



SCOTTISH EXECUTIVE

Health Department

BETTER CRITICAL CARE

**REPORT OF
SHORT-LIFE WORKING GROUP
ON ICU AND HDU ISSUES**

CONTENTS

Section 1	Introduction	Page 3
Section 2	Remit and Method of Working	Page 5
Section 3	Current Arrangements and Provision	Page 7
Section 4	Needs Assessment	Page 11
Section 5	Critical Care	Page 15
Section 6	Flexibility to cope with pressures and peaks in demand	Page 20
Section 7	National Collaboration between Intensive Care Units	Page 25
Section 8	Education and Training	Page 28
Section 9	Audit Arrangements	Page 30
Section 10	Conclusions and Recommendations	Page 31
Appendix	Membership of Working Group	Page 33

1 INTRODUCTION

1.1 The Working Group on issues relating to intensive care units (ICU) and high dependency units (HDU) was established as part of the wider review which the Health Department is undertaking of the effectiveness of winter planning arrangements. This review aims to determine what needs to be done to improve service planning across the whole year so that the NHS is well prepared for the additional pressures which winter inevitably brings.

1.2 The work of the Group was informed by the findings set out in 3 recent Scottish audit reports. An outline of each is given below.

Scottish Paediatric Intensive Care Audit (SPICA)

1.3 The key findings in this CRAG-funded study were that in 1997, 1051 children required level 2 or 3 care (i.e. single or multiple organ failure; high dependency care is regarded as level 1 care). There were only 3 admission 'refusals' which resulted in a child being diverted to another hospital and there were 10 admission delays. Within one hour of admission, 91% of children were seen by a consultant, 9% were seen by a specialist registrar and less than 1% were seen by an SHO. Nurse/patient ratios were 1:1 or better in 1018 cases. Using established severity scoring systems, predicted mortality was 11.8% whereas actual mortality was 9.4%. 195 children needed transfer but no deaths were recorded during transfer.

1.4 This last point bears emphasis. These 1051 children were admitted to 51 different units but care was delivered in 14 centres, only 4 of which had a caseload in the year of 49 or more (49,112, 337 and 479). Seven centres admitted 1 or 2 children in the course of the year. The Department has indicated its support for the recommendation that level 3 care should be delivered in two established paediatric intensive care units (PICU), one in Glasgow and one in Edinburgh, and level 2 care should be restricted to identified PICUs in major acute teaching hospitals. This would help to sustain the PICU in RHSC Edinburgh following the move of paediatric cardiac surgery and underpin the Minister's commitment to maintain its viability. A short life working group is reporting on the arrangements needed for the safe transfer of critically ill and injured children to appropriate centres. Much of the transport network is in place and relatively little extra provision is likely to be needed.

Scottish Intensive Care Society Annual Audit

1.5 The most recent report of this CRAG-funded study deals with adult patients requiring intensive care in 1998. It shows a standardised mortality ratio (0.87) which reflects a hospital mortality (29.7%) better than that predicted using scoring systems (31.7%). Demand on ICU remains high, with particularly high occupancy rates in Grampian (98.7%) and not every patient who might have benefited from ICU may have received this level of care. The Report acknowledges the expansion in ICU seen in Greater Glasgow (in line with recommendations from the previous year), points to work in progress in Argyll and Clyde, and identifies areas for further appraisal in Lothian and Ayrshire & Arran. Work is already under way in Grampian to increase ICU capacity.

1.6 There is an ongoing need to monitor ICU occupancy rates, recognising that expectations will continue to shift and categories of patient not expected to have intensive care in the past are now so managed with benefit. A key message from the report was the need to improve flexibility at the ICU/HDU interface and in terms of ICU provision.

Scottish Audit of Surgical Mortality (SASM)

1.7 This ongoing study was originally funded by CRAG but is now funded by the consortium of Health Board General Managers and supported by the Royal Colleges in Scotland. SASM identified 4331 patients who died in surgical wards in Scottish hospitals in 1998, and peer review of each death is available in 95% of cases. No less than 99% of relevant consultants in Scotland participate in this voluntary exercise. Underprovision of HDU was highlighted as a concern, although the perceived need for HDU must be seen against a backdrop of changing expectation and improving practice. The audit concludes that in the case of 194 patients, management might have been improved by HDU/ICU care, although it recognises that since the last report some hospitals have opened HDUs while others are in the late stage of commissioning. Nevertheless, there is the perception of a widening gap between high dependency need and provision.

1.8 The Chief Executive and CMO wrote to Trust Chief Executives on receipt of the SASM report, asking for it to be considered by their Clinical Governance Committees, and indicating that the Department could assist SASM in developing a Trust by Trust (rather than surgeon by surgeon) breakdown of data.

Other Initiatives and Background Work

1.9 On 22 February, the Minister announced that an extra £6.8m would be distributed immediately to Health Boards as a one-off capital initiative to spend on intensive care and high dependency beds and medical equipment. The Department is writing to Boards asking for information on the way in which the funds were allocated.

1.10 Further work which the Group took into account included the Department of Health in London's report (June 2000) *Comprehensive Critical Care: A Review of Adult Critical Care Services*; the review of intensive care services in Northern Ireland published by the Department of Health and Social Services (DHSSPS) in February 2000; and *Acute Medicine: the physician's role Proposals for the future*, a report by a working party of the Federation of Medical Royal Colleges (June 2000).

2 REMIT AND METHOD OF WORKING

Remit

2.1 The Group was set up with the following remit:

“To assist Health Boards and Trusts to ensure that provision matches demand by examining the administration and professional management of ICUs and HDUs throughout Scotland, and in particular by considering:

- The adequacy of the current provision of ICU and HDU beds;
- the appropriate use of ICU and HDU beds, including the interface between ICU and HDU and between HDU and general wards;
- the ability of the service to increase ICU capacity at times of increased demand;
- the development of a pool of trained staff who can work flexibly at varying levels of dependency care and expand at times of need;
- the feasibility of developing a mobile ICU equipment resource;
- the development of a series of guidelines on best ICU/HDU practice; and
- the appraisal of patient transport services and the use of an electronic bed bureau.”

2.2 The Group’s aim was not to provide central directives but to develop coherent thinking which would provide Health Boards and Trusts with a framework within which they can assess their arrangements and develop improved services.

Membership

2.3 The membership of the Group is given in the Appendix. In addition to its core members, the Group was also extremely grateful for the participation of a number of other people who gave presentations to it: Mrs Margaret Connolly, Critical Care Course Co-ordinator, North Glasgow University Hospitals NHS Trust; Mr Liam Gaffney, Clinical Nurse Specialist ICU/CCU, Raigmore Hospital; Dr Nigel Leary, Head of Clinical Service, Anaesthesia/Theatres/Intensive Care, Borders General Hospital; Ms Fiona MacKirdy, Project Director, Scottish Intensive Care Society; Dr Saxon Ridley, Consultant in Anaesthesia and Intensive Therapy, Norfolk and Norwich Health Care NHS Trust; Mrs Catriona Rostron, Principal Nurse, Surgical and Associated Services Division, Lothian University Hospitals NHS Trust; and Dr Sheila Scott, Director of Planning, Argyll and Clyde Acute Hospitals NHS Trust.

Method of Working

2.4 The Group held 5 meetings between 13 April and 13 July and apart from the papers already mentioned, considered a wide range of literature on the subject.

Scope of Work

2.5 An important factor which the Group recognised as having a bearing on its work is the effect of the increasing expectations of patients and their relatives, and the growing perception that a critical care bed should be available for all seriously-ill patients. The Group rapidly became aware at its first meeting of the need to decide from the outset on which types of provision it wished to concentrate, in order to focus its work as clearly as possible. It therefore decided that it would not consider: paediatric intensive care, Coronary Care Units (CCU), post-cardiac surgical units, and neurosurgical ICU and HDU. Each of these areas was already the subject of work by another group. The shape of paediatric intensive care would be influenced by the report of the working group currently looking at the transport of critically ill and injured children; the CHD Task Force was the more suitable forum for looking at issues related to CCUs; and CMO was concurrently chairing a short-life working group looking at neurosurgery in Scotland, the work of which would include consideration of ICU beds and manpower.

2.6 All references later in the report to 'ICU' and 'HDU' should therefore be understood as excluding the areas mentioned in the previous paragraph, unless it is made clear otherwise.

3 CURRENT ARRANGEMENTS AND PROVISION

3.1 Useful definitions of Intensive Care and High Dependency Care were set out in the Tayside report on High Dependency Needs (see paragraphs 4.2-4.4). These had been adapted from the Department of Health (DH) Guidelines on Admission and Discharge from Intensive Care and High Dependency Care (1996), as follows:

Intensive Care is appropriate for:

- Patients requiring or likely to require advanced respiratory support alone
- Patients requiring support of 2 or more organ systems
- Patients with chronic impairment of one or more organ systems sufficient to restrict daily activities (co-morbidity) and who require support for an acute reversible failure of another system

High Dependency Care is appropriate for:

- Patients requiring support for a single failing organ system, but excluding those needing advanced respiratory support
- Patients who can benefit from more detailed observation or monitoring than can safely be provided on a general ward
- Patients no longer needing intensive care, but not yet well enough to be returned to the general ward
- Post-operative patients who need close monitoring for longer than a few hours, i.e. the period normally spent in the recovery area.

General Principles

3.2 While these definitions are helpful, their tendency to ‘compartmentalise’ patients may create barriers to the continuum of care which patients require. There is therefore merit in a more fluid overall concept which embraces the whole spectrum of dependency. From the outset, the Group was attracted to the concept of ‘critical care’, which should be understood as applying to the treatment of all patients with, or at risk of developing, organ system failure. This care may be delivered in the setting of an ICU or HDU care facility. ICUs operate on the principle that the most severely ill patients, who have the capacity to recover from their illness, should be cared for in one location, irrespective of the nature of the underlying medical condition. In this setting, care is delivered by medical and nursing staff with special expertise in the monitoring and support of organ system failure, particularly respiratory failure.

3.3 The need for high dependency care recognises the gulf in the intensity of medical and nursing support which exists between the ICU and the general ward. High Dependency Units (HDU) have been developed to meet this need. They provide a setting where patients at risk of organ system failure can be treated in the expectation that further deterioration may be prevented and admission or readmission to intensive care avoided. Nurses working in these areas require special expertise.

Overview of ICU Provision

3.4 The Intensive Care Society Annual Report presented in 1999 sets out key data from the preceding year. The number of patients admitted to Scottish ICUs in 1998 was 8,327 whereas the total number admitted over the previous three years was 20,738. Approximately half of the patients admitted in 1998 were operative (48%), their mean age was 60.1 years and their mean length of ICU stay was 4.4 days (range 0 – 84). ICU mortality was 19.3% and hospital mortality was 27.2%, figures that are remarkably similar to those of previous years. As mentioned earlier, observed mortality for patients with APACHE II predictions was less (29.7%) than that predicted (31.7%).

3.5 Overall ICU bed occupancy fell slightly to 78% when compared with the previous two years (1996, 80%; 1997, 83%), the fall being attributed to increased bed provision on a number of sites and recruitment of two ICUs to the audit that had ICU/HDU flexibility. Occupancy was found to be consistently high during the period December – March, running in excess of 80%. There was considerable variation in the year-on-year pattern of occupancy for each ICU, although the report emphasised that flexible use of ICU/HDU beds and uncertainty about the number of *funded* beds may lead to an underestimate of occupancy.

3.6 The proportion of occupied bed days in which a patient was ventilated varied from 51% to 106%, giving some indication of the extent to which various ICUs could have alleviated pressure by using HDU beds had they been available. As in all analyses of this type, the relatively small number of beds in Scottish ICUs (range 3-10.6) means that undue reliance on proportions and percentages is inappropriate. The number of ICU beds and their occupancy is shown in Table 1 below (Table 3 in the SICS report) and the number of beds expected by the year 2000 is shown for comparison. Pressure on beds during January 2000 is reflected in the fact that the number of occupied ICU beds on the 6th and 12th respectively was 146 and 162, these numbers having to be set against an ‘establishment’ of 129.5 funded beds.

3.7 Other factors emphasised in the report include the remarkably consistent age distribution of the ICU patient population with its large number of elderly patients, the consistent increase with mortality that is associated with increasing age, and the much higher mortality experienced by the elderly following discharge from ICU. While the overall survival rate for Scottish ICU patients was 81%, approximately one-third of all deaths in ICU patients occur in wards following ICU discharge.

Table 1
ICU Bed Numbers and Occupancy by Health Board
 DATA FROM 1998

Health Board	Population (n)	ICU beds (n)	HDU beds in ICU (n)	ICU Beds per 1000,000	Occupancy (%)	<i>Expected ICU beds in 2000</i> (n)
Grampian	528,400	8		1.51	98.7	9
Argyll & Clyde	429,300	8	3	1.86	70	9
Lanarkshire*	561,600	12		2.14	73.8	12
Ayrshire & Arran	376,500	9		2.39	68.2	9
Highland	208,600	5		2.40	78.7	5
Tayside	392,400	10		2.55	74.6	10
Dumfries	147,300	4	2	2.72	89.7	4
Lothian Health	772,000	21		2.72	81.4	22.5
Fife	348,400	9.5		2.73	78.7	10
GGHB	905,100	25		2.76	86	29
Borders	106,200	3		2.82	83.7	3
Forth Valley	275,600	9	4	3.27	61	8
Total for Scotland	5,122,500	123.5		2.41	78.7	130.5

* Lanarkshire: Hairmyres – no occupancy data.

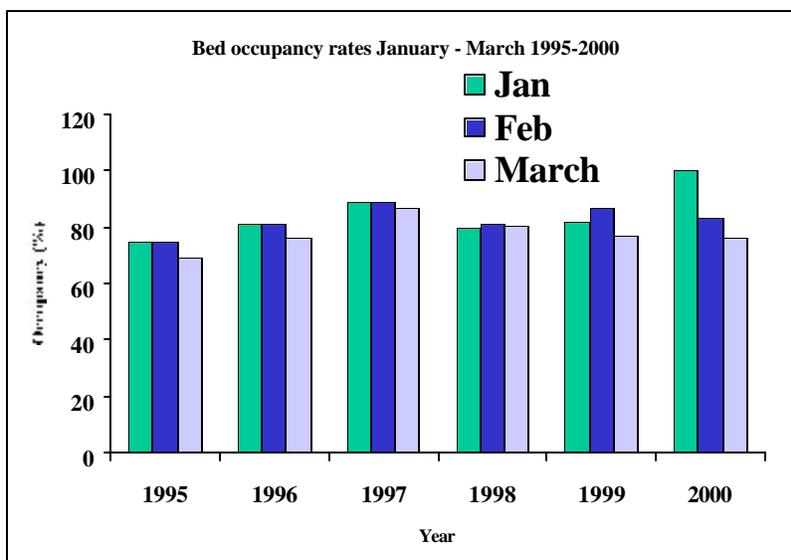
HDU Provision

3.8 The Group benefited from a survey carried out for it by the Scottish Intensive Care Society Audit Group. This showed that Scotland currently has a total of 37 HDUs of all types in 31 hospitals. Five hospitals (Aberdeen, Crosshouse, Dumfries, Falkirk and Ninewells) have more than 1 general HDU. There are 205 HDU beds across the country, 10 of which are neurosurgical. Surgical HDUs account for 41% of the HDUs, 24% are mixed (i.e. covering both medical and surgical), 16% are combined ICU/HDU, 11% are medical and 8% are neurosurgical. For a further discussion of medical HDUs, see paragraphs 5.14-19.

3.9 The number of admissions to each HDU ranges from 60 to 2,000 per annum, this representing between 18,000 and 18,500 patients. Surgical admissions accounted for 70% of these cases. The ranges reflect the variety of arrangements and criteria for intervention which prevail among HDUs and highlight the lack of clarity about what is meant by 'high

dependency'. The Group recommends that a multi-disciplinary group is established to take forward work on defining standards for HDU, including nursing levels and entry criteria (see also paragraph 9.1).

3.10 That the winter of 1999/2000 was quantifiably worse in terms of pressure on ICU beds than those of previous years is shown by the Figure below. Pressure on beds in January 2000 was noticeably worse than in previous years. Whereas overall occupancy has not shifted dramatically in other months, the continuing rise in the number of available ICU beds means that there is a continuing upward trend in the total number of patients receiving intensive care.



3.11 The data available show that in January 2000, only 8 ICUs in Scotland ran beneath 90% occupancy, 4 ran with occupancy rates between 90 and 100%, and 11 ran at over 100% occupancy. Mean occupancy rates ran at 101.5% in January, falling back to 84.1% and 77% respectively in February and March. Four ICUs continues to run at over 100% occupancy in February and 2 did so in March.

3.12 Apart from this Scottish perspective, there are particular parts of the country which experienced serious problems over the winter of 1999-2000. This is illustrated by data from Raigmore Hospital which normally has 4.5 funded ICU beds. In the period 28 December 1999 to 24 January 2000, a minimum of 6 ICU beds were in use and for 20 days, 8 or more beds were in use and on one day no less than 11 patients were nursed in an intensive care setting.

3.13 Public expectations apart, there are other pressures on critical care provision. Medical patients admitted to ICU tend to be sicker than surgical admissions and therefore stay longer. The pressure to provide more HDU beds stems in part from the analyses provided by anaesthetists and surgeons working through SASM, the pan-Scotland audit of in-hospital **surgical** deaths. If there were to be a similar national audit of in-hospital **medical** deaths, there could be similar pressure for HDU beds for medical patients. The Group encourages the Royal Colleges of Physicians in Scotland to establish such an audit following discussion with CRAG.

4 NEEDS ASSESSMENT

4.1 The level of provision of ICU and HDU beds is a matter of particular concern and has significant implications for quality assurance and clinical governance. A shortfall in ICU and HDU facilities has implications for a Trust's ability to maintain elective surgery and provide emergency care. Lack of availability of HDU beds can also lead to the cancellation of elective surgery at very short notice, with adverse effects on waiting lists. Both College accreditation for training posts and peer reviews, such as that conducted by the King's Fund, highlight the pressures on Trusts to provide appropriate ICU and HDU services. Against that background, and in the light of the trends noted in the previous section, the Group took particular interest in work which has assessed the need for both ICU and HDU beds, referred to collectively as 'critical care beds'.

Scottish Needs Assessment Studies

4.2 The Group looked examples of needs assessments undertaken in a range of Scottish hospitals including a major teaching hospital, large DGHs and a small DGH. These are described in some detail in the following paragraphs.

4.3 In March 1998, the then **Dundee Teaching Hospitals NHS Trust** published a report of a High Dependency Needs Assessment Project. The total patient population was divided into units, the actual number of which was determined following a pilot feasibility study. In order to obtain a true representation of overall work pattern, the study Co-ordinator visited each unit 7 times in the course of the study period, unannounced, at different times of the day. On arrival, the Co-ordinator liaised with the identified 'link person' with knowledge of the existing patient complement. Patients were then allocated into one of 3 groups: Ward/HDU/ICU. The reliability of this categorisation was tested on a sample patient population by a member of the Working Group. In each area within a unit, the total number of patients was recorded, together with the number and skill mix of available nursing staff. The opinion of senior medical staff was invited on the categorisation of his/her patients, considering both present and anticipated future categorisation.

4.4 The study showed that the 32 HDU/ICU beds accounted for 3.1% of the total bed complement. 81 patients overall were assessed as receiving too low a level of care, but 24 patients were also assessed as receiving too high a level of care. The recommendations were for an increase in the number of high dependency beds at Ninewells, most pressingly in relation to adult general medicine. It was estimated that a multi-disciplinary unit of 15-20 beds would meet both current and predictable future needs for the adult medical and surgical directorates. The report also recommended a unified management structure for all the general critical areas within the hospital.

4.5 A supplementary HDU needs assessment in Tayside carried out by **Tayside University Hospitals NHS Trust** between October and December 1999 was also made available to the Group. It aimed to complete the assessment of baseline HDU need across Tayside in advance of any service redistribution resulting from the regional acute service review. In addition to quantifying the total baseline HDU requirement, the study allows assignment of need on a specialty by specialty basis. The quantified need is regarded as a minimum in current practice terms, taking no account of the intrinsic effect of lack of HDU facilities on patient

management, or of predictable developments in patient care, such as intensive oncology regimes. The authors of the report see the need for further debate regarding the advantages or disadvantages of combined multi-specialty HDU facilities, and of combined ICU/HDU facilities. The Group was informed that the methodology was thought by some to underestimate the Trust's HDU needs and that the recommendation for a general management structure for all critical care areas had proved controversial.

4.6 The health needs assessment for ICU/HDU beds in the **Argyll & Clyde Acute Trust** area, which reported in December 1999, was mainly concerned to develop a methodology for capturing the number of ICU bed days and therefore the number of beds needed at any one time. Analysis of historical data allowed predictions to be made of future ICU occupancy levels. The work was undertaken in response to indications that there was a high level of unmet need for provision of high dependency care. Before a firm assessment could be made, however, a local survey was carried out of all patients receiving high dependency care, and a checklist devised of clinical criteria for identifying patients who required admission to an HDU. It was clear from the study that clinical practice had been skewed by lack of HDU facilities. Proposals are now being worked up to obtain the necessary HIP/TIP funding to put in place the additional ICU and HDU beds identified by the survey.

4.7 **Borders General Hospital** has recently undertaken a needs assessment of high dependency care, in response to the rising elderly population in the region. The hospital currently has no formal HDU. The conclusions reached were that in a DGH, HDU needs were dictated not so much by the nature of the operations being undertaken, but more by the patients on whom the operation was performed. Excluding coronary care requirements, 50% of HDU demand was assessed as medical. In a small DGH it makes sense to have a combined surgical and medical HDU, making it essential that one plan accommodates the needs of both types of patient. Close association with ICU in terms of location, staffing and supervision, is highly desirable and yields training opportunities such as rotations from other wards, that can prevent de-skilling of Trust staff, both medical and nursing. Assessment indicates a need for 3 ICU beds and 9 HDU beds per 100,000 population (excluding coronary care). More beds would be needed if vascular or oesophageal work were undertaken in this hospital. Half of critical care bed demand relates to patients older than 70 years. Changing demography will equate to 7% increase in demand for critical care beds over the next 5 years. It is estimated that by 2005 a small DGH with no vascular or oesophageal work will require 14 critical care beds per 100,000 (probably 3-4 ICU and 10-11 HDU).

4.8 **Crosshouse Hospital** has just undertaken an assessment of HDU needs which suggests that 12 surgical and 12 medical HDU beds are required for the hospital's catchment population of 220,000. If these additional beds were added to the hospital's current complement of 6 ICU beds, it would give a total of 30 critical care beds out of an overall bed complement of around 300 beds (excluding coronary care). The Group noted, however, that in the Argyll & Clyde ICU/HDU needs assessment, the **Royal Alexandra Hospital** is seen as needing 6 surgical and 2 medical HDU beds for a similar size of population.

4.9 **Raigmore Hospital** had calculated its needs by dividing patients into 4 categories and measuring the nursing workload. Across 3 surgical wards it was shown that there were 4.5 patients a day in the most dependent category, and taking account of increasing levels of co-morbidity, that had led to the creation of a 6-bedded HDU. The hospital had a total of 90 surgical beds for 6 specialties serving a population of around 200,000.

4.10 While it is clear that different types of hospital will have different critical care needs to which they must respond, the variability in the methods of calculation illustrated in the previous paragraphs highlight the need for a more coherent approach in Scotland (see also the recommendation in paragraph 3.9). The Group considered whether work undertaken in other parts of the UK might help to develop such an approach.

Work undertaken in other parts of UK

4.11 The Group was impressed by the critical care modelling exercise developed by the **Norfolk and Norwich Health Care NHS Trust** in conjunction with the Institute of Mathematical Modelling, University of Southampton. The estimate of bed numbers was undertaken by reviewing the literature, identifying sick patients on general wards, modifying the queuing theory, developing Artificial Neural Networks and applying Classification and Regression Tree (CART) analysis, a technique which splits data into smaller and smaller subsets, minimising variation within subsets, to create discrete ‘packets’ of patients with similar length of stay. Mathematical modelling can then be applied. The exercise used a repetitive model based on the hospital’s own data. The data used were simple (age, severity of illness, operative status, specialty, source), the aim being to choose variables which explain most variations in length of stay. The model then fits a distribution to length of stay and uses that distribution, and the known rate of presentation, to predict bed occupancy. The model runs repetitively to account for all possibilities, and also allows scenario planning.

4.12 The Group was attracted to the model because it formalised processes which take place already. Since the model works on a dataset derived from each hospital’s own current practice, it shows up variations in practice and encourages consideration of the reasons for variations, such as different lengths of stay for similar groups of patients. The Group also felt the real value of the CART analysis is in breaking up a heterogeneous population into manageable ‘bundles’. This gives insight into complications as well as mortality, and therefore helps to capture elements of quality of service. It also assists the planning process, as decisions can be taken on the admission of a particular type of patient when data are available on their likely length of stay.

4.13 The model would provide interesting results if applied to the Scottish Intensive Care Society data, and the Group was pleased to note that the Society is making its data available to Southampton so that the NHS in Scotland can benefit from work done on modelling Scottish data. The Group noted that the University of Southampton appeared to have donated the software to the NHS in England, and encourages the NHS in Scotland to explore its application north of the border.

4.14 As a result of public and political concern over the issue of provision of critical care facilities, the National Assembly for Wales commissioned research led by Dr Ronan Lyons to determine the appropriate number of beds required for a health authority area of 500,000 in **South Wales**. To select patients deemed to require critical care, criteria were developed using an evidence-based consensus approach. This approach followed the work of the Department of Health’s working group on guidelines on admissions to and discharges from intensive care and high dependency units (see paragraph 3.1 above).

4.15 The findings of the report, which was published in the *Lancet* in February (355, 595-598), were that, based on consensus decisions, a population of 500,000 adults has an average daily requirement of 21 ICU and 43 HDU beds. The paper emphasised that the number of

beds required to meet fluctuating demand depended on the size and number of critical care units. To meet needs 95% of the time, 30 ICU and 55 HDU beds in a single critical care unit are required, with further increases in overall bed numbers required as the number of sites on which critical care is provided is increased. Three separate units for the same catchment population would require a 10% increase in bed numbers. There was no strong relationship between the need for critical care beds and deprivation score, suggesting that affluent and deprived areas will have similar needs. The report also suggests it provides the best estimates to date of the need for critical care beds in the UK.

4.16 Although the methodology of the report has been criticised (correspondence in the *Lancet*, (355, 1997-8), the Group generally felt that the analysis in the paper was robust. It took the view that population served was a better denominator than the number of hospital beds, and felt the formula had general applicability. Hospitals should still undertake their own assessments to take account of their particular needs. An additional consideration in applying the Welsh formula to Scotland was that allowance needed to be made for the greater distances involved. It would be particularly necessary to consider those critical care units that serve relatively isolated areas and that run periodically at very high occupancy rates.

4.17 The study showed that Wales had about 70 adult critical care beds per million population. Scotland is in broadly the same position, with some 355 critical care beds. Extrapolation of the formula of 90 critical care beds per million population would mean that the number of critical care beds in Scotland would need to increase by around 100 to some 450 beds.

Unmet Need

4.18 Studies consistently show that critical care facilities are not available or not used for significant numbers of medical patients, and the Group was also concerned that orthopaedic patients may not yet receive appropriate critical care in all cases. The small number of medical and mixed medical/surgical HDU beds currently provided suggest that patients in general medical wards may be particularly disadvantaged in relation to provision of high dependency care. Patients requiring epidural analgesia also need careful consideration in this context.

4.19 The Group was also concerned by the implications of data from the Scottish Audit of Surgical Mortality, which showed that 850 ASA 4 patients had died who might have benefited from HDU care at some point during their treatment. These data underline the necessity for needs assessments to take account of mortality rates. The Group commended the SASM decision to work with ISD to use the SASM database to identify the subset of ASA 4 patients who died within 5 days of operation to determine whether their deaths could in fact have been prevented by admission to HDU.

5 CRITICAL CARE

5.1 As noted in paragraph 3.1, existing methods tend to classify patients requiring critical care by the level of organ support received or the type of bed they occupy. The Group believes that a more flexible approach is needed, one which looks at the complete process of care for the critically ill. This 'critical care' approach focuses on the level of care that individual patients need at various points in their clinical course, rather than on beds and buildings. It encompasses the needs of those at risk of a critical illness, and of those who have recovered from such illnesses, as well as the needs of patients during the critical illness itself. Its delivery depends on the availability of a continuum of expertise and facilities, both within and between hospitals.

5.2 Within the spectrum of critical care, however, there is still value in determining different levels of dependency. The Group was attracted to the three-fold categorisation as used in the Tayside study:

- Level 1: routine monitoring after major surgery, specialised analgesia (epidural), and the care of frail elderly patients having surgery such as repair of fractured neck of femur and revision of hip replacement;
- Level 2: HDU;
- Level 3: ICU

The Group recognise that the requirement for epidural analgesia can put pressure on critical care services and currently serves as a source of unmet need.

5.3 The manner in which these categories of patients are to be accommodated should be locally determined. For level 1 patients, the Group identified a number of alternatives, including designated areas on specialist wards, 24-hour postoperative recovery areas, accommodation within HDU and on general wards if nurse staffing levels can be adjusted appropriately.

Interface between ICU, HDU and general wards

5.4 Notwithstanding the reservations noted in the Ninewells HDU needs assessment (paragraph 4.5), the Group took the view that models of close co-location of ICUs and HDUs, or HDUs nesting within ICUs, worked well. Historically, HDUs have been created as distinct departments from ICUs, with separate nursing workforces and different medical management. However, economies of scale and great benefits of flexibility can be achieved by siting HDUs in or next to ICUs, with use of a common nursing workforce. With such an arrangement, a bed can be an HDU bed in the morning and an ICU bed in the afternoon, or vice versa, depending on need. The Group therefore felt that such arrangements should be recommended in the forthcoming Building Note (HBN27) for general intensive care units. A suggestion that this be accompanied by a building note for HDU was also supported. The Scottish Intensive Care Society should be invited to co-ordinate advice, to ensure consistency between the 2 Notes.

5.5 This model of care does not preclude a key role for the post-operative recovery unit. The Group noted that it could serve as a useful intermediate step between HDU and the surgical ward (level 1). However, the Group recognised the concern that proliferation of such

specialist care areas removes more patients from the general ward, with potential consequences for both skill levels and morale among ward nursing staff. This may be addressed by exchange or rotation of staff between these high dependency care areas and the general ward. For certain specialties, the preferred option for level 1 patients may be designated areas in general wards with the proviso that monitoring equipment and staffing levels are appropriately upgraded.

Ratio of ICU/HDU Beds and staffing implications

5.6 The Group noted with interest that the Department of Health report *Comprehensive Critical Care* recommends a ratio of HDU:ICU beds of 17:11, as opposed to the ratio of 2:1 HDU:ICU beds endorsed by a variety of studies. Lyons' paper favoured a ratio of 2:1 and the Group endorsed this as an indicative ratio that should be subject to needs assessment in the light of local circumstances (such as case mix, patient population and anaesthetic practice).

5.7 Critical care areas are characterised by relatively high nurse/patient ratios. While fixed ratios in ICU (1:1) and HDU (1:2) are reasonable starting points, a flexible approach which reflects case mix is commended. Information is available from the current Scottish Intensive Care Society audit to inform this process. For level 1 care, a ratio of 1:4 may be more appropriate.

5.8 While there are efficiencies in creating larger intensive care units, as seen in much of North-Western Europe, it is clear that once an ICU reaches a critical size of approximately 8 beds a second medical team may be required. There are disbenefits in larger units because of the difficulty in retaining adequate focus on the care of all patients. The Critical Care Delivery Group should take these considerations into account when defining staffing needs, especially in terms of the balance between medical staff and trainees.

Night Discharges

5.9 As Goldfrad and Rowan (*Lancet* 2000 355; pp 1138-1142) showed, night discharges from ICU have doubled over the past decade, and this is seen as a worrying trend because patients discharged at night fare significantly worse than those discharged during the day. Ultimate ICU mortality was 2.5-fold greater for night discharges and ultimate hospital mortality was 1.4-fold greater. The main reason why night discharges do worse than day discharges is that they are more likely to be premature in the view of the clinicians involved. The rising proportion of night discharges reflects increasing demand on intensive care beds.

Models of Critical Care

5.10 The Group identified 3 basic models for the delivery of critical care, selection being determined primarily by the size of the hospital:

- HDU beds within ICU, an arrangement which might particularly suit small DGHs;
- Separate surgical HDUs and medical HDUs outwith the ICU; and
- Mixed surgical and medical HDUs outwith the ICU.

5.11 As a general principle, the Group felt that an ICU needed a critical mass of patients to justify its provision and that not every acute hospital in Scotland would have such a unit. A surgical HDU should be created if a hospital had a surgical service undertaking major surgery

which needed to be backed up by monitoring and high quality nursing. There was no generic HDU model which could apply across the whole of Scotland.

5.12 ICUs and HDUs are services which offer appropriate support for the other clinical services provided in a hospital. Before determining what ICU or HDU services are necessary, small hospitals need to re-consider the spectrum of clinical services that are appropriately provided by them. It is questionable whether smaller hospitals should be doing the type of surgery which requires ICU beds, as they are unlikely to have the junior or even senior levels of anaesthetic cover to meet current guidelines. The quality of care given must take precedence over local access to care. The Group took the view that small hospitals should not develop critical care services in ways which encourage them to manage cases which they should not take on, or continue to manage for longer than they should.

5.13 The Group was struck by the benefits that flowed from having a nurse with defined administrative responsibility in HDUs. This was necessary to supervise and support junior (and agency) nursing staff and facilitate efficient bed management in the absence of a designated consultant-led medical team whose sole responsibility is to the HDU (the model of care normally provided in ICU). Where care in the HDU is provided by a variety of medical teams (e.g. admitting team, surgical or medical teams, acute pain team, critical care team) there must be unambiguous guidelines and protocols which set out responsibilities for care and lines of communication. The Group recommends the development of protocols which would empower the nurse administrator to discharge patients from HDU, working in conjunction with the consultant in administrative charge.

Medical HDU Issues

5.14 General medicine is having to deal with a continuing rise in acute medical admissions, (many of whom are elderly patients), against a background of reducing acute medical bed numbers. To help deal with this, many Acute Trusts have developed acute medical receiving units, which concentrate appropriate skilled nursing and medical expertise on one site.

5.15 Since the early 1960s, physicians have also developed their own form of HDU, the Coronary Care Unit (CCU), to provide acute care for an important proportion of medical admissions, namely patients with acute myocardial ischaemia. Some larger hospitals have also developed specialised HDUs in renal and liver medicine. On the other hand, the development of medical HDU beds for the care of the acute general medical patient has largely been unplanned and somewhat haphazard, often being determined by enthusiastic local clinicians. Further coherent work is needed to ensure that all critically ill medical patients can gain ready access to appropriate medical HDU care.

5.16 Of the 37 general HDUs in Scotland only 11% are medical alone and 24% are mixed. The stand-alone medical HDUs are in some of the smaller hospitals such as Wick, Western Isles and Lorne & Islands. Three medium-sized district general hospitals have medical HDUs: Crosshouse, Dumfries and Falkirk. Mixed medical/surgical HDUs tend to be in the larger hospitals such as Edinburgh Royal Infirmary, Ninewells and Gartnavel/Western.

5.17 The recent appointment of the Acute Care Medical physicians in the larger teaching hospitals has highlighted the growing focus on critical care. These physicians are responsible for the management of acute receiving and may take on the responsibility of the medical

patients in HDU. The widespread development of these posts has not been recommended by the recent Royal College of Physicians' report on *Acute Medicine: The Physician's Role*.

5.18 The survey carried out recently in the Royal Alexandra Hospital, Paisley, to look at the need for HDU (see paragraph 4.6) gives some indication of the type of medical patients (other than cardiac patients) who could benefit from admission to HDU. The commonest reason for admission was respiratory failure, followed by impaired renal function, haemodynamic instability, deteriorating medical condition and self-poisoning. This is followed by a variety of other common medical emergencies (diabetic ketoacidosis, meningitis, liver failure, brain injury, hypothermia, asthma).

5.19 The Group recommend strongly that defined general medical HDU beds should be developed in each Acute Trust. Where local geography allows, the beds should be integrated into a mixed speciality HDU to allow maximum flexibility of bed use and staff deployment. Such mixed HDUs are not without areas of difficulty, such as inter-speciality rivalry for the use of the beds, problems with lines of demarcation and confusion over consultant and junior staff responsibilities. These issues need to be dealt with explicitly and robustly for the clear and efficient running of these units. This is an important role for a critical care consultant as suggested by the DH *Comprehensive Critical Care* document. Each Trust should have protocols which determine the use of HDU beds, and clarify their use for medical and surgical patients over busy periods such as the turn of the year.

Occupancy Rates

5.20 The Scottish Intensive Care Society audit recommends mean occupancy rates of 70-75% as a reasonable bench-mark. It recognises that there are considerable swings in demand and that many units have to run at peak capacity (or more) during periods of pressure. For example, as mentioned earlier the Raigmore unit had been known to run periodically at 120% occupancy. The Group noted that the Society has worked on the assumption that an occupancy rate of 70% of the staffed beds probably indicates adequate provision, but is somewhat arbitrary. The nuances of percentages become absurd when applied to a unit with 5 beds, however. The key point is that Trusts should regularly review the number of staffed ICU beds in the light of trends in both 'normal' and 'peak' activity.

Outreach Teams and 'Patient at Risk' Philosophy

5.21 Outreach teams were recommended in the *Comprehensive Critical Care* report as an essential part of critical care services. They are seen as identifying patients who are deteriorating and helping to prevent admission or ensuring timely admission to a critical care bed. They could enable discharges by supporting the continued recovery of discharged patients on wards, and could even have a role following discharge from hospital. They would also share critical care skills with staff in wards and in the community (paragraph 36 of the report).

5.22 The Group took the view, however, that outreach teams and follow-up would not significantly affect ICU workload, optimal patient care or bed requirements. It felt that Trusts should instead develop a 'patient at risk' philosophy, building on existing 'patient at risk' protocols and scoring systems. The overall aim of such a philosophy is to secure the most appropriate and timely referral of patients from general wards. Nurse specialists could have a role in the education of ward nurses in identifying patients at risk and therefore alerting ward

medical staff to the need for referral. Specialist nurses working in acute pain teams have a comparable role, as do physiotherapists. Physiotherapists already provide continuity of care which can prevent patients from having to return from the general ward to ICU/HDU. They work across the interface between ICU, HDU and the general wards, and can foster good practice in all these settings, provide advice and education and act as 'scouts'. They can therefore be seen as the existing embodiment of the outreach principle. The 'patient at risk' philosophy is an approach which should be run Trust-wide on a multi-disciplinary network basis. The Critical Care Delivery Group (see paragraphs 6.2-6.6) should develop local guidelines which facilitate timely referral from general medical and surgical wards, and from high dependency care areas, to the critical care team.

Mixed Sex Wards

5.23 The Group looked at the issue of developing single sex wards in ICU or HDU. It concluded that the current mixed sex critical care units did not give rise to problems, provided that staff continued to show a proper degree of sensitivity to the concerns of patients and their relatives.

6 FLEXIBILITY TO COPE WITH PRESSURES AND PEAKS IN DEMAND

6.1 Many hospitals have attempted to cope with peaks in demand by creating additional ICU capacity. Experience shows that that additional capacity soon becomes absorbed in routine provision, and the relief achieved is temporary, as it is difficult to accommodate any further 'additional' demands. Flexibility is the real key to coping with growing pressures, especially peaks in demand. This section sets out a number of approaches which Trusts can adopt in order to develop that flexibility.

The Critical Care Delivery Group

6.2 The Group recommends that in order to deliver integrated and flexible services each NHS Trust should establish a Trust-wide Critical Care Delivery Group, which should include the key professions and specialties which use and deliver the service (see also paragraphs 6.11 and 8.8). Such Groups should be established particularly where ICU and HDU care in a Trust are supervised by different specialties. The Group would have a defined lead clinician. It would be the responsibility of the Critical Care Delivery Group to assess the adequacy of critical care bed capacity within the Trust and the capacity for expansion at times of need (see paragraph 6.6 on this point). This would recognise the multi-disciplinary nature of critical care, and facilitate the development of clear guidelines on the respective medical (consultant and trainee) and nursing responsibilities in the administration of HDU facilities.

6.3 The Critical Care Delivery Group would also be responsible for defining the Trust's escalation policy for dealing with peaks in demand. One individual, the lead clinician, should be empowered to institute escalation of ICU capacity. In doing so, he/she would follow the policy developed by the Critical Care Delivery Group.

6.4 It is essential to create a single nursing administration for all critical care areas in order to facilitate collaboration and flexibility of use. A single medical administration is also highly desirable, but the Group appreciate that this will require local evaluation and determination.

6.5 Even where there is adequate ICU and HDU provision, there will remain, on general medical and surgical wards, patients with a wide range of illness severity. Nursing levels and monitoring equipment provided in this setting must reflect this range of illness, and demand will always fluctuate with time. In turn, the routine equipping of HDUs should be determined by the range of patients treated and the competencies of the medical and nursing teams. Explicit thresholds for admission to and discharge from ICU and HDU should be determined as part of an overall hospital policy. This would be for the Critical Care Delivery Group to work up. Appropriate staffing levels, not only in critical care areas but in general wards, must be tailored to take account of these thresholds.

6.6 The Group takes the view that it would not be sensible or appropriate to equip all HDU beds in Scotland to ICU standard (the approach advocated in *Comprehensive Critical Care*). The Critical Care Delivery Group should define a hospital's maximum capacity for expansion at times of peak demand, based on the availability of trained nursing and medical staff. This should be translated into bed numbers, with identification of those Level 2 care beds which

are most suitably located in relation to the ICU. This approach should then be used to determine the additional equipment needed to underpin an appropriate escalation policy.

Equipment

6.7 In the light of the situation that developed in places such as Raigmore Hospital last winter (where ventilators had to be imported from Caithness and hired from the south of England) the Group discussed mechanisms of providing equipment for temporary increase in ICU bed capacity, as alternatives to outright purchase. An inventory of critical care equipment (conducted for the Group by the Scottish Intensive Care Society Audit Group) demonstrated considerable variation in both manufacturers and models, making provision of a central national store of such equipment impractical. A central store would also be unworkable as everyone would be in difficulties at the same time.

6.8 The possibility of leasing arrangements with guaranteed delivery times was discussed. Such arrangements exist in some units for provision of additional dialysis equipment. The Group did not itself explore this idea with manufacturers but commend evaluation of feasibility at a local level. Scottish Healthcare Supplies should also be invited to investigate the possibility of hiring equipment from the manufacturers as well as exploring the savings which could follow central purchasing arrangements for expensive equipment such as ventilators and syringe drivers. The Critical Care Delivery Group within each Trust should define the equipment needed for an ICU bed space.

6.9 The variation in critical care equipment is not unexpected given that local purchasing is influenced by factors such as familiarity with particular models and satisfaction with previous service arrangements. However, to better inform potential purchasers of critical care equipment the Scottish Intensive Care Society is invited to work with Scottish Healthcare Supplies to determine whether an information resource can be developed which encourages “best buys”.

6.10 Where older, but still safe and serviceable, critical care equipment is being replaced, the Group assume that Trusts will retain such equipment for emergency use.

Interface between Critical Care and Admission Units

6.11 The interface between critical care areas and Medical Admission Units is particularly important at times of increased winter pressures. As the Federation of Medical Royal Colleges’ report (June 2000) points out (paragraph 4.9), the specialist in intensive care medicine is increasingly necessary for the care of the acutely sick patient, yet interfaces between ICUs, HDUs, A&E departments, Medical Admissions Units and the on-take team are often unclear. It is recommended that policies for escalation during these periods of increased demand are co-ordinated by having a representative of the acute medical team on the Critical Care Delivery Group. Whenever possible, patients requiring intensive care should go directly to ICU rather than first being admitted to a general ward or HDU.

6.12 As escalation will be a reflection of pressure affecting the whole service, a Scotland-wide bed bureau (see paragraphs 7.3-7.9 below) can help to indicate signs of stress, in much the same way as flu spotter practices are used to give early warning of influenza epidemics.

Nursing Staff

6.13 The other key determinant of flexibility is the availability of nurses experienced in critical care. The problems which the NHS encountered last winter in providing ICU services stemmed in large part from a lack of nursing staff suitably skilled in the care of critically ill patients. This points to the need for an effective strategy to expand the number of nurses who do not routinely work in ICU but who possess ICU skills. The Group heard about a number of such initiatives, consideration of which should be a top priority for a Trust's Critical Care Delivery Group. A general model for critical care nurse resource management has been developed by Raigmore showing the dynamics of the system. As HDUs and ICUs are staffed up by trained staff from general wards, so the pool of staff on general wards needs to be replenished.

6.14 **Raigmore Hospital** has faced particular problems because of its geographical isolation. The ICU is under a variety of pressures to take "all comers" and avoid the long-distance transfer of critically ill patients, with all of the attendant social and clinical problems. These difficulties were compounded by a lack of a bank of ICU nurses, making the hospital dependent on the willingness of the nursing staff to surrender days off and cancel annual leave. There was also inappropriate use of the ICU because of the lack of an HDU, a problem which was offset by the creation of a 6-bedded surgical HDU in the winter of 1997.

6.15 Following the creation of an HDU, it was anticipated that there would be many reciprocal benefits if nurses rotated between the ICU and the new HDU. The original proposals were for 1 ICU nurse (Grade D or E) to spend 6 months in HDU, and for an HDU nurse (Grade D or E) to spend 6 months in ICU. A 6-month training period within ICU was felt to be the minimum time needed to produce the confident and safe care of ICU patients. A 6-month period in HDU for the ICU nurse was also felt to be important if the placement was to provide significant experience.

6.16 These proposals were initially resisted by nursing staff because of worries about separation from colleagues, de-skilling while away from ICU, and the perceived lack of professional development. There were also concerns about dilution of the skill-mix available in ICU, the additional burden of educating 'novices', and the disruption to junior ICU nurses. Structural issues related to the location of ICU and HDU in different management groups made it harder to find solutions. These concerns led to revised proposals under which one ICU nurse at a time would spend 3 months in HDU, while at the same time an HDU nurse would spend 6 months in ICU. This proved acceptable and the scheme has created a pool of ICU nurses to complement those who normally work in ICU. This has increased the hospital's ability to 'flex up' during peaks in demand, has led to more appropriate use of ICU beds and to raised standards of critical care outwith ICU. Additional benefits have been fewer cancellations of major surgical cases, earlier discharge of surgical patients from ICU and enhanced interdepartmental relations. Flexible working practice must not be regarded, however, as a cheap substitute to the provision of a properly-funded critical care service. Training costs are incurred when an experienced ICU nurse is replaced by a less experienced colleague.

6.17 **Lothian Universities NHS Trust** also experienced difficulty in providing adequate numbers of skilled critical care staff at times of peak activity. All sites in Lothian relied heavily on their own staff offering to undertake additional shifts. These staff members have

been paid either through agencies, through additional hours on their substantive contract or through the Nurse Bank at the Western General Hospital.

6.18 The Trust's solution to managing peaks in activity without taking undue advantage of established staff, while at the same time maintaining high standards of critical care, has been to recruit an additional pool of experienced/skilled staff. The Trust has been able to attract the following groups of staff through a series of roadshows on its different sites:

- Experienced ICU/HDU nurses who had left the Health Service, but who are available for a few hours a week on either day or night duty;
- Staff already recruited to the Western General Hospital (WGH) Bank, but who require additional skills to care for patients in ICU/HDU;
- Staff on part-time contracts in general areas of the Trust, who are interested in increasing their hours, or who regularly undertake agency work; and
- Staff on the night duty pool at the Royal Infirmary of Edinburgh, or who could be appointed to it.

These staff are being provided with a flexible orientation programme and will achieve defined competencies before they will manage the care of an ICU patient.

6.19 The orientation programme in ICU requires a week of hospital orientation for those recruited from outwith the Trust. This is followed by an intensive programme of local orientation over a two or three week period (dependent on previous experience and achievement of clinical ICU competencies) during which time these nurses must be supernumerary. By the end of a 3-month period, staff are expected to have attained defined objectives and competencies. They then undertake a further programme of enhanced ICU skills training, such as caring for a patient having renal replacement therapy.

6.20 The flexibility of staff between ICU and HDU has been enhanced considerably recently, by including HDU in the Critical Care Directorate. The previous arrangement allowed some flexibility, but only on an ad hoc basis. The two areas now share education programmes and there is a formalised rotational programme for staff between them.

6.21 Staff on the Royal Infirmary of Edinburgh site have been provided with zero hours contracts, negating the need to pay agency commission, and on the WGH site many have been recruited to the Nurse Bank or have remained on their bank contract.

Funding Issues

6.22 It is essential to avoid the financial concerns of individual Trusts acting as a disincentive to either the temporary upgrading of ICU capacity or the acceptance of ICU transfers from other Trusts. An equalising financial principle is needed to take account of the fact that during times of peak pressure, traditional referral patterns are disrupted by the transfer of patients in all directions. Trusts should be allowed to aggregate the effect of transfers at the end of each financial year, based on an agreed method of costing, using the 3 levels of critical care and length of stay as the main factors. The Scottish Intensive Care Society can provide information on the cost of individual patients, and could shadow patient transfers in the current year in order to determine whether the charges would more or less cancel each other out. The development of an agreed system of funding of transfers would help Trusts to admit patients to unfunded ICU beds, especially when they were being transferred from other unfunded ICU beds.

Elective Surgery

6.23 Flexibility is essential to minimise the impact of peak ICU/HDU activity on elective surgery. Reducing elective surgery has been the device traditionally adopted by Trusts in coping with periods of intensive activity. While pressure will continue to dictate that plans for elective surgery take account of the pressures on ICU/HDU at the beginning of the year (particularly in years with high levels of influenza and related respiratory illnesses), every effort must be made to ensure that adverse effects on waiting lists are avoided. Trusts are encouraged to continue to develop flexible responses to times of demand, and adequacy of HDU provision is seen as central to success.

7 NATIONAL COLLABORATION BETWEEN INTENSIVE CARE UNITS

7.1 This is a key aspect of developing greater national flexibility. The discussion is set against the background of a current national ICU audit system that is funded by CRAG.

7.2 It will always be preferable to provide intensive care for patients in the appropriate hospital which is closest to them and the one to which they are first admitted. However the day-to-day fluctuations in demand at a given site may overwhelm a resource which has limited flexibility both in terms of the number of equipped bed spaces and the availability of trained nurses. This problem exists throughout the year but manifests itself particularly during periods of peak demand.

Electronic Bed Bureau

7.3 The need to transfer a patient or secure admission to a more distant ICU arises when medical and nursing resources are already stretched. It follows that anything which can be done to facilitate the process is welcome. The major difficulty usually involves identifying a unit with an available staffed bed. This can be a frustrating exercise as units are contacted in random order, and a cycle of calls may be required to reassure a reluctant unit that they are best placed to care for an additional patient. This is compounded by a lack of clear rules as to a unit's obligation to transfer or accept a patient where nursing resources rather than bed space is the limiting factor. The electronic bed bureau offers a means of addressing these problems and facilitating appropriate transfers while maintaining good working relationships between the participating hospitals.

7.4 At first sight, a bed bureau operates on a fairly simple basis. The software, 'Ward Watcher', allows routine patient admissions and discharges to be displayed on a bed plan. To discharge a patient, the patient name is simply dragged from the bed icon onto the list of patients awaiting discharge information. Admission simply involves entry of the patient name onto the bed icon which necessitates only 3 pieces of information: name, date and time of admission. When a new patient is admitted into a bed or a discharged patient moved from a bed, a message can be sent automatically via the hospital and NHS network to a central computer based in the Victoria Infirmary. The number of beds occupied in that unit is then updated. When a patient needs ICU care and a bed is not available locally, the bed state of the Scottish general intensive care units is accessed by clicking on the bed bureau icon. A very limited set of patient information such as name and source is required before the bed state of each of the hospitals is displayed. Hospitals are ranked from top to bottom based on the number of empty staffed beds (defined later). It is presumed that unless there is a tertiary referral issue (e.g. burns) that the patient will be referred to the unit in their region with the greatest available capacity. The data on the bed bureau is only as accurate as the most recent entry from the site, so it may be that the unit cannot accommodate the transfer. If that is indeed the reason, it must be recorded in order to understand why. It is therefore vital that once a transfer is arranged, the outcome is entered on the computer.

7.5 One of the issues which confuses collaboration between intensive care units is the extent to which they may legitimately request a transfer or refuse a request from another ICU. No arrangement will ever be ideal, and the Group proposes that the following model should

be the basis on which such discussions should take place and on which the bed bureau will display “available beds”.

7.6 At the outset, all ICUs should declare the agreed number of beds for which they are funded. These numbers will be used to determine the number of available staffed beds, but it is recognised that they will not take into account episodic local difficulties in providing staff. The onus is on each unit to staff its agreed bed complement, and how this is achieved is a local issue. In allocating nursing staff prospectively it will be important to take account of the potential requirement to accept a transfer, particularly at times of general peak demand. Where an ICU has additional equipped bed spaces which are not “staffed”, there is no obligation to accept transfers into those beds. It should be remembered that the bed bureau is simply a map which directs the unit in difficulty to the most appropriate site. Local difficulties may preclude acceptance, but as already noted, it is vital that such refusals are logged for audit purposes.

7.7 The most common reason for a unit to refuse a transfer is when an admission is imminent either from within or outwith its own hospital. A planned admission following major surgery on the following morning is not sufficient reason to refuse admission, but it goes without saying that every effort must be made to avoid cancellation.

7.8 The rate limiting factor in developing a national bed bureau is the pace at which hospitals and their intensive care units are being connected to the NHSnet. The system represents an early example of the benefits which the NHSnet provides. Trusts must make connection of the ICU to the net an IT priority. The Group see no reason why such connection cannot be effected by October 2000 so that an electronic bed bureau is available for national use throughout the forthcoming winter. It anticipates that the bureau will be overseen by the Scottish Intensive Care Society as part of its ongoing audit activities.

Transfers

7.9 The West of Scotland currently uses a dedicated ICU transfer team of 2 doctors, each of whom rotates into the team for 6 months from anaesthesia training programmes. These doctors are experienced SHOs (i.e. have undertaken a minimum of 2 years anaesthetic training) and handle over 350 transfers a year in accordance with existing guidelines on the Transfer of Critically Ill Patients. The service is supervised by a Consultant based at the Western Infirmary, Glasgow. Ongoing support for such a system which provides safe transfer is strongly recommended. There is a need for systems of transfer of patients in both parts of the country, and the east of Scotland in particular is encouraged to examine the need for a dedicated ICU transfer team. Hospital transfer policies must be consistent with currently published guidelines.

Managed Clinical Networks

7.10 Clinicians concerned with intensive care in Scotland have already developed a pragmatic clinical network based on common protocols, audit, collaborative research and the evolution of agreed clinical standards. Collaboration occurs at a “regional” level, particularly when it comes to accepting transfers of patients for critical care at times of excessive local demand.

7.11 The main appeal of developing a Managed Clinical Network is that it would underpin the current network of clinicians and could facilitate funding. It would encourage all units to work in a framework which encourages co-operation. There is, for example, one outlier at present, which does not use the system of audit. Development of Managed Clinical Network could also help bring HDUs into the larger critical care ethos.

7.12 The Scottish Intensive Care Society should be invited to bring forward proposals for a Managed Clinical Network for critical care on a regional basis but under a national umbrella, as is being done for renal transplantation.

8 EDUCATION AND TRAINING

Medical Staff

8.1 Though medical input to critical care areas is predominantly provided at both consultant and trainee level by anaesthetists, multidisciplinary involvement should be encouraged at all levels. Trusts should encourage multidisciplinary training opportunities, and the development of medical HDU beds provides an opportunity for combined medical and surgical training in aspects of critical care. Where possible and appropriate, multiprofessional training and continuing professional development (i.e. doctors, nurses, physiotherapists) is to be encouraged.

8.2 Exposure to critical care represents a valuable training opportunity for a wide range of medical and surgical specialties. Many current training programmes fail to take advantage of this opportunity; for example, surgeons can reach Specialist Registrar without having undertaken any formal attachment to a critical care facility. Every member of junior staff preparing for hospital practice should have training that enables them to deal with the critically ill patient. Although this is not a requirement of training programmes at present, the Group recommends that the Scottish Council for Postgraduate Medical and Dental Education is invited to consider critical care training and the establishment of a modular critical care course, capable of being delivered in each hospital. The recently announced expansion in medical trainees, including appointments for flexible training, and the desire to improve SHO training, offer important opportunities to develop such training.

Nursing Staff

8.3 The Group heard concerns about the way in which nurse training is currently organised. The current system of post-registration education for ICU nurses in Scotland appears to be disjointed and inconsistent. Critical Care courses vary in duration from a week to a year. Some are provided by academic institutions while others are provided by hospitals. It is perceived that courses provided by academic institutions tend to concentrate on theory, with detriment to practice. The effect of this is that ICU nurses in Scotland are seen to be disadvantaged compared to their counterparts in England, where there is a nationally recognised and accredited ICU course with appropriate balance of theory and practice. However, all Specialist Practitioner Courses in Scotland with approval of the National Board for Nursing, Midwifery and Health Visiting for Scotland (NBS) have a 50:50 split of theory and practice.

8.4 Work is being undertaken by the NBS that should be helpful to education and service providers in agreeing appropriate programmes in the future:

- Strength Through Partnership: A Framework for Quality Assuring Continuing Professional Development (CPD) was published in May 2000 and includes the concept of a Portfolio as a Route to Enhanced Competence;
- A draft pathway for Clinical Care Nursing, which creatively fits with the Portfolio Route, has been developed; and

- Work has commenced on developing Clinical Care Competencies, with practising nurses in the driving seat, with consultation scheduled for September. The competencies will be both knowledge and practice based.

When all this detail is available a degree of uniformity should be possible, while leaving room for flexibility and innovation.

8.5 There are good examples from Lothian, Glasgow and Highland of a flexible and incremental approach to developing appropriate levels of knowledge and skill, including short programmes run by Trusts themselves.

8.6 Money is now being made available to Trusts to boost the number of ICU nurses by 50 and to enable at least 50 nurses to undertake training appropriate to the needs of the individual and the Trust.

Physiotherapy: current practice and potential developments

8.7 Although numerous respiratory courses are available for physiotherapists, there is an increasing need for accredited on-call training. All external training is supplementary to the on-site training provided by the respiratory team leader, who must ensure that all on-call staff have achieved and continue to achieve an appropriate standard. Guidelines to this effect are provided by the Association of Chartered Physiotherapists in Respiratory Care.

8.8 Extended Scope Practitioner posts are now being introduced, with physiotherapists becoming more involved in airway management, oxygen prescription, alteration of bronchodilator therapy, arterial blood sampling and in some cases therapeutic bronchoscopy. These skills, combined with pre-existing clinical specialisation in areas such as non-invasive ventilation, mean that physiotherapists are key personnel in both the ICU and HDU settings and in the development of outreach services. These skilled individuals should form an important part of the Critical Care Delivery Group within Acute Trusts.

8.9 The addition of modular competency-based training to the current accredited and validated post-graduate training should allow the skills of physiotherapists to be more readily recognised and accessed. A junior physiotherapist rotation is now accredited in Doncaster and offers an example of the initiative now needed to exploit the full potential of physiotherapists in critical care.

9 AUDIT ARRANGEMENTS

9.1 All of the documents consulted by the Group stressed the importance of audit, and many were in themselves testimony to its value. The lack of detailed data on HDU activity contrasts strongly with the excellent audit of ICU which currently exists in Scotland. With relatively minor adjustments, audit of HDU could be added to the audit of ICU being undertaken by the Scottish Intensive Care Society, and CRAG should be asked to consider funding this extension of the current audit arrangements. If that comes about, other medical and nursing staff should be closely involved, given their key role in the provision of HDU. It would be essential to make sure that the data collected were of use to nurses and doctors alike. Expansion of critical care audit into HDU will encourage common audit, research and clinical standards to evolve across a wider range of critical care activity. The Scottish Intensive Care Society should be invited to liaise with SASM and establish a multidisciplinary and multiprofessional group with a remit to provide a minimum dataset suitable for use in HDUs. Data collection should be established by a target date of April 2001. In time, audit of HDU should extend to physicians (see paragraph 3.9).

9.2 One-third of all patients who die following admission to intensive care do so following ICU discharge. High quality intensive care should provide appropriate step-down facilities and, where appropriate, ongoing involvement of the critical care team. The Group sees this as an area into which the Scottish Intensive Care Society audit might extend.

9.3 The success of the Scottish Intensive Care Society National Audit in providing almost 100% participation from the outset derived from CRAG's willingness to provide comprehensive funding at national rather than local level. This provided a package of hardware and software for use at local level with funding for a central office. In the second phase of funding, hardware purchase and support was devolved to Trusts, and it is now proposed that software costs should be devolved to Trusts. Ongoing national funding would thereafter be required exclusively for a central office established independently, as part of a Managed Clinical Network, or within ISD. Inclusion of HDUs in data collection would require Trust purchased hardware and software. Data analysis could be undertaken by the central office established for the ICU audit. In the first year (2000-2001) an additional salary would be required to provide on-site training and support in the use of the system.

9.4 The Group sees the ongoing funding of the extended SICS National Audit as vital, and encourages SICS to maintain its current relationship with CRAG about ongoing funding.

9.5 The Group is aware that SASM, SICS and the Scottish Trauma Audit Group (STAG) are all concerned with analysis of deaths following surgery. It wishes to encourage collaboration among all 3 agencies in order to avoid duplication of effort, promote accuracy and encourage collaborative working. It looks to CRAG as an appropriate agency to work with Health Boards Chief Executives to ensure that this audit activity remains coherent, appropriate and robust.

10 CONCLUSIONS AND RECOMMENDATIONS

10.1 Critical care should be classified as having 3 levels, extending from routine monitoring after major surgery (level 1), through high dependency care (level 2) to intensive care (level 3). It follows that the spectrum of critical care should be recognised as extending from ill patients in general wards and patients in HDUs to patients in ICUs.

10.2 Each Acute Trust should establish a Critical Care Delivery Group. The Group should be responsible for assessing the adequacy of critical care bed capacity and defining the maximum capacity for expansion at times of increased demand. The Group should have a lead clinician who has responsibility for instituting an agreed escalation policy at times of increased demand. While pressure on critical care services appears to peak at the beginning of the year, demand seldom abates before March and pressure can continue throughout the year.

10.3 While a ratio of 2 HDU beds to one ICU bed is still seen by the Group as a reasonable target, detailed determination of bed provision can only be decided at Trust level in the light of casemix complexity. Maximum flexibility in the use of critical care beds is to be encouraged, and is facilitated by the co-location of ICU and HDU wherever possible.

10.4 Admission and discharge criteria for ICU and HDU should be agreed by the Critical Care Delivery Group and publicised within the Trust. The Group recommends that each HDU should have a nurse with defined administrative responsibilities. This nurse would work with the consultant in administrative charge and would be empowered to discharge patients according to agreed protocols.

10.5 Patient-at-risk guidelines should be drawn up. This has particular relevance for patients who would not otherwise be identified as requiring critical care. The guidelines should specify the mechanism whereby such patients are identified, how they are drawn to the attention of the Critical Care Delivery Group and how their care should be co-ordinated when they are identified.

10.6 There should be a common nursing administration for the Critical Care Service. This would include both ICU and HDU nursing services and the educational activities of nurse specialists. It would help to ensure maximum flexibility in the use of critical care resource to develop.

10.7 The need for more nurses with critical care skills is now being addressed and the Review Group was greatly encouraged by the recent announcement of 50 new posts for ICU nurses and enhanced provision for training. It sees a need to develop a more coherent training programme for critical care nurses with an appropriate mix of academic instruction and practical training delivered in an incremental manner on approved modular courses.

10.8 When defining escalation policies, consideration needs to be given to the availability of both staff and equipment. The need to develop a pool of critical care nurses who can work flexibly between HDU and ICU and expand to deal with periods of pressure is of central importance. The Report details examples of good practice and describes ways in which additional nurses can be recruited to the critical care pool and trained appropriately.

10.9 The Review Group does not recommend that Trusts purchase equipment so that every HDU can be converted into an ICU bed but it does expect the Critical Care Delivery Group to make appropriate allowance for equipment availability when defining its escalation policy. It sees difficulty with creating a central equipment reserve that could be deployed at times of need, but encourages Trusts to plan with their equipment suppliers in ways which ensure that equipment could be leased on a short-term basis at times of crisis.

10.10 Continuation of the Scottish Intensive Care Society audit is critical and CRAG is encouraged to maintain its financial support. The Group see the need to extend audit activity from ICU into HDU (and ultimately should include patients having level 1 care). All in-hospital deaths should be audited in the way that surgical deaths are currently audited by SASM and this will mean extension of audit activity to include deaths in medical as well as surgical patients. Particular attention needs to be paid to the clinical course of patients following discharge from ICU.

10.11 Communication between ICUs needs to be improved so that an electronic bed bureau could be brought into operation through the NHS Net. The Scottish Intensive Care Society is well placed to administer an electronic bed bureau and Trusts should link to NHS Net by October 2000. Networking between intensive care units is already well established, and further development of a Managed Clinical Network or Networks is seen as a desirable goal.

APPENDIX

WORKING GROUP ON ICU AND HDU BEDS

Membership

Chairman

Sir David Carter Chief Medical Officer

Members

Mr Neil Campbell	General Manager, Dumfries & Galloway Health Board, Dumfries
Dr Alistair Dorward	Consultant General Physician, Royal Alexandra Hospital, Paisley
Ms Linda Gray	Senior 1 Physiotherapist, Borders General Hospital, Melrose
Mr Nigel Hobson	Director of Nursing & Quality, Highland Acute Hospitals NHS Trust, Inverness
Ms Marion Hodge	Service Manager, Anaesthetics Department, North Glasgow University Hospitals NHS Trust
Dr Cameron Howie	Consultant Anaesthetist, Victoria Infirmary, Glasgow
Professor J D Hutchison	Consultant Orthopaedic Surgeon, Aberdeen Royal Infirmary
Dr Dermot McKeown	Consultant Anaesthetist, Royal Infirmary of Edinburgh
Mr Chris Morran	Consultant in General Surgery, Crosshouse Hospital, Ayrshire
Ms Chris Paterson	Senior Sister, High Dependency Unit, Gartnavel General Hospital
Mr Peter Stonebridge	Consultant Vascular Surgeon, Ninewells Hospital, Dundee
Dr David Wright	Consultant Anaesthetist, Western General Hospital, Edinburgh

Observer:

Mr Eric Taylor Medical Directorate, Scottish Executive Health Department

Secretary :

Mr W S Scott Health Care Policy Division, Scottish Executive Health Department