(%)***
Yes	83	*(21)*
No	313	*(79)*
Sub-total	**396**	
Insufficient data	43	
Total	**439**	

Table 6b. Reasons why admissions were considered avoidable	
Reason ICU admission could have been avoided (Answers may be multiple)	**Total** *n = 83*
Different care could have prevented need for admission	21
Treatment limitation decision could have avoided admission	58
Other	9
Total	**88**

Each of the cases were graded on a nine point scale, where one = very poor and nine = excellent. Aspects of clinical management that were assessed using this method were: airway management, management of breathing, management of the circulation, use of monitoring and oxygen therapy. The findings are presented in Figures 1-5.

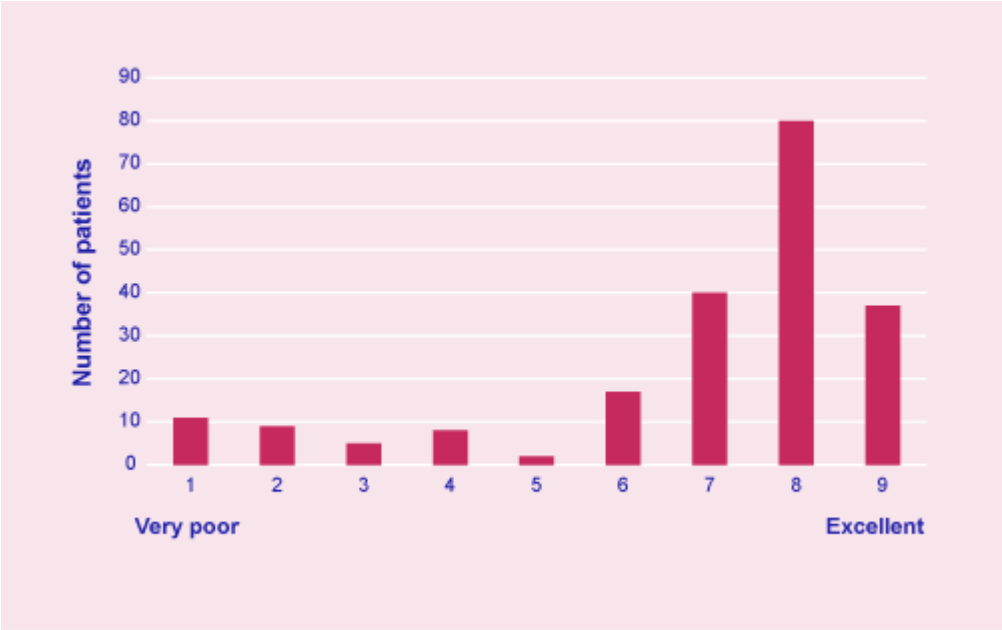

Figure 1. Airway management *n=209*

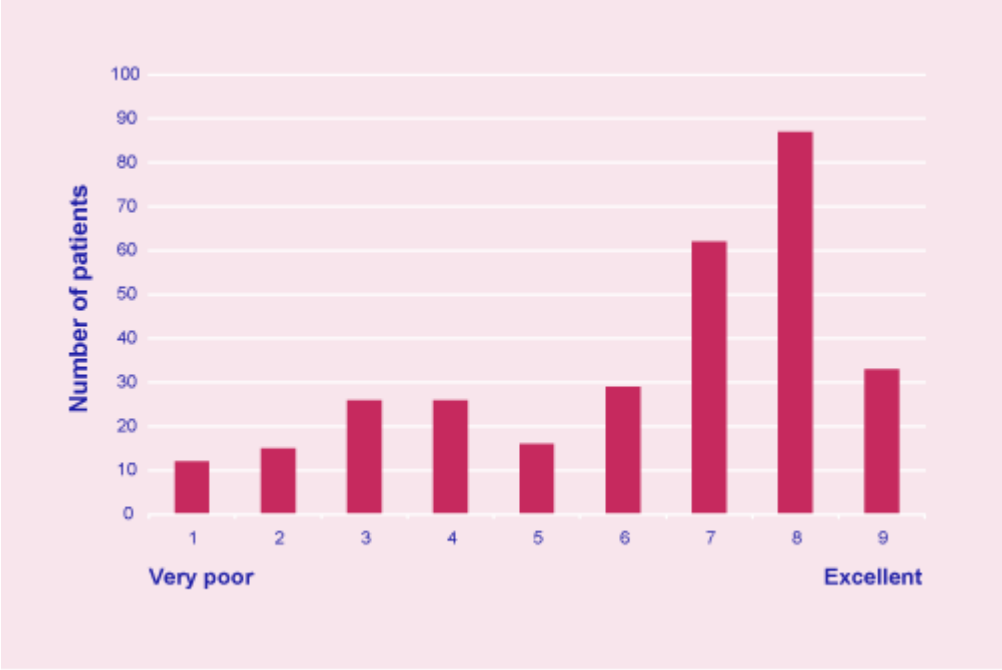

Figure 2. Breathing management *n=306*

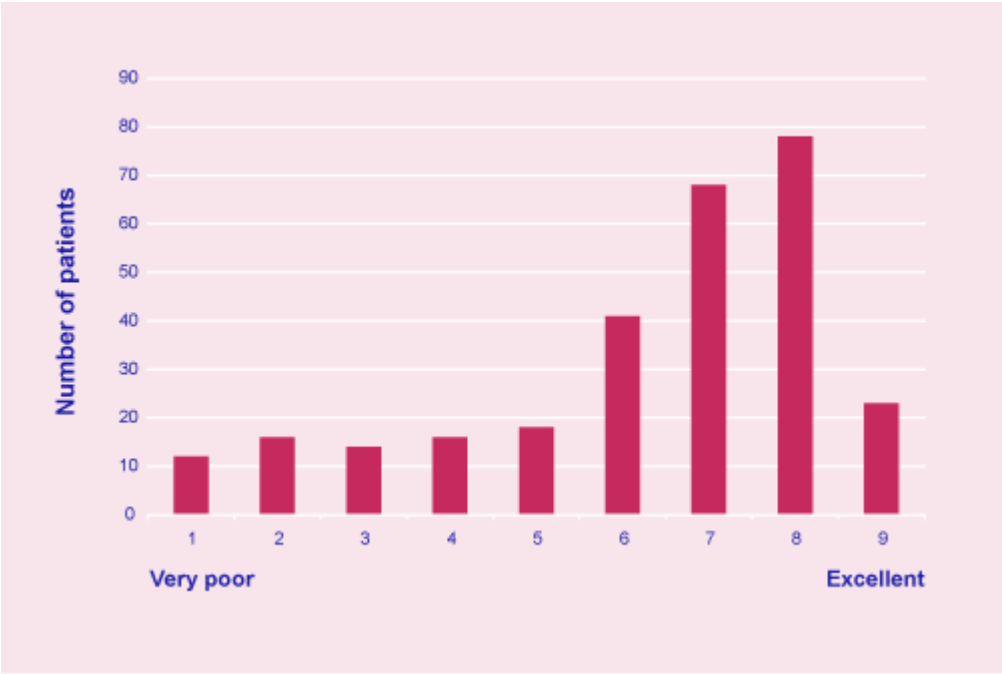

Figure 3. Circulation management *n=286*

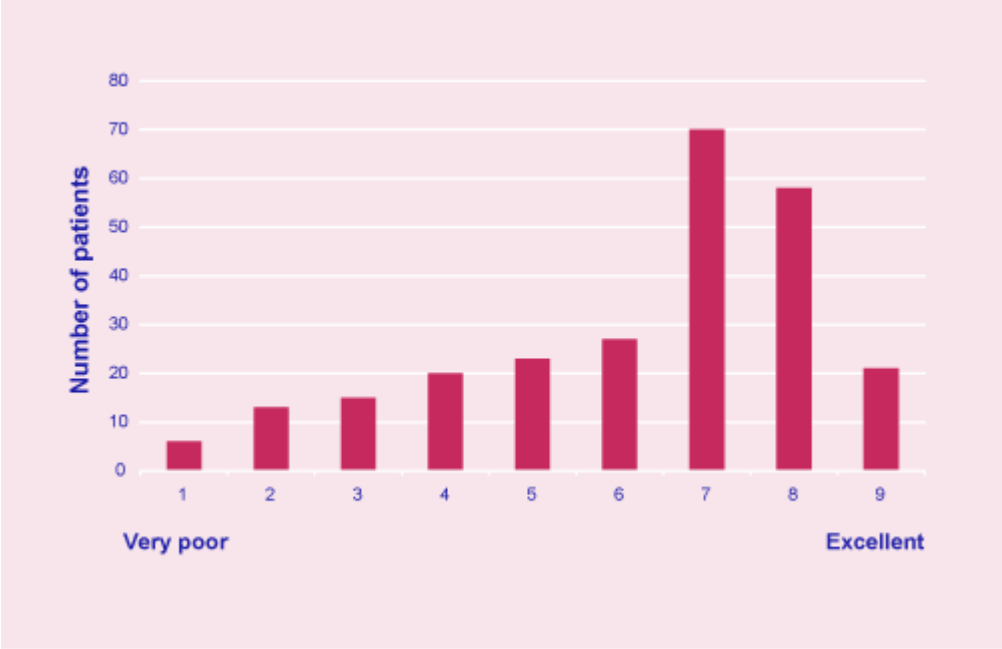

Figure 4. Monitoring *n=235*

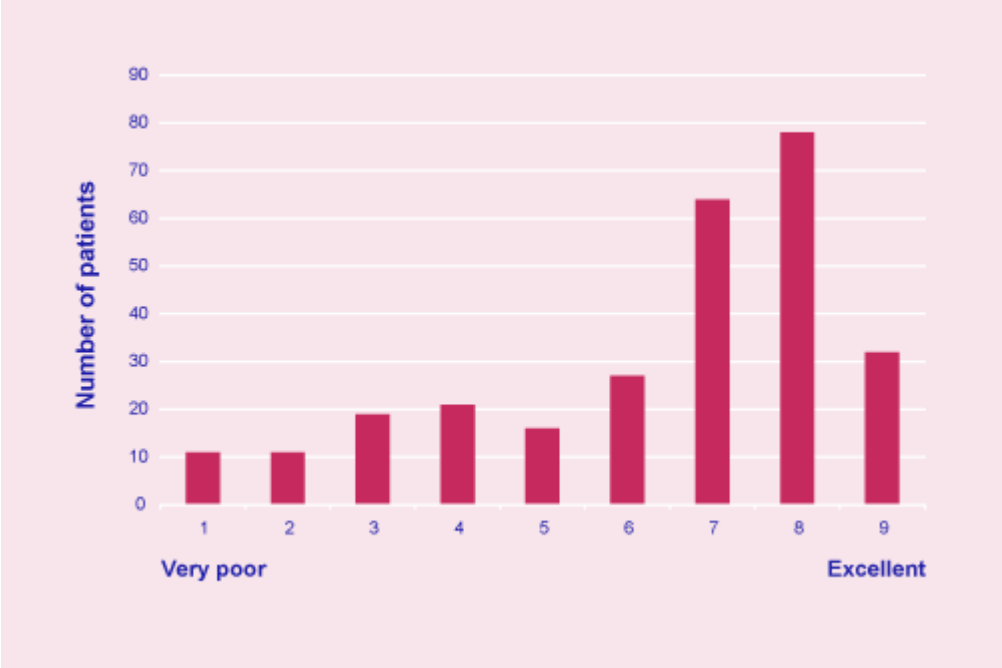

Figure 5. Oxygen therapy *n=279*

As can be seen, these domains were generally rated highly. However, although there is a skew to the higher end of assessment there were still a significant number of cases that gave cause for concern. Cases were rated at the very end of the spectrum (grades 1-3) with respect to management of the airway (11%), breathing (16%), circulation (14%), monitoring (13%) and oxygen therapy (14%). This is particularly worrying as previous work has shown that suboptimal management of these aspects of care may be associated with increased morbidity, mortality and avoidable admissions to critical care[1].

Supervision of cases

These findings, although of great concern, are not surprising. Such deficiencies in the ability of junior doctors have been demonstrated previously [31]. The past two years have seen an unprecedented and rapid change in established working patterns, driven by the imperative to meet the European Working Time Directive and compounded by the changes in training set out in the Chief Medical Officer's report *Unfinished business* [32] and in the Department of Health's response *Modernising medical careers* [33]. Shift work and fragmentation of the team due to the reduction in junior doctors' hours have led to poor continuity of care for patients and a loss of learning opportunities for trainees. The product of many of these changes is that junior medical staff are less able to manage the demands of acutely unwell patients. It is therefore vital to develop strategies such as outreach services and critical illness education packages that can bridge the deficiencies highlighted [34].

Case study

A patient in their late seventies presented as an emergency admission with a history of productive cough and breathlessness over the preceding 48 hours, associated with a high temperature and rigors. There was no past history of chest disease. A presumptive diagnosis of community acquired pneumonia was made. On admission notable findings were signs of consolidation at the base of the right lung, hypoxia on room air (SpO_2 64%) and on oxygen (SpO_2 89% on 15 l/min via rebreathing mask), tachycardia (135 beats per minute) and neutropenia. An arterial blood gas performed 12 hours after admission revealed a PaO_2 of 6.6 kPa on high flow oxygen. Over the next 24 hours the patient became more hypoxic and tachypnoeic. No consideration was given to the use of invasive or non-invasive ventilation in the setting of worsening hypoxia. The patient suffered a cardiac arrest 36 hours after hospital admission. After resuscitation the patient was transferred to ICU where death occurred 72 hours later. The diagnosis was subsequently confirmed to be pneumococcal pneumonia.

This case highlights the inappropriate use of oxygen therapy, since the plan that was followed did not relieve the profound hypoxia, and eventually led to cardiac arrest. In addition, it highlights the lack of appreciation of severity of illness and clinical urgency.

Other aspects of care that were assessed were ability to seek advice from senior doctors, appreciation of clinical urgency, clinical knowledge, organisational aspects of care and supervision. The findings are shown in Figures 6 to 10.

Figure 6. Ability to seek advice from senior doctors *n=212*

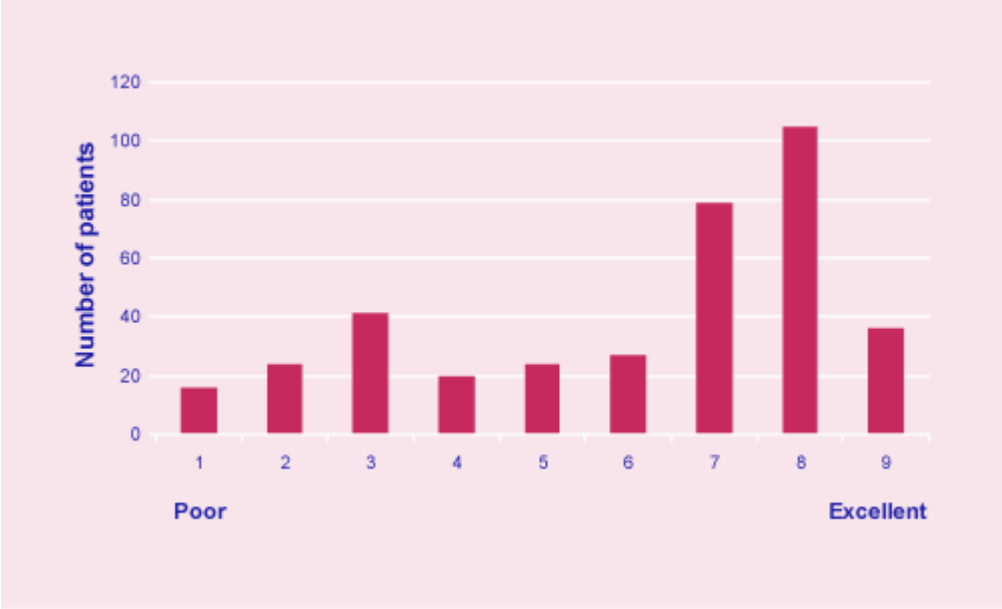

Figure 7. Appreciation of clinical urgency *n=372*

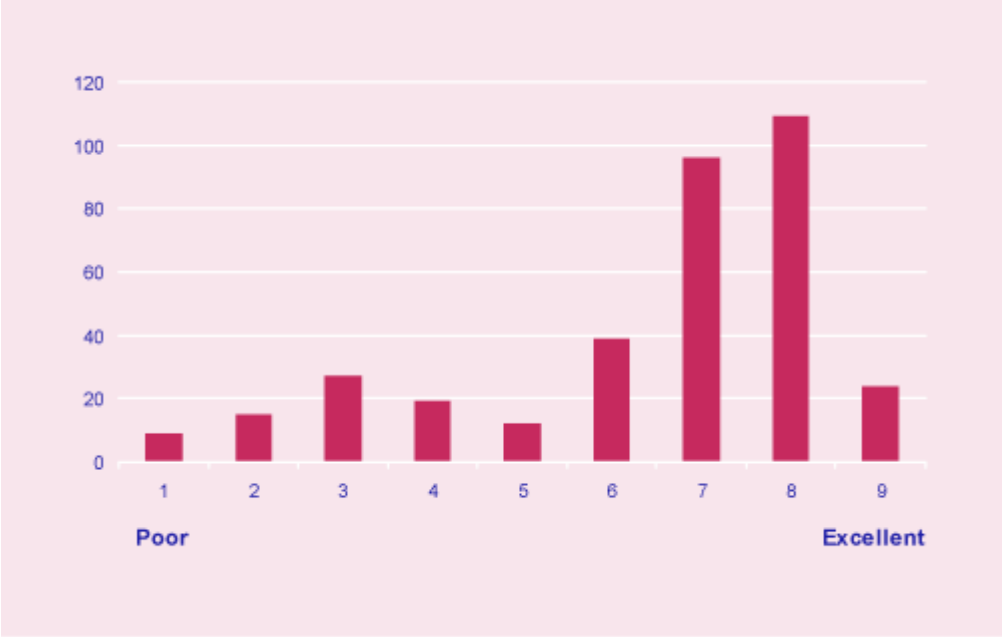

Figure 8. Clinical knowledge *n=350*

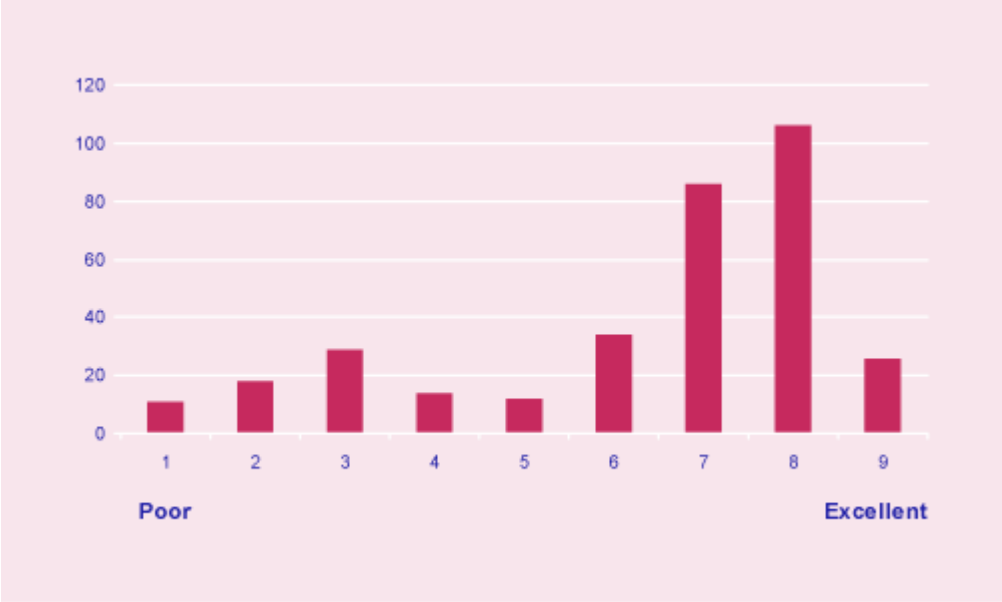

Figure 9. Organisational aspects of care *n=336*

Figure 10. Supervision *n=234*

The most worrying domains were ability to seek advice, appreciation of clinical urgency and supervision; 30%, 21% and 28% of cases were rated at the very poor end of the spectrum (Grades 1-3). NCEPOD has previously recommended that surgical and anaesthetic trainees should readily seek senior advice and not operate unsupervised at night [21]. Similar recommendations for senior input have been made for patients with major trauma [35]. However, few reports or recommendations regarding consultant input are available for the care of medical patients. As can been seen in this report there was a significant problem in seeking advice and consultant supervision. It appears that junior doctors in medicine are often providing care that would be improved by greater consultant input and supervision.

Case study

A patient in their early thirties was admitted following a significant overdose of coproxamol and codeine. They presented to hospital at 10:00 hrs and were combative and non-compliant with examination or investigation, and their Glasgow Coma Score was estimated to be 14. The patient was given haloperidol to try to manage their aggressive state. Over the next 12 hours they remained agitated and difficult to assess. At 23:00 hrs they were noted to be drowsier (GCS estimated at nine) and blood was eventually taken which revealed toxic quantities of paracetomol but no therapy was instituted due to their continued combative manner and lack of intravenous access. The medical SHO discussed the problem of agitation with the medical SpR who stated he would review soon. Over the next hour the patient started making tonic-clonic movements which were assessed by the SHO as not representing seizures. No further review or intervention occurred until two hours later when the patient was noted to be apnoeic and pulseless. After a prolonged resuscitation the patient was transferred to ICU, where they subsequently died.

This was a very difficult case to manage and the junior doctors found great difficulty in coping with an aggressive patient with a life-threatening, but entirely reversible, condition. There was no consultant physician input in this case, highlighting the problems of the failure of junior doctors to seek support and lack of consultants actively managing the acute medical take and supporting their medical team.

Case study

An elderly patient was admitted as an emergency under the care of the physicians with a history of shortness of breath and palpitations. Colonoscopy and biopsy had been performed five days earlier as an outpatient. They were admitted to the medical assessment unit and treatment was started for a supraventricular tachycardia. There was no previous history of heart disease. Despite rate control the patient remained unwell, the predominant feature being tachypnoea and hypotension. They remained on the ward for five days with clear deterioration in cardiovascular, respiratory and renal function. At no time did a consultant physician review the patient. Abdominal pain became a feature of their illness on the fifth day after admission. The surgical SpR opinion was that there was peritonitis secondary to perforation of a viscus. The patient was transferred to ICU to allow optimisation of their condition prior to any surgical intervention. However, due to continued deterioration in the face of supportive care a laparotomy was felt inappropriate and the patient was allowed to die “peacefully”. The intensive care questionnaire states “not been seen by a consultant physician despite being on medical ward for five days”.

Elderly patients with critical illness have a very high mortality. Early recognition and intervention is essential. The lack of consultant input in this case is worrying. In addition there was no outreach service in this hospital, which may have allowed earlier identification and management of the problems.

Assessment of cases

An overall assessment of each case was made using the classification given in Table 7. In 206 cases it was felt that care was of a good standard. However, there were a significant number of cases where the standard of care fell below this level. In the cases where care was classified as less than good practice, the advisors were asked to quantify the impact of the deficiencies. Table 8 shows the potential impact of deficiencies in care on mortality. It was felt that sufficient information was available to assess the potential impact on mortality in 124 cases. Within the group it was felt that there were 41 cases where these deficiencies could have contributed to death.

Table 7. Classification of overall assessment of each case		
Advisors overall of assessment of care	**Number of cases**	***(%)***
Good practice	206	*(53)*
Room for improvement – clinical	100	*(26)*
Room for improvement – organisational	30	*(8)*
Room for improvement - both clinical and organisational	22	*(6)*
Less than satisfactory	30	*(8)*
Sub-total	**388**	
Insufficient data	51	
Total	**439**	

Table 8. Potential impact of standard of care being less than good on mortality		
Did deficiencies contribute to death?	**Total**	***(%)***
Yes	41	*(34)*
No	83	*(68)*
Sub-total	**124**	
Insufficient data	58	
Total	**182**	

Recommendations

- **Training must be provided for junior doctors in the recognition of critical illness and the immediate management of fluid and oxygen therapy in these patients.**
- **Consultants must supervise junior doctors more closely and should actively support juniors in the management of patients rather than only reacting to requests for help.**
- **Junior doctors must seek advice more readily. This may be from specialised teams e.g. outreach services or from the supervising consultant.**

9. Outreach

Key findings

- **There was geographical inequality in the presence of outreach services, with the majority being provided in English hospitals.**
- **One in four hospitals did not use some form of track and trigger system to allow early identification of deteriorating patients.**

Introduction

One of the approaches to the recognition and management of seriously ill patients has been the development of early warning systems and outreach services. This was proposed as a solution in England by the Department of Health in 2000 [10] and has been endorsed by the Royal College of Physicians in 2002 [7].

It is not clear how outreach services should be organised and there are a number of different models of outreach care [25,36]. The main differences are the trigger that prompts review by an outreach service, the availability of the outreach service throughout the 24 hour period and the composition of the outreach team that responds to the trigger. It is unlikely that the trigger used is of great importance, so long as it is suitably sensitive and specific, but it is of no use highlighting deteriorating patients through an early warning system if there is no link to a robust and effective team response and critical care service.

Availability of outreach services

We have earlier shown that the presence of outreach systems was variable and geographically biased towards England (Table 1). This lack of uniformity is unacceptable given the support to outreach from the Department of Health, the Intensive Care Society and the Royal College of Physicians. Unfortunately, we did not collect data concerning the availability of outreach services throughout the 24 hour period.

Table 1. Outreach services available in the United Kingdom

	Outreach service			
Country	**Yes**	**No**	**Not answered**	**Total**
England	108	65	2	175
Independent hospitals	5	7	1	13
Wales	3	9	0	12
Northern Ireland	0	9	0	9
Guernsey	0	1	0	1
Isle of Man	0	1	0	1
Total	**116**	**92**	**3**	**211**

In addition, many hospitals did not use a track and trigger system to allow early recognition of patients who are at increased risk of death (Table 2).

Table 2. Hospitals' use of early warning systems		
Early warning system	**Total**	***(%)***
Yes	153	*(73)*
No	58	*(28)*
Total	**211**	

This study was not designed to show any effect of outreach on outcome but has uncovered data of interest.

Table 3. Presence of outreach by review time slot										
Review time slot	**Outreach service**									
	Yes	***(%)***	**No**	***(%)***	**Unknown**	***(%)***	**Not answered**	***(%)***	**Total**	***(%)***
Day	103	*(48)*	217	*(32)*	42	*(43)*	20	*(38)*	382	*(36)*
Evening	79	*(37)*	286	*(42)*	34	*(35)*	23	*(43)*	422	*(40)*
Night	33	*(15)*	183	*(27)*	22	*(22)*	10	*(19)*	248	*(24)*
Sub-total	**215**		**686**		**98**		**53**		**1,052**	
Not answered	22		94		32		35		183	
Total	**237**		**780**		**130**		**88**		**1,235**	

Table 3 shows the time of day that patients were reviewed by critical care services for hospitals with and without an outreach service. It can be seen that hospitals with an outreach service were more likely to highlight patients during daytime and have reduced referrals at night. This may be due to earlier recognition of deteriorating patients and would be consistent with the rational for outreach services.

The advisor groups considered the appropriateness and timeliness of admission to ICU (Tables 4 and 5). As can be seen in this study there was no measurable effect of outreach services on either variable. In a study of this size it is not surprising that no measurable effect on these domains could be shown. The effect of outreach on these variables is likely to be lessened by other factors that we have shown earlier in the report. These factors (lack of senior doctor involvement in patient management and admission decisions, delays in ICU review and admission, lack of 24 hour 7 day per week cover by outreach services) will potentially reduce the proposed benefit of outreach. However, the result that there is no measurable difference in this small study should not be interpreted as lack of evidence of benefit of outreach.

Table 4. Appropriateness of admission by presence of outreach				
	Outreach service?			
Admission appropriate?	**Yes**	**No**	**Not answered**	**Total**
Yes	245	96	16	361
No	31	12	6	49
Sub-total	**276**	**108**	**22**	**410**
Insufficient data	22	5	2	29
Total	**298**	**113**	**24**	**439**

Table 5. Timeliness of admission by presence of outreach				
	Outreach service?			
Referral at correct time?	Yes	No	Not answered	Total
Yes	202	73	14	289
No	52	23	6	81
Sub-total	**254**	**96**	**20**	**370**
Insufficient data	27	9	2	38
Not answered	21	8	2	31
Total	**302**	**113**	**24**	**439**

Table 6 shows patient outcome according to the presence of an outreach service. It can be seen that there was no positive association between outreach services and outcome within this study. Again this is not surprising given the confounding factors mentioned above. In addition, it may be that hospitals with an effective outreach team will facilitate management of some patients on the ward and avoid admission to ICU. This will have the effect of increasing the severity of illness of patients admitted to ICU (by removing the less unwell patients who remain on the ward) and may worsen crude ICU mortality.

It should be noted that a large multi-centre study evaluating the utility of outreach services has been commissioned by the Department of Health and is being taken forward by the Intensive Care National Audit and Research Centre(ICNARC). Results from this study should be available in 2007.

Table 6. Outcome by presence of outreach					
Outcome	Hospital outreach service?				
	Yes	No	Sub-total	Not answered	Total
Died on ICU	366	139	505	55	560
Survived	643	351	994	102	1,096
Sub-total	**1,009**	**490**	**1,449**	**157**	**1,656**
Unknown	0	1	1	1	2
Not answered	9	8	17	2	19
Total	**1,018**	**499**	**1,517**	**160**	**1,677**

Recommendations

- **Each hospital should have a track and trigger system that allows rapid detection of the signs of early clinical deterioration and an early and appropriate response.**
- **Although this recommendation does not emerge from the findings in this report, NCEPOD echoes other bodies and recommends that trusts should ensure each hospital provides a formal outreach service that is available 24 hours per day, seven days per week. The composition of this service will vary from hospital to hospital but it should comprise of individuals with the skills and ability to recognise and manage the problems of critical illness [7,10,25,36].**
- **Outreach services and track and trigger systems should not replace the role of traditional medical teams in the care of inpatients, but should be seen as complementary.**

10. Quality of medical records and audit

Key findings

- **The quality of medical records was poor.**
- **Documentation of resuscitation decisions rarely happened, even in patients at high risk of deterioration.**
- **Retrospective review (audit) of patients' management was infrequent.**
- **Where retrospective review did occur, there was a low level of participation by referring physicians.**

Introduction

Quality in the medical record is crucial. The issues of legibility, attribution of each entry, date and time of each entry and content of each entry are key. This allows good patient care, good communication, and compliance with GMC requirements. In addition, a poor medical record hampers retrospective casenote review. The quality of casenotes reviewed in this study was assessed. Although difficult to measure, the advisor group consistently commented on the poor legibility of a large number of medical records. Table 1 shows that 59% of entries in the medical record did not have adequate contact details recorded and of these it was impossible to determine the grade of doctor who reviewed the patient in 43% of patients.

Entries in medical records

It is clear that the quality of the medical record was poor and not in keeping with current guidance and that significant improvement is required [37,38,39].

Table 1. Contact details recorded in patients' medical records

Contact details* recorded	**Total**	***(%)***
Yes	904	*(41)*
No	1,330	*(59)*
Total	**2,234**	

***Contact details** = at least two of the following:
Name
Bleep number
Grade

It has been recommended that patients at risk of deterioration should have their resuscitation status considered early in their care. The General Medical Council is quite clear in this regard -

"Where a patient is already seriously ill with a foreseeable risk of cardiopulmonary arrest, or a patient is in poor general health and nearing the end of their life, decisions about whether to attempt CPR [cardiopulmonary resuscitation] in particular circumstances ideally should be made in advance as part of the care plan for that patient. A patient's own views, about whether the level of burden or risk outweighs the

likely benefits from successful CPR, would be central in deciding whether CPR should be attempted. It is important in these cases to offer competent patients or, if a patient lacks capacity to decide, those close to the patient, an early opportunity to discuss their future care and the circumstances in which CPR should or should not be attempted" [40].

A more recent joint publication also emphasises the importance of decisions relating to resuscitation status [41].

Such actions will allow for a clear plan of management in the event of deterioration. This is especially important as the impact of shift working has reduced continuity of care significantly and it is less likely that a member of the medical team who knows the patient will be present.

Resuscitation status

Table 2 shows that documentation regarding resuscitation status could only be found in 42 health records (of the 390 sets of notes with sufficient data available for review). Table 3 shows the predicted risk of death on admission to hospital and Table 4 shows the predicted risk of death on referral to the ICU (predicted by referring physician) in the group of patients who died. It is clear that a large number of acute medical admissions in this group were considered to be at high risk of death (expected or at definite risk) - 229 on admission to hospital and 325 at referral to ICU in this study. It is disappointing that only 42 health records contained statements about resuscitation status. This is clearly not in line with GMC guidance.

Table 2. Statement of resuscitation status in health records

Resuscitation status documented	**Total**	***(%)***
Yes	42	*(11)*
No	348	*(89)*
Sub-total	**390**	
Insufficient data	49	
Total	**439**	

Table 3. Predicted risk of death at hospital admission (group of patients who died)

Risk of death at hospital admission	**Total**	***(%)***
Not expected	40	*(12)*
Small but significant risk	58	*(17)*
Definite risk	182	*(53)*
Expected	47	*(14)*
Unable to define	15	*(4)*
Sub-total	**342**	
Not answered	97	
Total	**439**	

Table 4. Predicted risk of death on referral to ICU (group of patients who died)		
Risk of death on leaving the ward	**Total**	***(%)***
Not expected	1	*(0)*
Small but significant risk	7	*(2)*
Definite risk	234	*(68)*
Expected	91	*(27)*
Sub-total	**333**	
Not answered	106	
Total	**439**	

Where a statement regarding resuscitation could be found, an attempt was made to assess whether discussion had taken place with the patient and/or family. This data is shown in Tables 5 and 6. There was a surprising lack of discussion with patients about this aspect of their treatment. Whilst there was greater family discussion, there were still a number of patients in whom it appeared that decisions about resuscitation had been made without involvement of either party.

Table 5. Discussion with patients of resuscitation statement	
Patient discussion	**Total**
Yes	2
No	21
Sub-total	**23**
Insufficient data	19
Total	**42**

Table 6. Discussion with patients' families of resuscitation statement	
Family discussion	**Total**
Yes	17
No	8
Sub-total	**25**
Insufficient data	17
Total	**42**

Morbidity & mortality meetings

Morbidity and mortality (M&M) meetings should be an integral part of the provision of good medical care. It was therefore of great concern that 40% of hospitals within this study reported that the critical care service does not have regular M&M meetings (Table 7a). Where M&M meetings did occur, it is clear from the data in Table 7b that the main input into these meetings was by consultants in anaesthesia and intensive care medicine. Whilst other staff members did attend it was with a much lower frequency and undermined the principle of multidisciplinary case review. We have earlier shown that there are concerns with the management of medical patients prior to admission to critical care. The low participation of referring

physicians in M&M meetings is a missed chance to address some of these issues.

Table 7a. Regular morbidity and mortality (M&M) meetings in ICU		
Mortality meetings	**Total**	***(%)***
Yes	125	*(60)*
No	83	*(40)*
Sub-total	**208**	
Not answered	3	
Total	**211**	

Table 7b. Attendance of morbidity and mortality (M&M) meetings in ICU	
Which health professionals attend (Answers may be multiple)	**Total *n = 202***
Anaesthetists	94
Intensive care consultants	114
ICU trainees	96
Microbiologists/infection control	20
Nurses	76
Nutrition/dietetic staff	15
Operating department practitioners	5
Pathologists	2
Pharmacists	17
Physiotherapists	28
Referring physicians	14
Referring surgeons	19
Other	13

The ICU consultant who completed the ICU questionnaire was asked whether each patient's management would be reviewed at an M&M meeting. This data is shown in Table 8. There were only 168 cases where it was stated that the patient's management would be reviewed. It should be remembered that there were 560 deaths within this study (see Data overview chapter). Whilst there were a large number of cases where the answer to the question of review was unknown or not answered there is the possibility that a number of deaths were not considered at mortality and morbidity meetings. Tables 9a and 9b show that consultant physicians were informed in less than 27% of cases where a patient originally under their care was to be reviewed at an M&M meeting and even with notification, the attendance of a consultant physician was low. Many of the problems in the care of acute medical patients, which have been highlighted in the literature and in this study, are rooted in process issues that are ideally suited to be broached in the forum of M&M meetings. The low level of M&M meetings and participation from medicine is therefore very worrying. In addition, the data suggests that the guidance issued by the Federation of the Royal Colleges of Physicians of the UK is not being complied with [9]. This document states that '"all deaths within 24 hours of admission and other unexpected deaths should be promptly reviewed in a multidisciplinary forum".

Table 8. Review of patients' management at morbidity and mortality (M&M) meetings (answers from ICU consultants)		
Patient's management to be reviewed at M&M meeting?	**Total**	***(%)***
Yes	168	*(20)*
No	686	*(80)*
Sub-total	**854**	
Unknown	178	
Not answered	564	
Total	**1,596**	

Table 9a. Consultant physician informed of patient's review at morbidity and mortality (M&M) meetings		
Physician informed?	**Total**	***(%)***
Yes	21	*(27)*
No	57	*(73)*
Sub-total	**78**	
Unknown	29	
Not answered	61	
Total	**168**	

Table 9b. Consulting physician attendance of patient's review at morbidity and mortality (M&M) meetings		
Physician present?	**Total**	***(%)***
Yes	6	*(33)*
No	12	*(67)*
Sub-total	**18**	
Unknown	2	
Not answered	1	
Total	**21**	

Recommendations

- **All entries in the notes should be dated and timed and should end with a legible name, status and contact number (bleep or telephone).**
- **Each entry should clearly identify the name and grade of the most senior doctor involved in the patient episode.**
- **Resuscitation status should be documented in patients who are at risk of deterioration [40]. Each trust should audit compliance with this recommendation by regular review of patients who suffered a cardiac arrest and assessment of whether a 'do not attempt resuscitation' order should have been made prior to this event.**

11. Pathology

Key findings

- **16% of the patients who died in this study had an autopsy. Of these 77% were authorised by a coroner and only 18% were the result of a clinician request.**
- **Of the received autopsy reports, 50% were judged to be satisfactory or better.**
- **34% of reports had no clinico-pathological summary and in 24%, where it was presented, it was judged to be unsatisfactory.**
- **The causes of death were erroneously structured according to the ONS pattern of formulation in 26% of cases and in a similar number of cases the causes of death were judged not to reflect the clinico-pathological circumstances.**

Introduction

Of the 560 patients in this study population who died. 16% (91/560) had an autopsy. Autopsy reports were received from 48% (44/91) of these cases. Since there are only 44 reports to consider, analysis and comment are necessarily limited. The observations on quality are based on standards indicated in the Royal College of Pathologists *Guidelines for Autopsy Practice* [42] which are intended to apply to both consented and coronial autopsies.

Most of the observations on autopsy quality are similar to those in previous NCEPOD reports. For coronial autopsies, there is the issue over the difference in expectations of what information an autopsy is intended to provide, between clinicians and the coroner. Under the Coroners Act 1988, coroners are only required to determine how the person came by their death, i.e. what is the cause of death. Clinicians would like to know more about the underlying disease, its complications and the impacts of treatment in order to audit the care of their patients. Another point made in the last report [43], that the formulations of causes of death could be significantly improved, pertains again in the current data set.

Autopsy rate

18% (8/44) of the autopsies followed clinicians' interest and consent from relatives, but the majority (80%, 35/44) were performed on instruction from a coroner. The remaining one was unable to be classified. The overall proportion of autopsies among the patients dying on ICUs (16%) is less than the current national average of 23% of all deaths [44]. Whilst patients on ICUs are perhaps more likely to have known underlying pathology compared with many deaths in the community, the experience of this patient data set as well as published and personal experience indicate that the autopsy on ICU patients presents many surprises [45]. The revealed clinical pathology and comparison with the presumed pathology is often useful in formulating policy changes in ICU management. More consented autopsies should be sought from this important patient population.

Age of cases

The median age of the patients autopsied was 65 years (range 16-84).

Clinical history

A clinical history was incorporated into the autopsy report in 84% (37/44) of cases, and qualitatively was satisfactory or better in 81% (30/37) of those. The unsatisfactory reports failed to indicate the clinical questions being addressed, confused the dates of events, omitted mention of MRSA, or were so short as to be unhelpful, for example “This man was admitted with breathlessness”.

External descriptions of the cadaver

Only 7% (3/44) were unsatisfactory, usually being too telegraphically short. Since the patients came from ICU and all had lines inserted at some stage during admission, one expects that the lines and other devices should have been left in the body pending the autopsy and that all descriptions would include mention of such lines instead of in only 73% (32/44) of reports.

Body measurements

It is recommended that body height and weight be recorded for all autopsied patients[42]. In this study, 73% (32/44) had their height recorded and 64% (28/44) were weighed. Anecdotally we know that budgetary constraints often inhibit provision in public mortuaries of equipment such as body scales.

Full or limited autopsy

Full autopsies were conducted in all but seven cases, where the head was not opened for examination of the brain. The reasons given for this were, in one case, specific non-consent from relatives for opening the skull. In five other coronial cases where the clinical history was presented, the pre-mortem clinical data indicated no issue of possible significant brain clinical pathology. This is now regarded as reasonable, as long as it can be justified that little or no pathological purpose may be served by opening the head and rendering the cadaver less presentable to relatives[42]. Interestingly, in one case where the head was not opened, the pituitary was stated to be normal: presumably this reflects over-reliance on a standard autopsy proforma.

Cerebral pathology

In the other 37 autopsies, the brain was examined and found to be abnormal in ten cases; nearly one third. These included intracerebral haemorrhage, stroke, hypoxic encephalopathy, or metastatic tumours to the brain. Review of the available clinical histories indicates that in most cases these conditions were already known or suspected, the autopsy providing useful confirmation. In only two cases did brain examination bring out previously unknown pathology, but neither were severe: a 1.5cm choroid cyst, and a small old cerebral infarction. However, in the majority of the ‘normal brains’ no histology was performed.

Hypoxic encephalopathy

An issue that has not been addressed nationally in pathology circles is the need to perform histology on the brains of patients who have been clinically declared to be ‘brain dead’. 8% (3/37) of the autopsied patients examined were so categorised in this study, and none had confirmatory histology. The gross appearances of the brain in early hypoxic encephalopathy are non-specific and then the morphological diagnosis can only be confirmed microscopically. In life, the diagnosis of brain death follows strict clinical and imaging criteria, and for medico-legal purposes it is not a requirement to have autopsy confirmation.

Description of internal organs

The great majority of the descriptions were judged satisfactory or better, and only 3/44 were unsatisfactory. The reasons given were extreme brevity, for example, no mention of the coronary arteries in an ischaemic heart death case, and the fact that in a patient with presumed post fracture local sepsis, the site of the fracture was not examined for evidence of infection; normally the fracture site is not examined internally unless there are questions over the pathology underlying the fracture, or its treatment.

Histopathology sampling

Interestingly, in the majority of cases, 55% (24/44), histology was taken. This is more than the proportions of 36%, 28% and 27% in previous reports [22,43,46], a reflection, perhaps, of the complexity of ICU-derived death autopsies. From the advisors’ and general experience, many ICU deaths result from multi-organ failure, which can be very non-specific on gross appearances and requires further investigations for analysis. In this study, three categories of clinical pathology should also, in our opinion, have been investigated histopathologically. These were cirrhosis (three cases), presumed cancer (two cases), and heart valve vegetations (two cases).

It is important to note that histopathology is not routine in coronial autopsy work, being required, and thus permitted, by a coroner when a cause of death may not otherwise be provided from gross examination. There are cost implications for autopsy histopathology, since it is expected to be charged to the coroner by the pathologist or his department. Further, there are resource implications for the coroners’ officers in their obligations to involve relatives in informing about retaining tissue samples or organs. However, once the coroner’s requirement on cause of death is satisfied, and he is ‘functus officio’, the pathologist may legitimately approach the relatives to discuss further, consented, tissue sampling in order to refine the clinical pathology.

Clinico-pathological correlation

The Royal College of Pathologists [42] and NCEPOD increasingly have commented on the importance of the summary clinico-pathological correlation in an autopsy report. This enables a synoptic overview of the case, the diagnosis, the factors that lead to death, and resolution (if possible) of the issues raised by the death. In this sample 34% (15/44), had no such correlation in the report. In 24% (7/29) of cases where it was presented, it was judged unsatisfactory. Again, discussion and proper evaluation of the type of malignancy or of the significance of valvular vegetations were the most frequent basis for this assessment.

Office of National Statistics (ONS) cause of death

In the previous NCEPOD report [43], inadequacies in the formulation of the cause of death were highlighted. Pathologists, from their experience, should do this better than most clinicians. But in the available sample of 42 causes of death, 26% (11/42) were defective in the actual structure of the cause of death according to the standard rules, and in a similar proportion the quoted causes of death were judged not congruent with the pathological details in the actual autopsy report.

The following are typical of the problems found:

A. Patient who died following paracetamol overdose.
The stated cause of death was:

1a. bronchopneumonia
1b. intracerebral haemorrhage
1c. hypertension
2. obesity, enlarged fatty liver.

Better would have been:

1a. bronchopneumonia
1b. liver failure
1c. paracetamol toxicity
2. hypertension, intracerebral haemorrhage.

B. Patient who died of lung cancer with septic complications. The stated cause of death was:

1a. multifactorial
1b. hepatorenal failure
1c. pyelonephritis
2. primary lung carcinoma.

Better would have been to place lung carcinoma in the lowest line of part 1 of the cause of death sequence:

1a. multi-organ failure
1b. sepsis
1c. carcinoma of lung.

The Office of National Statistics(ONS) derives data for the main causes of death from the bottom line of Part 1 in the medical certificate of cause of death. The above cases illustrate how even autopsy diagnoses are not being accurately incorporated into national statistics on cause of death because of incorrect certification.

Cirrhosis

9% (4/44) of autopsied ICU patients had cirrhosis, three of these apparently unsuspected pre-mortem. Histological evaluation was only done in one case. The autopsy diagnosis of cirrhosis, particularly early cirrhosis, is not always straightforward with regard to confirmation or exclusion and histology also may indicate a cause for cirrhosis. Therefore more histological sampling would be useful. Unsuspected cirrhosis in a hospitalised patient population is an unquantified and complex problem. There is no simple non-invasive test that detects cirrhosis reliably, yet the presence of cirrhosis has significant impact on morbidity and mortality following major operations and in multi-organ disease as encountered in ICU patients [47].

MRSA infection

From the clinical data, 2/44 of the autopsied patients had known MRSA infection at time of death. In neither of the autopsy reports was this mentioned anywhere. In one case, the cause of death was “chronic lung disease with lung abscess (unspecified)”. Given the current concern about hospital-acquired infection rates and morbidity, and MRSA in particular, pathologists should be beholden to present a considered assessment of the attributable contribution of MRSA to the sequence of events leading to death. The evidence is important for reasons of public health.

Overall scores

These autopsy reports have been assessed against the Royal College of Pathologists guidelines[42]. 80% of the autopsies appeared to have been performed and documented satisfactorily or better, but only 50% were overall scored so, mainly because of the lack of clinico-pathological summary, lack of histology, and poor formulation of cause of death.

Concerning clinical relevance of the autopsy, in only one case did the autopsy reveal an unsuspected clinical pathology that might have altered management if known: the patient was presumed to have malignancy, but in fact had ischaemic heart disease.

Mortality and morbidity meetings

In the previous chapter it is noted that pathologists comprise only 1% (2/202) of the health professionals attending mortality and morbidity meetings. Whilst the majority of ICU deaths are not autopsied (84%), and therefore the pathologist’s presence may not be of assistance, this low figure suggests that they are not invited to the meetings, or that they cannot attend for reasons of timing. The advisors’ experience of such meetings is that they stimulate discussion of remediable factors and the pathologist’s contribution is valued.

The purpose of autopsies

Review of the autopsy reports raises the question of the differing expectations of the coronial autopsy in complex medical cases, and whether the results of autopsies are expected, or not, to contribute to clinical governance and audit. As discussed in the section on histopathological sampling above, more investigation can be done once the needs of the coroner are satisfied, with consent from relatives.

In the recent Shipman reports [48] and proposals for reform of the ‘coronial system’ [49], it is indicated that information from all autopsies should be used more in medical audit. For this to be useful, the quality of autopsy reports needs to be of a more uniform standard. It is hoped that more harmonisation and standardisation may develop if and when the reforms to the coroner’s and death certification systems in England and Wales are implemented [49].

Finally, NCEPOD will be undertaking a survey of the quality of all autopsy reports in England, Wales, Northern Ireland and Guernsey, from a representative selection of examinations of deaths in the community as well as in hospital. The results will provide a better baseline of performance data to enable more focussed critical review of future autopsy activity.

Recommendations

- More care should be given to the formulation of the cause of death for presentation to the coroner and transfer into the medical certificate of cause of death.
- On this group of patients, consented autopsies should be sought more often to evaluate complex clinical pathology.
- In coronial autopsies on ICU patients, increased histopathological sampling should be undertaken to improve disease identification, with the consent of relatives, once the coroner’s requirement is satisfied.
- Pathologists should become more involved in the mortality meetings on ICU patients.

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Appendices

Glossary

Apache II

A severity of illness score that measures the degree of acute physiological impairment.

Bartel Index

An assessment of the ability of individuals to perform activities of daily living.

Day

08:00 to 17:59.

Early warning system/score

See 'track and trigger system' below.

Evening

18:00 to 23:59.

Glasgow Coma Score

A method of assessing the level of consciousness of a patient.

Levels of care

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 postoperative 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.

Local reporter

A hospital member of staff who provides information on cases to NCEPOD.

Medical intensive care patient

Those referred to intensive care by a physician and, if they survived, were subsequently discharged to the care of a physician.

Night

00:00 to 07:59.

Outreach service

A service that: averts admissions by identifying patients who are deteriorating; enables early discharges and shares critical care skills [10].

Track and trigger system

A method of using physiological scoring to trigger action. Early warning scoring systems are based upon the allocation of 'points' to physiological observations, the calculation of a total 'score' and the designation of an agreed calling 'trigger' level.

Unselected medical emergency admissions

Patients admitted as an emergency whose illness cannot immediately be identified.

Abbreviations

A&E	Accident and emergency department
BP	Blood pressure
CPR	Cardiopulmonary resuscitation
DH	Department of Health
GMC	General Medical Council
HDU	High dependency unit
ICU	Intensive care unit
MEWS	Modified early warning system
M&M	Morbidity and mortality
MRSA	Methicillin resistant *staphylococcus aureus*
ONS	Office of National Statistics
PRHO	Pre-registration house officer
QAF	Questionnaire assessment form
RCP	Royal College of Physicians
SHO	Senior house officer
SpR	Specialist registrar
SpR 1/2	Year 1 or 2 specialist registrar

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Acknowledgements

This is the seventeenth report published by NCEPOD and, as in previous years, could not have been achieved without the support and co-operation of a wide range of individuals and organisations. Our particular thanks go to the following:

- The local reporters in each hospital who work tirelessly to ensure full participation by their organisation
- All those clinicians who contributed to the study by completing questionnaires
- The expert group members and advisors whose names are listed in ‘Appendix 4 ’
- The organisations who provide the funding to cover the cost of the Enquiry who are listed here:

National Institute for Clinical Excellence
Department of Health, Social Services and Public Safety (Northern Ireland)
Aspen Healthcare
Benenden Hospital
BUPA
Capio Health Care UK
Covenant Healthcare Ltd
Cromwell Hospital
Department of Health and Social Security, Isle of Man Government
Fairfield Independent Hospital
Foscote Private Hospital
HCA International Ltd
Horder Centre
Hospital Management Trust
Hospital of St John & St Elizabeth
King Edward VII Hospital
King Edward VII Hospital Sister Agnes
London Clinic
McIndoe Surgical Centre
Mount Alvernia Hospital
New Victoria Hospital
North Wales Medical Centre
Nuffield Hospitals
Orchard Hospital
St Anthony’s Hospital
St Joseph’s Hospital
Spencer Wing, Queen Elizabeth the Queen Mother Hospital
States of Guernsey Board of Health
Ulster Independent Clinic

The steering group, clinical co-ordinators and chief executive would like to record their appreciation of the hard work of the NCEPOD staff: Philip Brown, Heather Cooper, Marisa Cullinane, Steven Dowling, Dolores Jarman , Deon Palmer and Donna Weyman.

This work was undertaken by NCEPOD, which received the majority of its funding for this report from the National Institute of Clinical Excellence. The views expressed in this publication are those of the authors and not necessarily those of the Institute.