Scottish Intensive Care Society Audit Group

ANNUAL REPORT 2003

An Audit of Intensive Care Units in Scotland.

Project Director: Miss Fiona MacKirdy

Lead Clinician: Dr Simon J Mackenzie

Website: www.scottishintensivecare.org.uk

August 2003

A. CONTENTS

A.1. Figures

A.2. Tables

A.3. Appendices

B. ABBREVIATIONS

ACP	Augmented Care Period
APACHE	Acute Physiology and Chronic Health Evaluation
ARDS	Acute respiratory distress syndrome
CSAGS	Confidentiality and Security Advisory Group for Scotland
CCDG	Critical Care Delivery Group
DepCat	Socio-economic deprivation category
DGH	District General Hospital
eBed Bureau	Electronic Bed Bureau
EBM	Evidence-Based Medicine
HAI	Hospital Acquired Infection
HDU	High Dependency Unit
ICNARC	Intensive Care National Audit and Research Centre
ICU	Intensive Care Unit
ISD	Information and Statistics Division
NMBA	Neuro-muscular blocking agents
PAFC	Pulmonary artery flotation catheter
RRT	Renal replacement therapy
SAPS	Simplified Acute Physiology Score
SCCTG	Scottish Critical Care Trials Group
SCIEH	Scottish Centre for Infection and Environmental Health
SICS	Scottish Intensive Care Society
SICSAG	Scottish Intensive Care Society Audit Group
SMC	Scottish Medicines Consortium
SMR	Standardised mortality ratio
TISS	Therapeutic Intervention Scoring System

Key to tables 18 - 63

N/A	= not available
N/R	= not recorded
U/C	= unconfirmed
U/V	= unable to validate
SS	= strongly suspected
C	= confirmed

C. INTRODUCTION & SUMMARY

1. After another busy and productive year, this report continues in the format of those published in recent years. It is being published on the Scottish Intensive Care Society's (SICS) web site and provides benchmark data on levels of intervention and organ support, workload and outcome during 2001 and part of 2002 as well as a review of other work. As the extent of data increases, rather than continue to present previous years' graphs as comparisons, comments to the latter may be made in the text. You should, therefore, refer to the Annual Report 2002 [1] in particular, for 1998-2000 results.

2. We will once more provide the lead audit clinician with figures relating to his/her unit that are comparable with the overall Scottish results. The hope being that individual unit's results will be disseminated to all staff involved in collecting data in the intensive care units (ICUs).

3. The issues discussed at the Annual Audit Meeting held on 22nd November 2002 can be read in a review of the meeting available on the SICS website, in the SICS Newsletter 2003 or in the Meetings page [2].

4. Once again we provide comparative data on ICU occupancy (Section D.1) and levels of organ support derived from daily Augmented Care Period (ACP) data (Sections D.2 & D.3). These data are of particular value to the Trusts' Critical Care Delivery Groups (CCDGs), which have the responsibility for ongoing assessment of the adequacy of provision of critical care beds. A review of the remit of CCDGs is presented in Section E.2.

5. Case mix adjusted mortality is presented in Section D.5. Once again the most striking feature is the very narrow range of case mix adjusted (standardised) mortality ratios (SMRs). We have again divided SMR data for each unit according to the primary system failure. This allows each unit to evaluate performance in discreet areas of practice. These data are provided in an anonymised form, with an ICU's

identity made available to its own staff and at the request of relevant Trust staff. The codes used in consecutive Annual Reports do not necessarily correspond and you should be aware of the code applicable to your unit used in respective reports. **We would appreciate views on whether this level of anonymity should be sustained, given a political climate which encourages making this type of information available to the public.**

6. Multidisciplinary, retrospective analyses of outcomes in certain groups of ICU admissions are underway. The review of haemato-oncology outcomes is being supported by Haematologists in Scotland, and is nearing completion.

7. It is anticipated that analyses of data collected for the prospective audit of sepsis conducted between January and May 2002 will be completed shortly. Delays in recording hospital outcome information in a minority of units have held up progress.

8. The SICS has developed a guideline for use of Drotrecogin alfa (Activated), based not only on the published randomised study [3] but also on the sub-group analyses available on the Food and Drug Agency (FDA) web site [4]. As agreed at the Society's Annual General Meeting, the dataset has been modified to allow an audit of the use of the drug (as recommended by the Scottish Medicines Consortium) and also of the utility of the guideline. A report on the progress of the audit is available in Section D.6.

9. The results from a joint piece of work with Scottish pharmacists, reviewing sedative use, are presented in Section D.8. We hope this is the beginning of a productive collaboration, which may result in resource savings across Scotland.

10. The development of surveillance of Hospital Acquired Infection (HAI) in ICU, in conjunction with the Scottish Centre for Infection and Environmental Health (SCIEH), has progressed slowly. As anticipated this has been a difficult project and we are grateful to the two units which have piloted different approaches. Section E.5 provides a progress report on this audit.

11. As the audit has developed it has encouraged the creation of groups which rely, to a variable extent, on its structure and available data. This Report, therefore, includes reviews from the Evidence-based Medicine Group (E.3) and the Critical Care Trials Group (E.4).

12. The work of the audit group and results generated from data collected by all ICU staff, continue to be disseminated both at home and abroad. Since January 2003, presentations have been made at a variety of meetings and lectures including presentation of some sepsis results to the Irish Association of Critical Care Nurses in Dublin. Abstracts have been presented at the International Symposium on Intensive Care and Emergency Medicine in Brussels in March 2003 on the sepsis data [5] and on the effect of deprivation on outcome [6] (Section D.7). A review of the sepsis poster was also reported recently in the British Journal of Intensive Care [7]. An abstract on consultant expectations of outcome was presented at the European Association of Anaesthetists conference in Glasgow in June [8]. Anaesthesia has accepted a paper on the acute respiratory distress syndrome (ARDS) audit conducted in 2000 [9].

13. Funding of the Scottish Intensive Care Society Audit Group (SICSAG) has now been agreed with Scottish Health Boards. A pragmatic decision was made to generate top-sliced funding built around the very positive response to the creation of an *electronic* (*e*)Bed Bureau. As a result, funding has been assured for one further year (to March 2004) and it is anticipated that this level of funding will be ongoing.

14. As discussed in the Annual Report 2002 [1], funding of high dependency unit (HDU) audit is not included in the above package. The Audit Group established audit systems initially in 23 HDUs across Scotland early in 2002 [10]. This was established without additional resources, through a combination of savings from the software costs for the intensive care unit audit and a contribution from the SICS, generated by collaborative work with a number of pharmaceutical companies. Ongoing support for HDU audit was sought thereafter, by “selling” the system to individual Trusts. For the financial year April 2002-March 2003, funding to the tune of £2,500 for each

participating HDU was obtained from Acute Trusts to provide software and support to the HDUs from SICSAG. This is the way in which funding of intensive care audit is provided in England. During the current financial year (April 2003-March 2004) Trusts will be invoiced once more for the same amount per unit. Continuation of funding for the HDU audit is an item being discussed by the Chairs of the CCDGs, established in each Trust following the *Better Critical Care* report [11].

15. The ICU audit funding provides salaries for the Project Director and one assistant. If the same number of HDUs continue to participate in the audit, HDU funding will provide a salary for one additional WTE. Since February, we have been able to use this money to contract 1WTE at NHS Greater Glasgow to assist with maintaining the ICU central database, developing an HDU central database and performing analyses. Between the ICU and HDU funding, the Audit is being managed by the Project Director; the main remit of the assistant is in developing the HDU audit in collaboration with the HDU staff; database management and some analyses are supported at NHS Greater Glasgow. With the extent of work and the geography of the units, the 2 audit staff are continually under pressure to provide the level of support that is required in up to 60 ICUs and HDUs.

16. Our links with the Information and Statistics Division, NHS Scotland (ISD), continue to a lesser extent than expected, however, we continue to rely on their expertise with record linkage. It was expected that the level of contracted work producing SMRs and analysing the ACP data for the 2002 Annual Report would be repeated this year. There would have been great advantage to this – ISD would perform the necessary record linkage and had staff who were already familiar with our data and the analyses procedures required. Rather, our links with NHS Greater Glasgow have increased as described in latter paragraph. Yet again there has been a time delay in producing the Annual Report. This is inevitable as staff in the Board worked with the Project Director over the last few months to become familiar with the data and data analyses and record linkage performed by ISD is always a lengthy process.

17. No HDU data are included in this report. A separate report will be published on the website shortly. In summary, however, there are currently 26 HDUs participating in collecting comparable workload data, almost all conducted by nursing staff. Consultant staff continue to be sent information about the HDU audit, meetings' applications and SICS newsletters, as do the nursing staff. It is clear that consultant involvement in HDU audit is the exception rather than the rule. After a minimal service to *all* critical care units between February and June (whilst our audit nurse Gill Harris served military duty), all HDUs have been visited in the last 2 months with time spent helping staff accessing the data and creating informative reports.

18. We remain keen to receive feedback about the format or the content of either the Annual Report or the Annual Meeting to ensure the data are informative and effective.

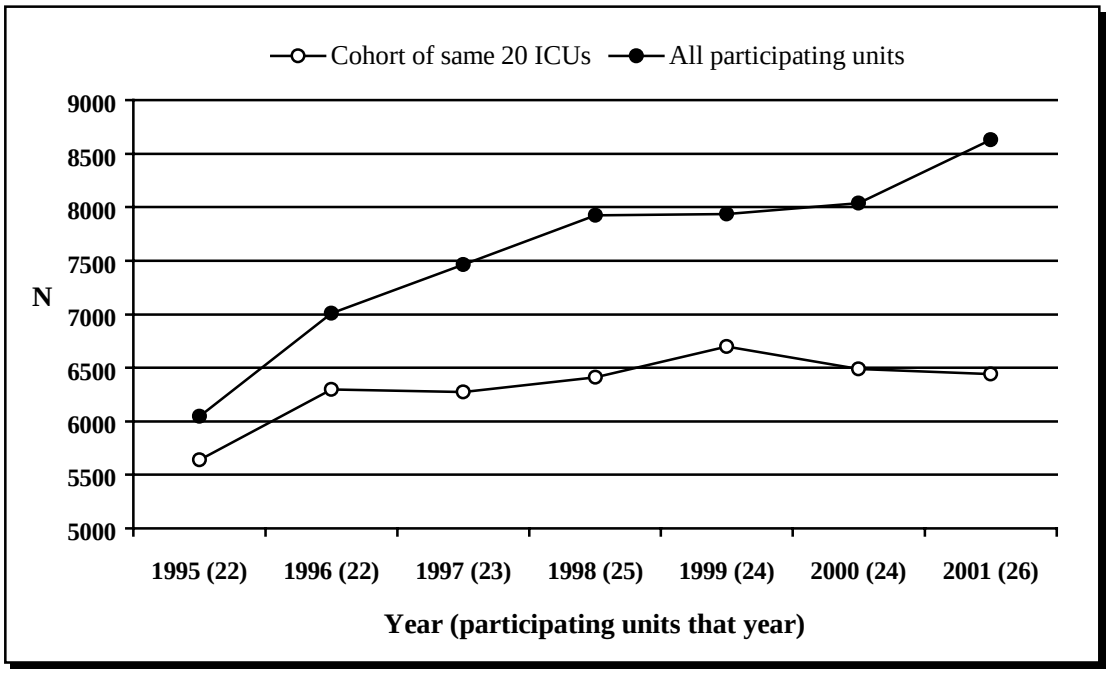
D. RESULTS & DISCUSSION

In all graphs * identifies District General Hospitals (DGHs), ^ identifies combined HDU/ICU, unless stated differently. Appendix I contains a list of all participating units and the acronyms used in the workload/organ support figures to identify these units.

D.1. Intensive care demand.

19. Figure 1 shows the trend in annual ICU admissions in all units who have contributed data over the period 1995-2001 and in those 20 which have participated throughout this 7-year period. For the first time, all 26 adult, general ICUs participated to some extent in the audit. The increase in the number of participating ICUs is reflected in the increase in admission numbers to 2001. In 1997, Glasgow Royal Infirmary began to participate; 1998 saw ICUs at Ayr Hospital and Dumfries & Galloway Royal Infirmary become involved; after a 3-year absence Falkirk & District Royal Infirmary re-established participation once the *e*Bed Bureau came on-line in 2001; Raigmore Hospital participates to a limited extent after 2-years.

Figure 1. Annual admission rates to Scottish ICUs, 1995 - 2001: a) in cohort of 20 units contributing throughout and b) all participating units.



20. The numbers of funded ICU beds in each unit for 2001 are given in Table 1. These bed numbers were confirmed with the lead audit clinicians in these units during 2001. Following the pressure experienced during winter 1999-2000 there were increases in bed numbers over the winter months in a limited number of units: Aberdeen Royal Infirmary, Hairmyres Hospital, Monklands Hospital, Raigmore Hospital, the Royal Infirmary of Edinburgh and St. John's Hospital. Two other beds elsewhere in Lanarkshire did not materialise.

21. We aim to use the correct number of available funded beds to determine bed occupancy as accurately as possible. This is made difficult whilst there continues to be variation in the given bed numbers as identified to the audit group by, on occasion, the same sources. We encourage senior staff to ensure that the correct number of ICU beds, particularly any increase in number over the winter months, are correctly identified when requested.

22. Bed occupancies during 2001, in Figures 2, 3, 5 and 6, are calculated using the bed numbers given in Table 1, with the exception of the combined HDU/ICUs in which the total numbers of funded beds for that unit are used. This methodology inevitably underestimates the 'ICU' bed occupancy in Vale of Leven in particular, where either 4 non-ventilated or 2 ventilated patients can be in the unit at any one time. The other combined units have the resource to run the units to the maximum funded ICU bed (5 in Falkirk, 5 in Hairmyres) as well as HDU capacity.

Bed Numbers used to calculate occupancy:

- Falkirk Royal Infirmary: N = 8
- Hairmyres Hospital: N = 7
- Vale of Leven: N = 4
- Wishaw General Hospital: N = 5 (Jan-June); N = 12 (July-Dec)

Table 1. Funded ICU beds in Scotland during 2001.

HEALTH BOARD	HOSPITAL	ICU FUNDED BEDS			
		Jan-March 2001	April-Nov. 2001	Dec. 2001	Mean 2001
Argyll & Clyde	Inverclyde Royal Hospital	2	2	2	2
	Vale of Leven DGH	2	2	2	2
	Royal Alexandra Hospital	4	4	4	4
	Total for Health Board	***8***	***8***	***8***	***8***
Ayrshire & Arran	Ayr Hospital	4	4	4	4
	Crosshouse Hospital	5	5	5	5
	Total for Health Board	***9***	***9***	***9***	***9***
Borders	Borders General Hospital	3	3	3	3
	Total for Health Board	***3***	***3***	***3***	***3***
Dumfries & Galloway	Dumfries Royal Infirmary	4	4	4	4
	Total for Health Board	***4***	***4***	***4***	***4***
Fife	Victoria Hospital Kirkcaldy	4	4	3	3.92
	Queen Margaret Hospital	6	6	7	6.08
	Total for Health Board	***10***	***10***	***10***	***10***
Forth Valley	Stirling Royal Infirmary	4	4	4	4
	Falkirk Royal Infirmary	5	5	5	5
	Total for Health Board	***9***	***9***	***9***	***9***
Grampian	Aberdeen Royal Infirmary	10	9	10	9.33
	Total for Health Board	***10***	***9***	***10***	***9.33***
Greater Glasgow	Western Infirmary	7	7	7	7
	Glasgow Royal Infirmary	7	7	7	7
	Victoria Infirmary	5	5	5	5
	Stobhill Hospital	5	5	5	5
	Southern General Hospital	5	5	5	5
	Total for Health Board	***29***	***29***	***29***	***29***
Highland	Raigmore Hospital	6	6	7	6.1
	Total for Health Board	***6***	***6***	***7***	***6.1***
Lanarkshire	Hairmyres Hospital	6	5	5	5.25
	Law (Wishaw) Hospital	5	5	5	5
	Monklands Hospital	6	5	5	5.25
	Total for Health Board	***17***	***15***	***15***	***15.5***
Lothian	Royal Infirmary of Edinburgh	12	11	12	11.3
	Western General Hospital	8	8	8	8
	St. John's Hospital	5	4	4	4.25
	Total for Health Board	***25***	***23***	***24***	***23.55***
Tayside	Ninewells Hospital	7	7	7	7
	Perth Royal Infirmary	3	3	3	3
	Total for Health Board	***10***	***10***	***10***	***10***
	SCOTLAND	**139**	**135**	**138**	**136.48**

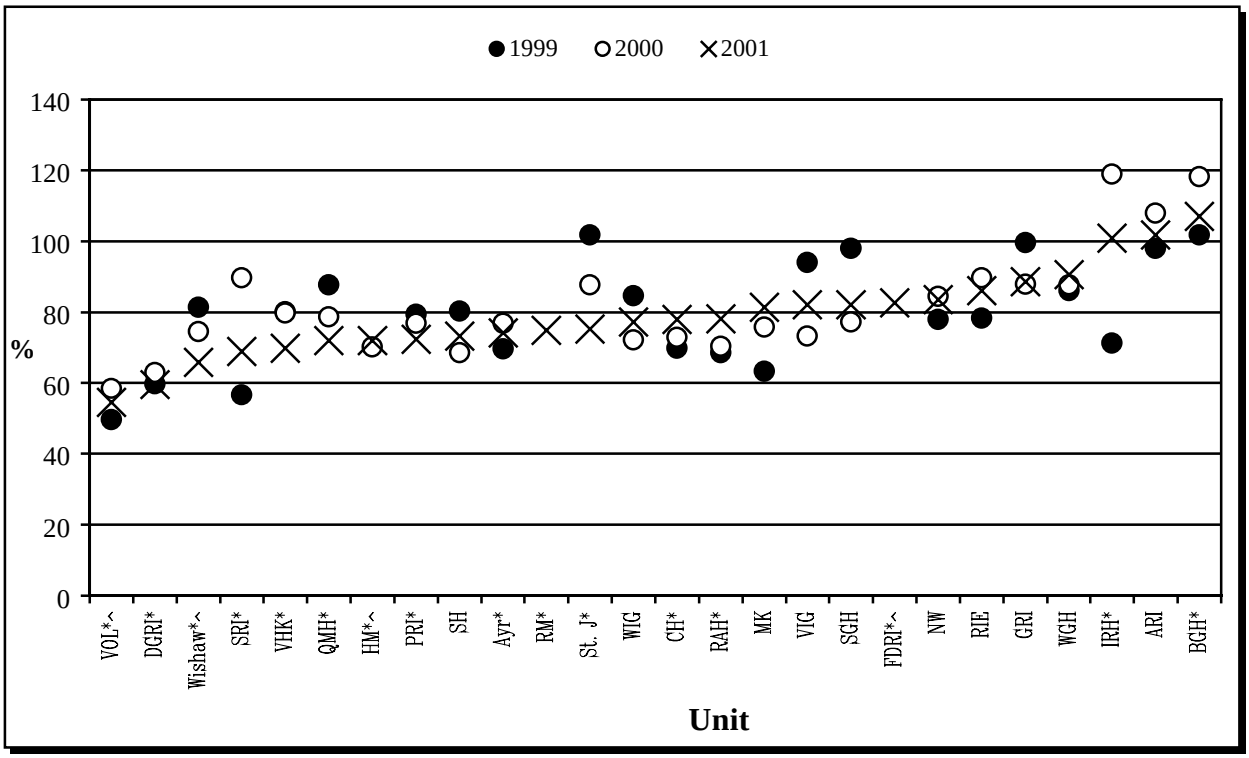
Key : indicates winter increase

23. Figure 2 shows the annual occupancy for each ICU for the years 1999, 2000 & 2001. Three quarters of all units had an average occupancy greater than 70% in 2001. In 1999, Stirling Royal Infirmary (SRI) had 4 funded beds and a bed occupancy of 56.6%, with 177 admissions. In 2000, Stirling's funded bed status decreased to 3, resulting in an average bed occupancy for 2000 of 90%, with 219 admissions. Funding for the fourth bed was available in 2001, with a resultant decrease in bed occupancy to almost 70% (192 admissions).

24. It is also worth discussing the bed occupancies throughout Glasgow. Until the end of 1999, Stobhill Hospital (SH), the Southern General Hospital (SGH), the Western (WIG) and Victoria (VIG) Infirmaries each had one more physical bed in their ICU than funded (funded beds = 4, 4, 6 and 4 respectively). These non-funded beds were being used to admit patients into. As of 1st January 2000, when the winter pressure was at its peak, the funded bed complement increased in all these units by 1 bed. Hence, the decrease in bed occupancies for these units between 1999 and 2000 is a result of an increase in funded beds rather than a decrease in throughput.

25. For the first 4 years of the audit, Inverclyde Royal Hospital (IRH) had no officially funded ICU beds although ICU patients were admitted into its then 3-bedded HDU facility. Occupancy data have historically been generated for this unit using the total number of available beds in the unit (N=3). In this current report, however, the occupancies for IRH for the years 2000 and 2001 have been modified to reflect the 2 official funded ICU beds now available. Hence, in Figure 2, an increase in bed occupancy is observed between 1999 and subsequent years. This modification also results in slight differences in occupancy data in this report compared to previous reports. The mean occupancies for IRH, however, have been consistently high and the ICU bed status is currently under review.

Figure 2. Trends in bed occupancies (%) in Scottish ICUs, 1999, 2000 & 2001.



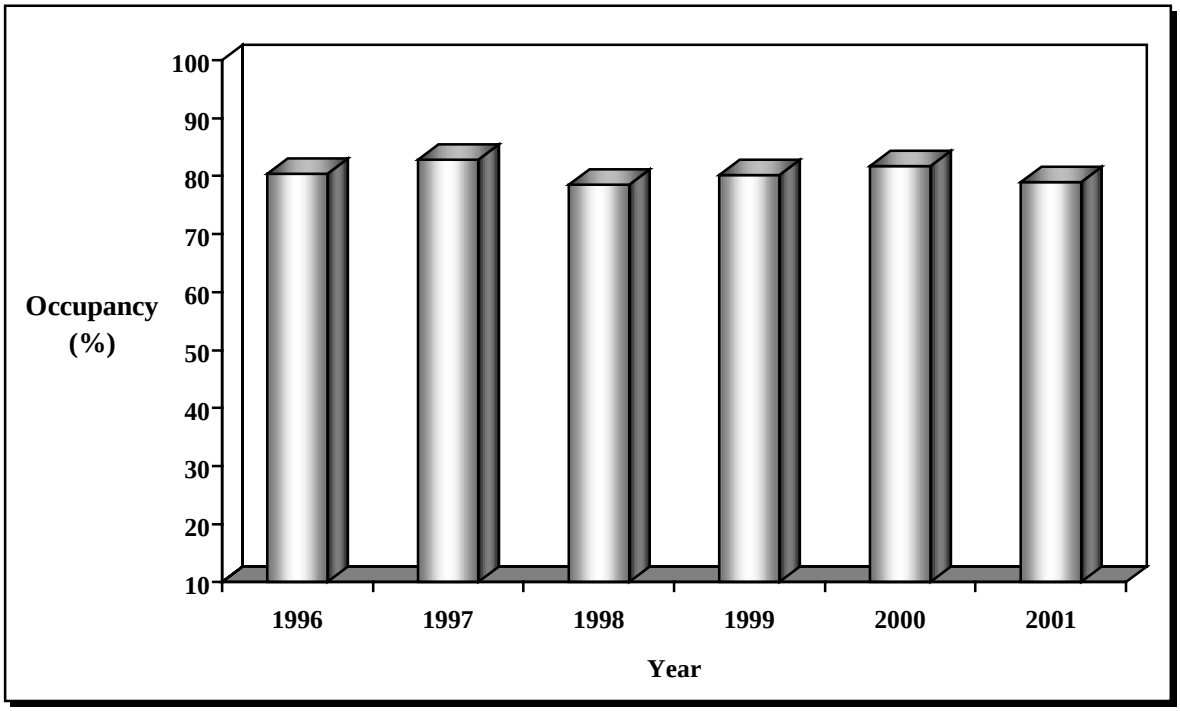
26. Occupancies at both Aberdeen Royal Infirmary (ARI) and Borders General Hospital (BGH) have also been persistently high. Grampian was identified previously as having the lowest number of beds *per capita* in Scotland. The Annual Audit Report 1999 [12] reported only 1.51 per 100,000, based on 8 ICU funded beds in Aberdeen. Table 2 provides a more recent indication of the number of ICU beds per 100,000 Health Board area population. The Health Board Area data are based on figures from June 2002. In 2001, Grampian still had least beds *per capita*. Recently, a new ICU in Aberdeen Royal Infirmary has increased the capacity to 12 funded beds at the end of 2003 or 2.29 beds *per capita*.

Table 2. Funded ICU beds in per 100,000 population.

		ICU Beds in 2001 (N)	
Health Board areas	**HB Population**	**Mean**	**per 100,000**
Argyll & Clyde	418,750	8	1.91
Ayrshire & Arran	367,060	9	2.45
Borders	107,400	3	2.79
Dumfries & Galloway	147,310	4	2.72
Fife	350,620	10	2.85
Forth Valley	279,370	9	3.22
Grampian	523,290	9.33	1.78
Greater Glasgow	866,080	29	3.35
Highland	208,140	6.1	2.93
Lanarkshire	552,910	15.5	2.80
Lothian	779,100	23.55	3.02
Tayside	387,420	10	2.58
Orkney	19,210	-	-
Shetland	21,940	-	-
Western Isles	26,200	-	-
Scotland	**5,054,800**	**136.48**	**2.70**

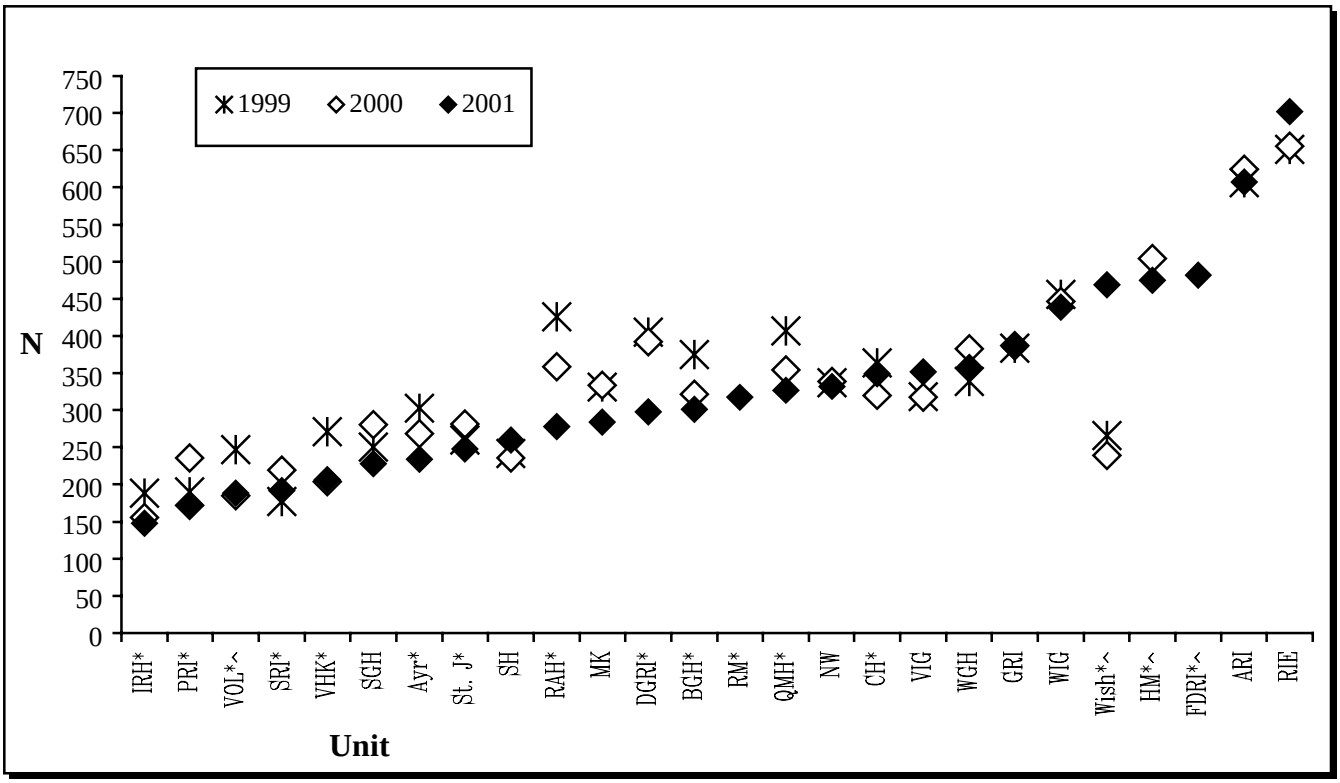
27. There has been an increase in the number of ICU beds in Scotland, from 112 beds in 1996 to an average of 136.5 in 2001. Average occupancy has, nevertheless, remained consistently high, at 80%, throughout the audit (Figure 3).

Figure 3. Scotland: ICU bed occupancy 1996-2001.



28. The number of admissions to each unit is demonstrated in Figure 4. Mid-way through 2001, Law Hospital ICU moved to the new Wishaw General Hospital as a combined HDU/ICU. The increase in admissions at Wishaw between 2000 & 2001 is a result of all adult critical care admissions being admitted to the one unit and recorded on the audit system for half of 2001. Decreases in admission numbers to the Royal Alexandra Hospital (RAH) and Dumfries & Galloway Royal Infirmary (DGRI) can be explained by the status of both units changing to that of ICU from HDU and HDU patients, in the main, subsequently being admitted to separate HDUs in both hospitals. In Fife, HDUs opened in Queen Margaret Hospital (QMH) and Victoria Hospital (VHK) during these years, which also explains the decrease in overall admission rates in these units.

Figure 4. Trends in annual admission rates: 1999-2001.



29. The electronic Bed Bureau continues to play a vital role in identifying appropriate, available funded ICU beds when required to transfer a patient. The effectiveness of this facility is reliant on staff ensuring that empty, non-funded ICU beds or HDU beds within the unit remain closed on the system. This will ensure that only the number of available, empty funded ICU beds will be displayed to those seeking one. A variety of changes to IT networks within the various Trusts and the audit software have resulted in periods when some units have been off-line from the system.

30. The period between December and March is a time when ICUs in Scotland have been most consistently under pressure. Figure 5 details the annual occupancy for these months from 1996 – 2002. January 2000 remains exceptional. Figure 6, however, details the trends in monthly occupancies throughout 1999 – 2001. This figure demonstrates the continuous pressure on ICU resources throughout the year.

Figure 5. Trends in Scottish ICU winter bed occupancies: December - March.

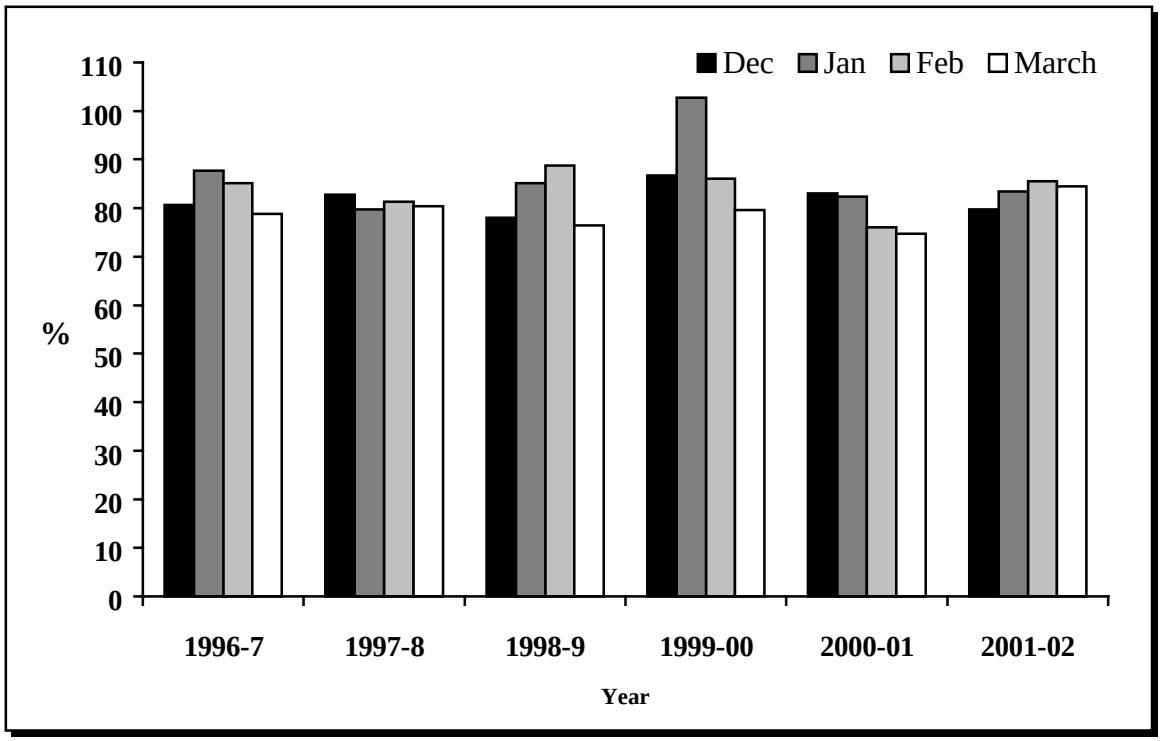
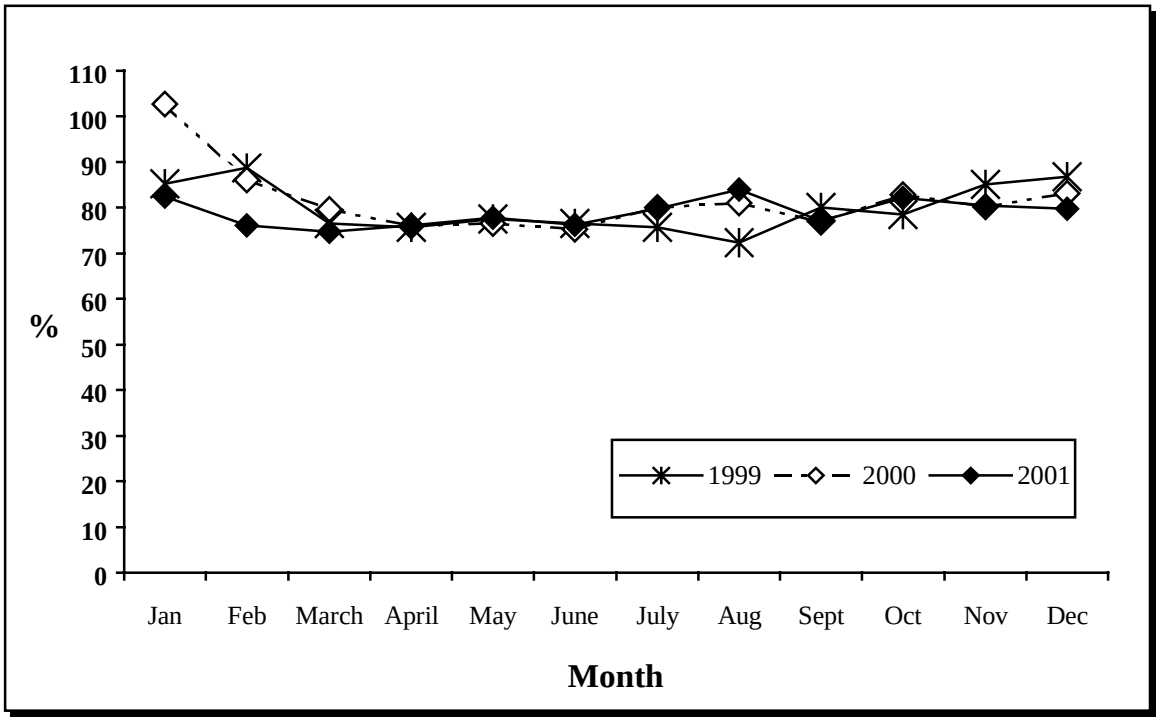


Figure 6. Trends in monthly bed occupancies (all units): 1999-2001.



31. Figures 7 and 8 demonstrate ICU lengths of stay. Mean length of stay is more than double that of the median, in every unit. This reflects the fact that length of stay is not normally distributed. Median length of stay is, perhaps, the theoretical appropriate way of describing these data but mean reflects absolute bed usage and resource. In previous years, we have examined to a limited extent the relationship between illness severity and length of stay in ICU survivors and non-survivors. Variations in length of stay are undoubtedly affected by case mix and by discharge facilities. There is a need, however, to investigate further the relationship between length of stay, number of admissions and bed occupancy.

32. Table 3 provides detailed information on a unit-by-unit basis.

Figure 7. Length of ICU stay, 2001 (Mean & Median).

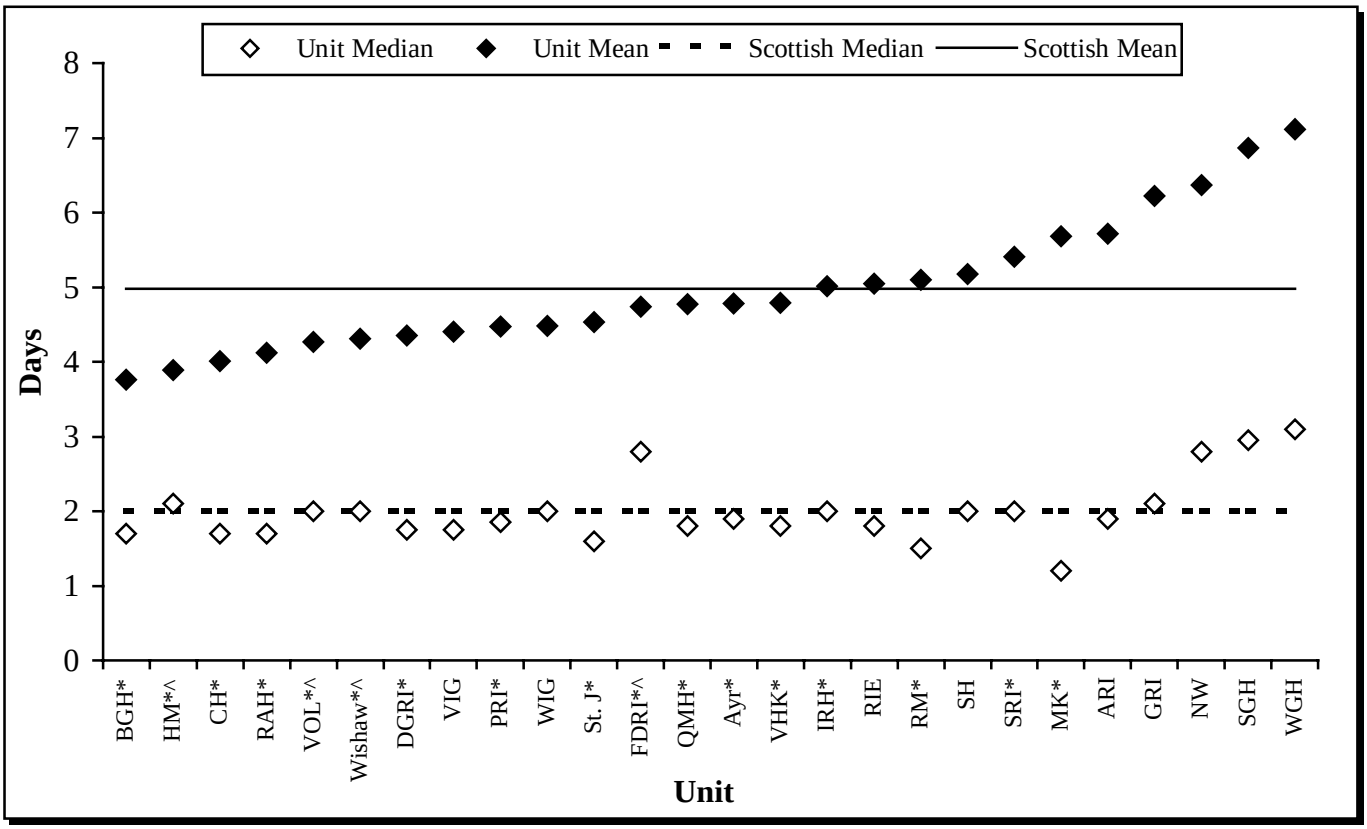


Figure 8. Length of ICU stay, 2001 (median and interquartile range). Scottish median = 2 days, IQR 0.9-5.2.

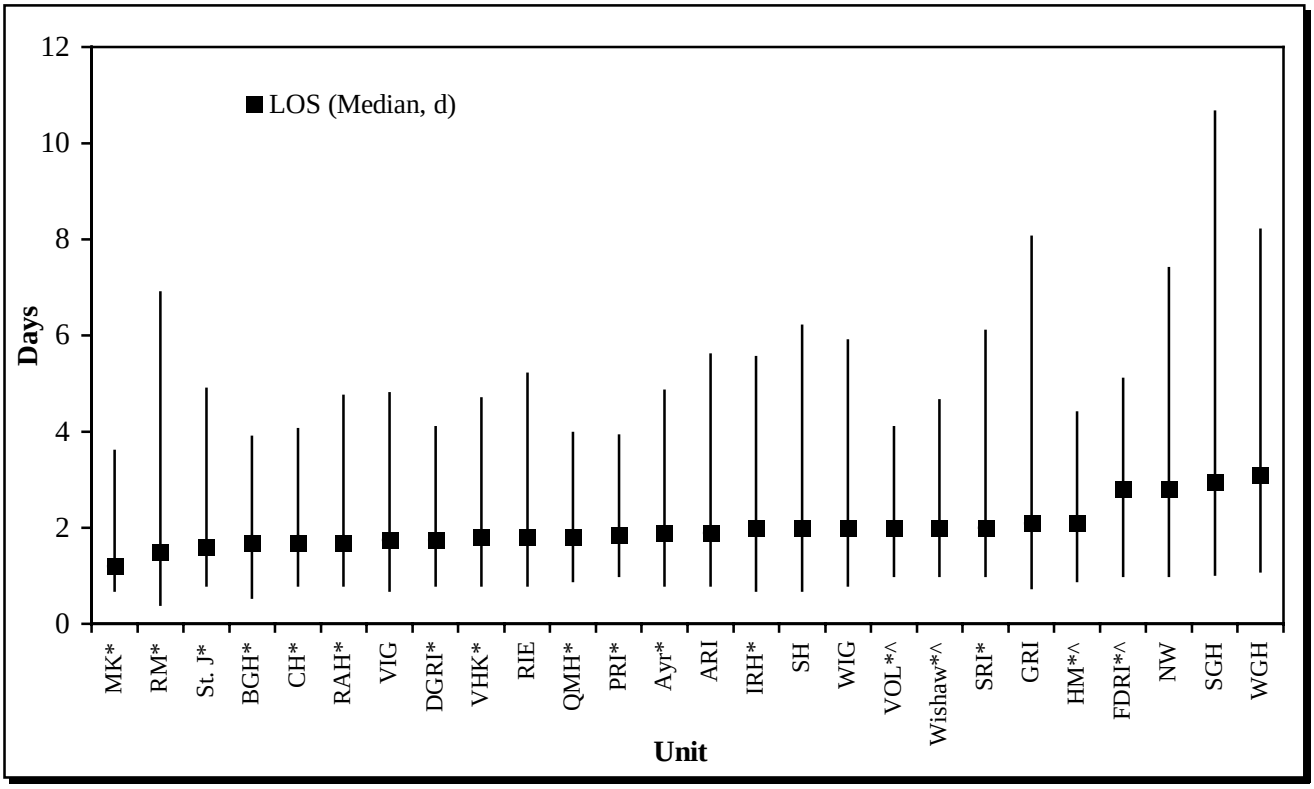


Table 3. Tabulated median and mean lengths of ICU stay, 2001.

	ICU LOS (d)					
Unit	**Median**	**Lower IQR**	**Upper IQR**	**Mean**	**Minimum**	**Maximum**
ARI	1.9	0.8	5.6	5.7	0.0	248.3
Ayr*	1.9	0.8	4.9	4.8	0.0	50.3
BGH*	1.7	0.6	3.9	3.8	0.0	33.0
CH*	1.7	0.8	4.1	4.0	0.0	55.8
DGRI*	1.8	0.8	4.1	4.4	0.1	78.0
FDRI*^	2.8	1.0	5.1	4.7	0.0	195.1
GRI	2.1	0.8	8.1	6.2	0.0	105.0
HM*^	2.1	0.9	4.4	3.9	0.1	50.0
IRH*	2.0	0.7	5.6	5.0	0.0	52.1
MK*	1.2	0.7	3.6	5.7	0.0	395.4
NW	2.8	1.0	7.4	6.4	0.0	57.9
PRI*	1.9	1.0	3.9	4.5	0.0	74.8
QMH*	1.8	0.9	4.0	4.8	0.0	54.1
RAH*	1.7	0.8	4.8	4.1	0.0	31.7
RM*	1.5	0.4	6.9	5.1	0.0	47.6
RIE	1.8	0.8	5.2	5.0	0.0	73.6
SGH	3.0	1.0	10.7	6.9	0.0	50.7
SRI*	2.0	1.0	6.1	5.4	0.0	66.2
St. J*	1.6	0.8	4.9	4.5	0.1	41.6
SH	2.0	0.7	6.2	5.2	0.0	58.2
VHK*	1.8	0.8	4.7	4.8	0.0	65.2
VIG	1.8	0.7	4.8	4.4	0.0	89.1
VOL*^	2.0	1.0	4.1	4.3	0.0	45.3
WGH	3.1	1.1	8.2	7.1	0.0	221.8
WIG	2.0	0.8	5.9	4.5	0.0	38.7
Wishaw*^	2.0	1.0	4.7	4.3	0.0	37.2
Scotland	**2**	**0.9**	**5.2**	**4.98**	**0**	**395.4**

33. Summary characteristics for the admissions to 26 Scottish intensive care units during 2001 are presented in Table 4.

Table 4. Summary demographic characteristics, 2001.

	All admissions
Admissions (n)	8629
Operative (%)	42
Non-operative (%)	58
Male (%)	55.8
Female (%)	44.2
Age (y) (mean)	58.9
Age (y) (range)	0 - 100
Mean length of ICU stay (d)	4.98
Median length of ICU stay (d)	2
Range of ICU Stay (d)	0-395
ICU mortality (in 25 units) (%)	22.9
Hospital Mortality (in 25 units) (%)	31.6

D.2. Organ support as a measure of workload.

34. Level of organ support routinely used in an ICU is complimentary to occupancy data when attempting to characterise workload, severity of illness and the consequent staffing requirements. The intervention results described in this section are from daily recording of ACP or augmented care period data during 1999-2001. The dataset incorporates Yes or No responses to the following fields for every calendar day. Therefore, the first and last ACP days may be for only a few hours in the intensive care unit during that day. Nevertheless, as the aim is to assess the greatest levels of support, if any of the categories have been utilised in that day, even if not at the time of recording the data, the response should always be Yes.

- Intubated
- Connected to a ventilator
- Face Mask CPAP
- Pulmonary artery flotation catheter
- Inotropes/vasopressors
- Filtration/dialysis

35. The Scottish ACP dataset was developed during 1998 for a variety of reasons. Firstly, the inclusion of the first 24-hour Therapeutic Intervention Scoring System (TISS) [13] was obligatory for the first 3-years of the audit (1995-1997). During this time Scotland participated in an APACHE III validation exercise, in which TISS was utilised along with APACHE III [14] to identify levels of care (low-risk monitoring, high-risk monitoring and active treatment). Costs for the audit software supported by APACHE Medical Systems Inc. Our license to use the APACHE III model ended in 1997 and we could not make assessments in this manner. Secondly, we conducted extensive validation of the first 24-hour TISS data during our retrospective review of combined renal and respiratory failure [15]. This demonstrated a high error rate in recording ‘Stable haemodialysis’ or ‘unstable haemodialysis’ in the renal section of the extensive TISS dataset. Thirdly, there had at that time been developments within the Department of Health which required English ICU staff to complete a dataset which identified periods during which patients received augmented care [16]. This

dataset was attempting to identify not only ICU care but also interventions of lesser severity and changing consultant episodes of care for funding reasons. Consequently, the Audit Steering Group reviewed the TISS dataset and the DOH ACP dataset with the aim of minimising and simplifying the dataset, whilst identifying key ICU-type interventions. The current Scottish ACP dataset was implemented during 1998.

36. With an increase in the number of combined HDU/ICUs and the audit now encompassing HDUs as well as ICUs, there is a need to modify the ACP dataset. Work is ongoing to determine the most effective way forward to establish an appropriate dataset, one which will stratify patients once more by levels of care, this time based on Levels 1, 2 & 3 as identified in *Better Critical Care* [11]. The audit software currently has the capacity to stratify patients in this manner, based on the DOH's ACP dataset and this is an option being considered.

37. An extensive database of the key ACP interventions has developed since 1999 and the following figures attempt to convey the extent of work conducted in Scottish intensive care units during 2001. Limited intervention data were available for Raigmore Hospital during this period of time and are not included in these results.

38. Figure 9 demonstrates the proportion of patients ventilated on the first 'ACP day' of ICU care in 2001. The first ACP day is the time between ICU admission and midnight that day: this may only be a few hours during which some patients are assessed prior to instituting key interventions. Figure 10 shows an increase from the rate of ventilation in the first day to that of patients ventilated at any time during their ICU episode. These figures demonstrate that more than 70% of admissions are ventilated in at least half of all ICUs. Variations are entirely understandable, with larger units, predominantly in teaching hospitals, having the greater level of this key intervention. It is important to recognise that collection of data on all admissions to the combined HDU/ICU facilities, FDRI, VOL, HM and Wishaw, underestimate the proportion of ICU patients who are ventilated. This issue will prevail as more 'critical care' units develop. It is with this in mind that the ACP dataset and stratification of patients into levels of care is a priority for the audit group.

Figure 9. Proportion of patients ventilated on the first ACP day during 2001.

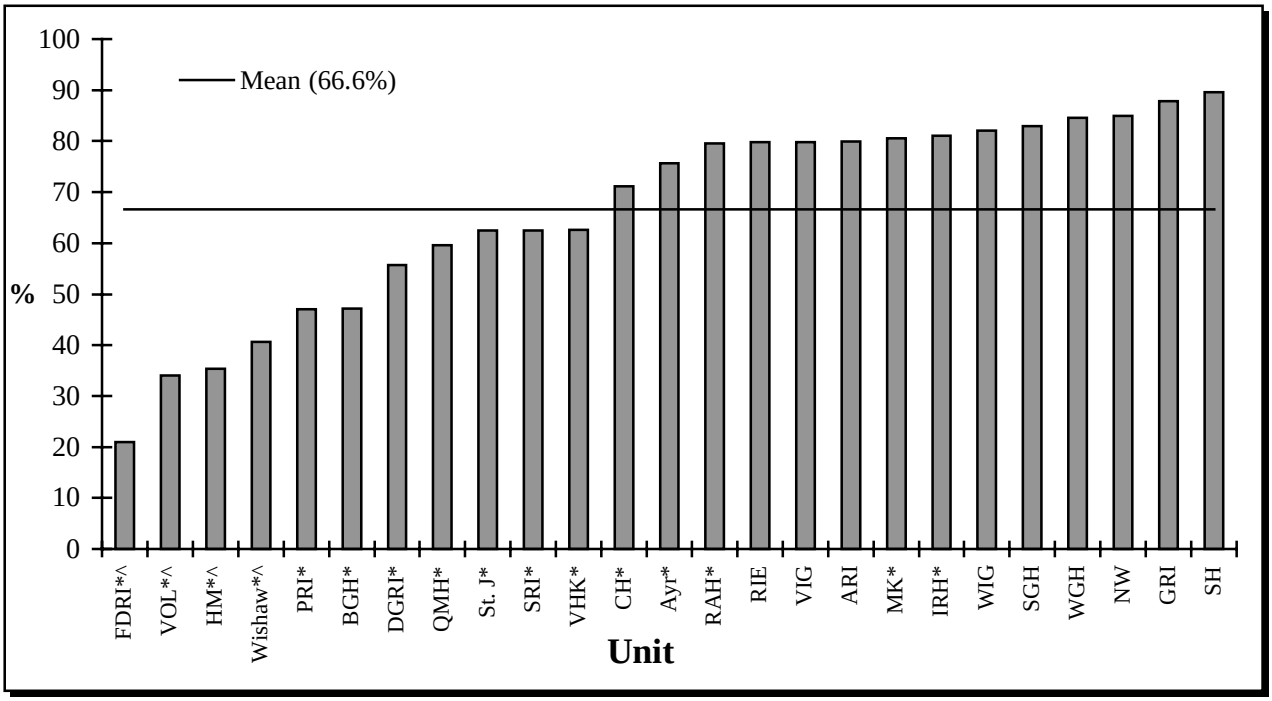
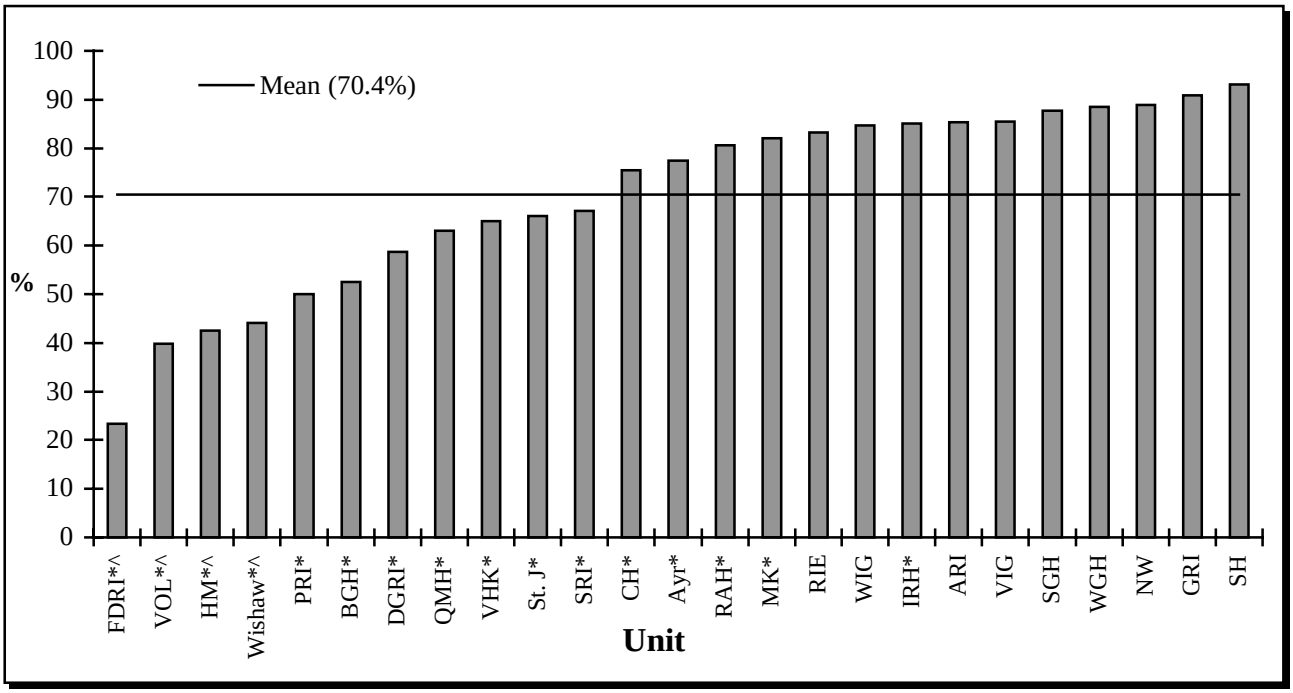


Figure 10. Proportion of patients ventilated at any time during 2001.



39. Figures 11 & 12 extract the ventilation data for comparison of teaching hospitals alone. Figure 11 demonstrates the continuous intensity of patients being ventilated. Figure 12 provides an insight into the severity of patients on admission to these units, demonstrating that ventilation is instituted in the first few hours (first ACP day) in over 90% of patients who are ever ventilated.

Figure 11. Proportion of patients ventilated at any time in teaching hospital ICUs. (Ninewells: no data 1999-2000).

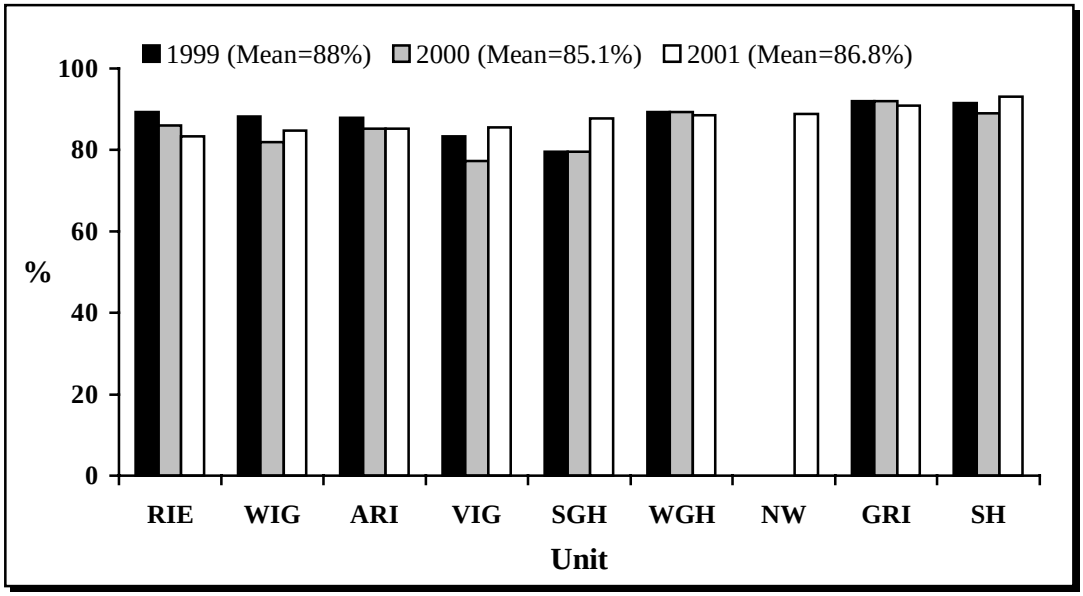
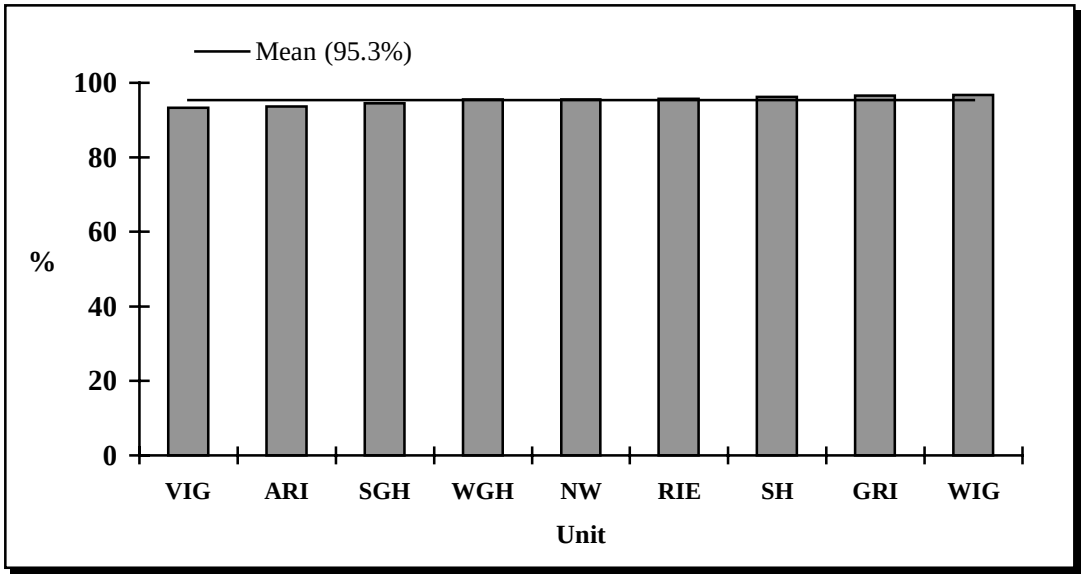


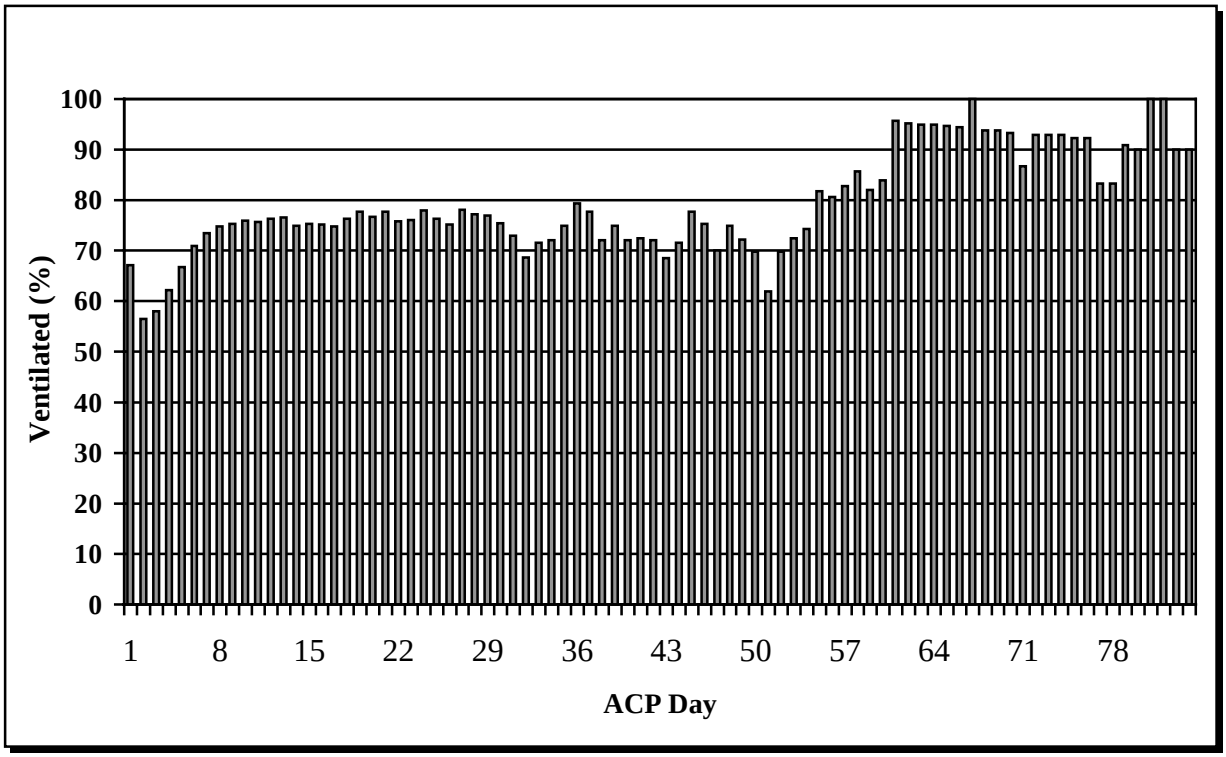
Figure 12. Proportion of all ventilated patients who are ventilated on the first ACP day in 9 teaching hospitals: 2001.



40. Figure 13 demonstrates the consistency of the ventilation rates over the first 12 weeks of ICU stay. The ACP data should be recorded in such a way as to reflect the greatest intervention in that calendar day. For example, a patient who is ventilated for only part of the day should have ventilation recorded. There is a fall in the proportion ventilated over the first few days, but the great majority of long-stay patients remain ventilated. We have previously published a review of the characteristics and outcome of patients remaining in the ICU for 30 days or greater [17]. The number of patients is low, decreasing with length of stay.

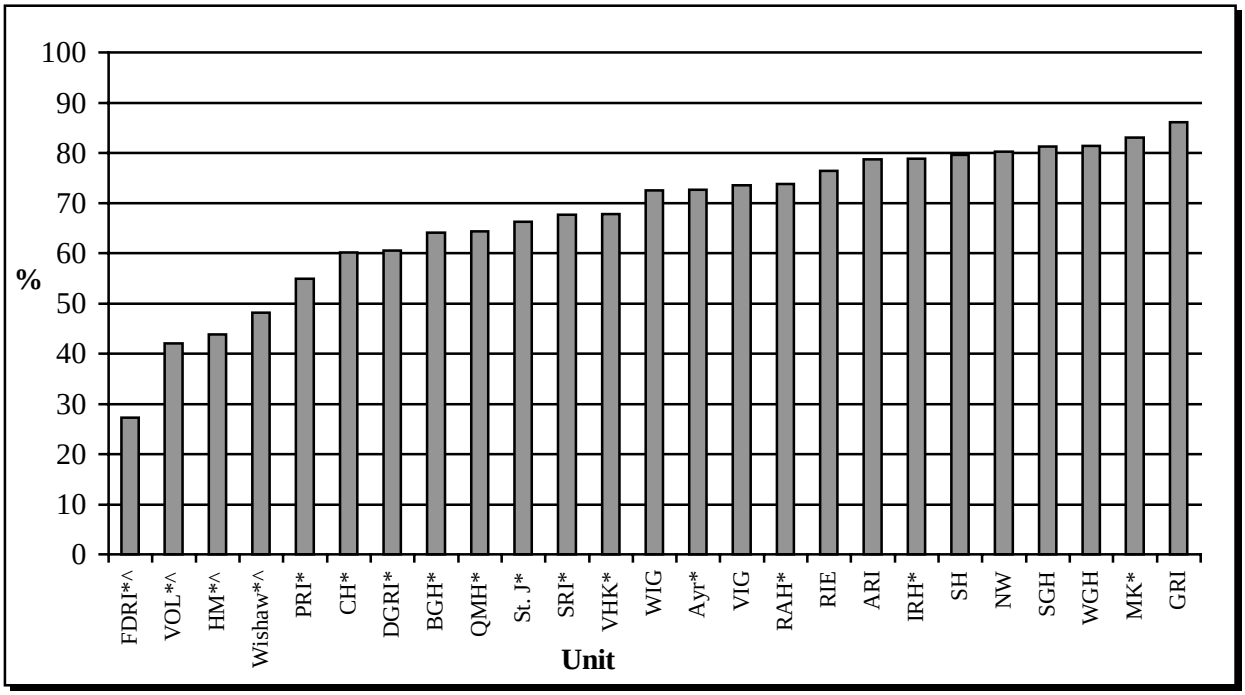
41. The decrease in the proportion of patients ventilated on day 2 may be a real decrease, with patients being prepared for discharge from intensive care (the median length of ICU stay being 2 days (Table 3)). There is also a possibility that staff are recording the last ACP prior to discharge as *not* ventilated when the patient may well have not been ventilated for only part of that day.

Figure 13. Proportion of patients in the ICUs who are ventilated n these ACP days.



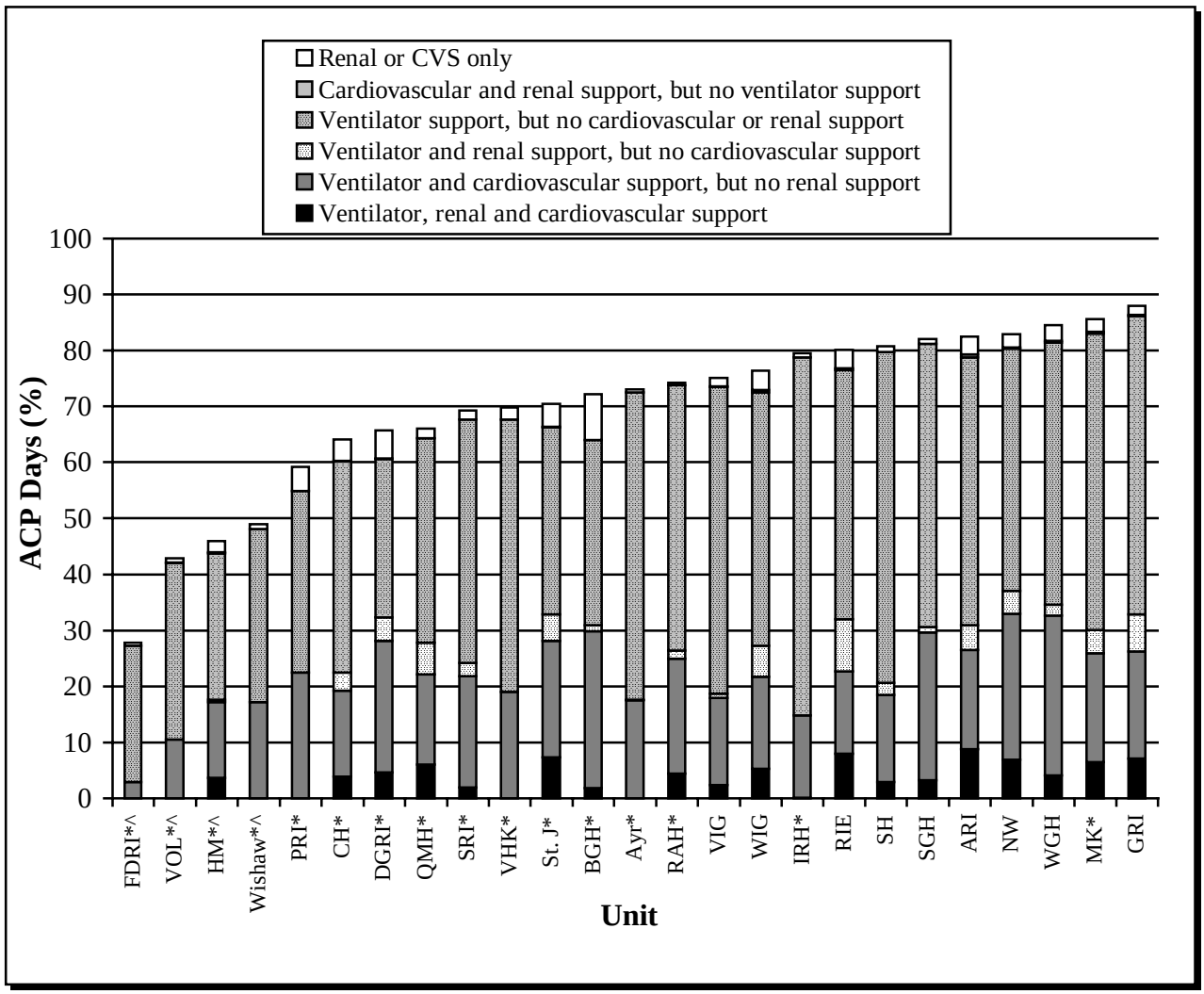
42. A more complete picture of the variation in dependency and organ support can be gained by aggregating the days on which each patient receives one or more key interventions i.e., ventilation, renal replacement therapy and cardiovascular support (inotropes &/or pulmonary artery flotation catheters). Figure 14 demonstrates the proportion of ACP days on which ventilation was used in each unit's population of patients.

Figure 14. Proportion of ACP days in which there is ventilatory support: 2001. Mean = 68% of ACP days.



43. Figure 15 depicts the proportion of days during which there was at least one of three organs being supported: ventilation, renal replacement therapy or cardiovascular support or some combination. Eighteen units cared for patients receiving simultaneous ventilation, renal replacement therapy (RRT) and cardiovascular support for part of their ICU stay (3 organs supported). In analysing these data it is important to recognise that 4 units were combined HDU/ICUs for the majority of time of data collection (FDRI, VOL, HM & Wishaw). The far lower proportion of days in which vital organ support is administered in these units is entirely to be expected.

Figure 15. Proportion of ACP days days in which there is ventilatory support alone, with either cardiovasular or renal support, or with both: 2001.



44. The following series of figures continues to provide each unit with details of the extent of renal replacement therapy, pulmonary artery flotation catheter usage and, for the first time, the degree to which inotropes/vasopressors are utilised. These fields are extracted from data recorded in the ACP dataset.

45. Figure 16 shows the number of patients who had RRT delivered and the proportion they represent of all ICU admissions for 2001. Figure 17 complements this, demonstrating the proportion of total patient days on which RRT was provided. Variation in the correlation of both series in Figure 17 will be dependent on the average time for which patients receive RRT whilst in ICU. Variation in the need for dialysis amongst units with comparable case mix might arise from differences in the threshold for institution of dialysis, the extent to which such support is instituted in patients with poor expectation of survival and the extent to which renal failure occurs during intensive care. The results presented here are similar to those in the Annual Report 2002 [1].

Figure 16. Provision of renal replacement therapy: 2001.

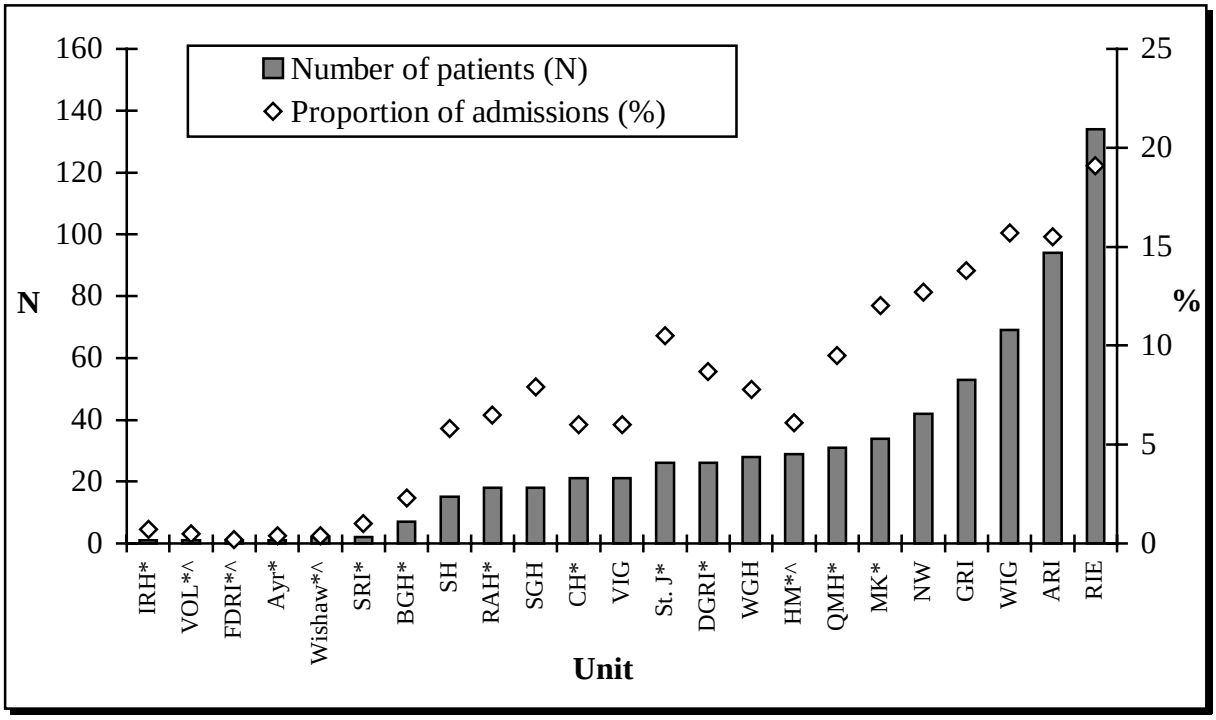
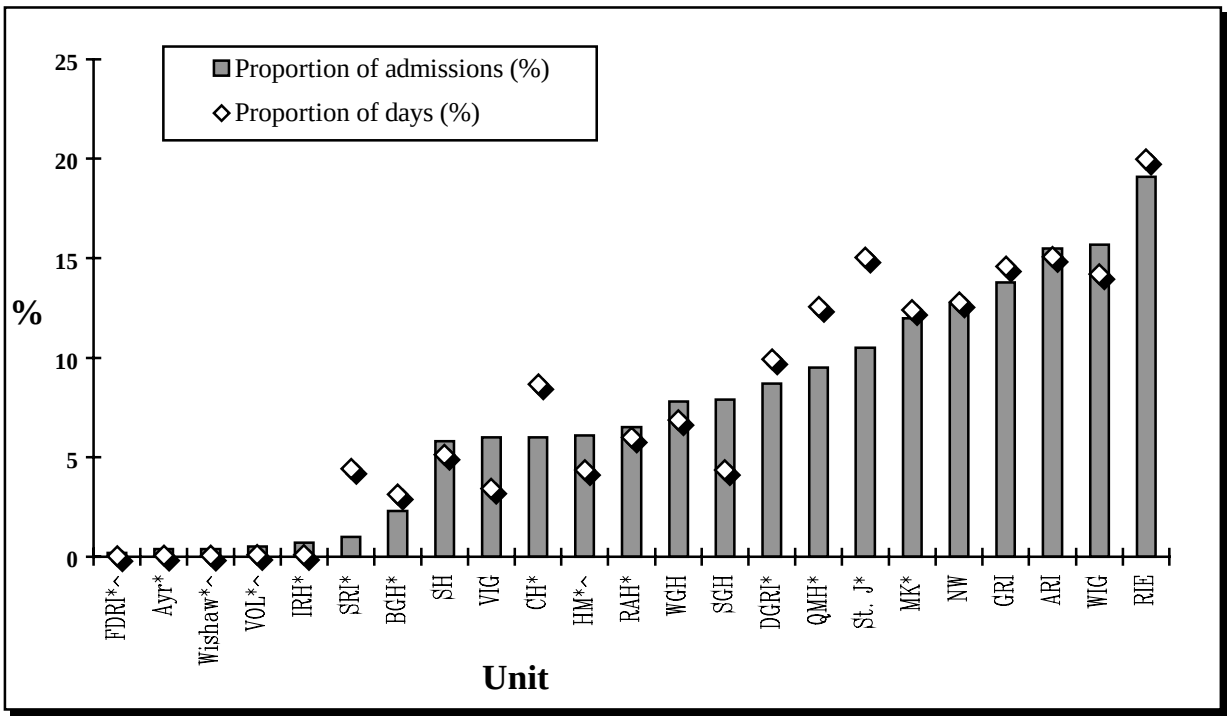
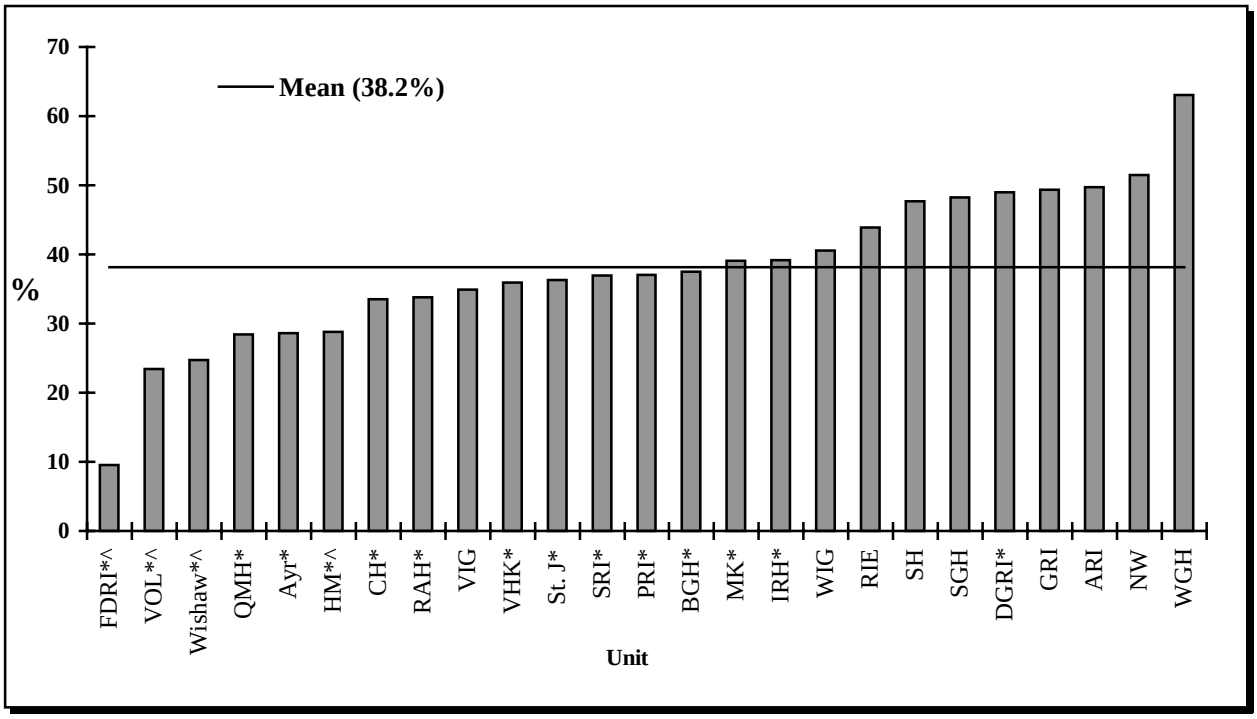


Figure 17. Provision of renal replacement therapy in 2001. Proportion of patients in Scottish ICUs receiving RRT = 8.1%, utilising 8.5% of ACP days.



46. Presented in Figure 18 are data demonstrating the extent to which inotropes/vasopressors are utilised during the intensive care period. On average, in 25 of the 26 adult, general ICUs, 38% of all admissions receive this therapeutic intervention. There is wide variation in the use of inotropes (10% - 60%), which reflects the different workload and severity of admissions. Unsurprisingly, the combined units have a lower than average rate of usage. Three quarters of all units administer inotropes to at least 30% of admissions. Any variations may also reflect differing approaches to management. It is interesting to note that overall the proportion of these patients receiving these drugs is very similar to the proportion of patients with severe sepsis and septic shock [5].

Figure 18. Proportion of patients receiving inotropes/vasopressors in Scottish ICUs: 2001.



D.3. Organ support as a measure of variation in process of care

47. Collection of daily intervention data allows us to gain insights into variations in practice both between units and with time. We would encourage units to examine their practice, not only in relation to the national norm but also in relation to that of comparable units.

48. Organ support obviously affects workload but it is arguable that some of this represents variations in approach to patient management. It seems improbable that this greatly affects the number of patients ventilated but it may well be true of the use of inotropes and more particularly of pulmonary artery flotation catheters (PAFCs), the use of which has been controversial. This has been previously discussed in greater detail [1]. The use of PAFCs in 2001 is demonstrated in Figure 19, once more showing the decrease in frequency of its utilisation.

49. More striking is the variation in utilisation, with comparable units differing in their use by a factor of 100%. Only a handful of units utilise this monitoring tool in 20% or more of admissions. Unusually high utilisation in Borders General Hospital relates to pre-optimisation of high-risk surgical patients. A randomised controlled clinical trial assessing pulmonary artery catheters is currently being conducted by the Intensive Care National Audit and Research Centre in London (ICNARC).

50. Table 5 identifies that a total of 49,420 ACP days were utilised in 25 adult units in Scotland during 2001 for 8,300 admissions. Summary data of the key interventions recorded in the ACP dataset are provided. Note, although admission numbers and occupancy data were available for Raigmore Hospital, no intervention data were available and hence, its admissions are not included in these numbers. Table 6 attempts to demonstrate the extent of these interventions in only the ICU-type patients in the combined ICU/HDUs. The ICU-type patients in these units were identified as those who were either ventilated at any point in their stay or had an APACHE score.

Figure 19. Proportion of patients with PAFC *in situ* on 1st day of ICU (mean = 6.7%) or at any time during ICU (mean = 10.9%): 2001.

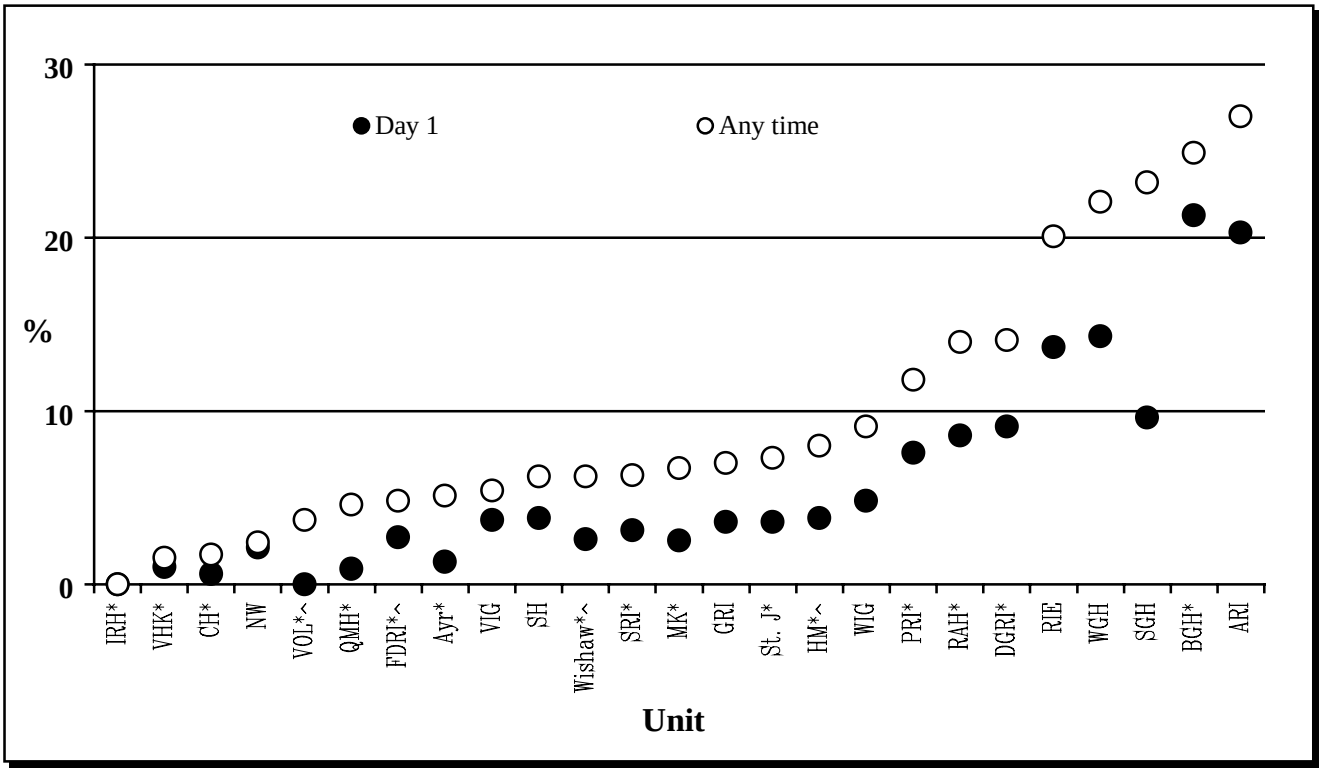


Table 5. Total ACP days per unit in 2001. Number and proportion of ACP days consumed by specific therapies/interventions. All admissions.

Unit	ACP Days, all admissions										
	Total days	Ventilator days		PAFC days		Inotrope days		RRT days		ICP Monitor days	
		N	%	N	%	N	%	N	%	N	%
ARI	4064	3199	78.7	499	12.3	1094	26.9	613	15.1	100	2.5
Ayr*	1337	970	72.6	34	2.5	234	17.5	1	0.1	0	0.0
BGH*	1410	903	64.0	281	19.9	479	34.0	44	3.1	0	0.0
CH*	1740	1046	60.1	14	0.8	377	21.7	151	8.7	2	0.1
DGRI*	1595	966	60.6	138	8.7	504	31.6	158	9.9	0	0.0
FDRI*^	2719	742	27.3	39	1.4	85	3.1	1	0.0	1	0.0
GRI	2760	2378	86.2	64	2.3	732	26.5	403	14.6	8	0.3
HM*^	2321	1016	43.8	89	3.8	437	18.8	101	4.4	2	0.1
IRH*	891	702	78.8	0	0.0	138	15.5	1	0.1	0	0.0
MK*	1885	1565	83.0	53	2.8	502	26.6	234	12.4	0	0.0
NW	2418	1942	80.3	27	1.1	819	33.9	309	12.8	52	2.2
PRI*	932	512	54.9	51	5.5	243	26.1	0	0.0	0	0.0
QMH*	1915	1232	64.3	26	1.4	438	22.9	241	12.6	0	0.0
RAH*	1421	1048	73.8	136	9.6	352	24.8	85	6.0	1	0.1
RIE	4253	3251	76.4	263	6.2	951	22.4	849	20.0	88	2.1
SGH	1769	1437	81.2	213	12.0	515	29.1	77	4.4	2	0.1
SRI*	1222	827	67.7	35	2.9	284	23.2	54	4.4	0	0.0
St. J*	1362	903	66.3	43	3.2	396	29.1	205	15.1	1	0.1
SH	1585	1263	79.7	37	2.3	303	19.1	81	5.1	0	0.0
VHK*	1196	811	67.8	4	0.3	251	21.0	0	0.0	0	0.0
VIG	1894	1392	73.5	44	2.3	364	19.2	65	3.4	12	0.6
VOL*^	998	419	42.0	14	1.4	112	11.2	1	0.1	0	0.0
WGH	2873	2338	81.4	241	8.4	990	34.5	197	6.9	394	13.7
WIG	2400	1740	72.5	78	3.3	525	21.9	341	14.2	2	0.1
Wishaw*^	2460	1184	48.1	91	3.7	427	17.4	2	0.1	2	0.1
Scotland	**49420**	**33786**	**68.4**	**2514**	**5.1**	**11552**	**23.4**	**4214**	**8.5**	**667**	**1.3**

Table 6. Number and proportion of ACP days consumed by specific therapies/interventions for ICU-type patients only in combined units.

Unit	ACP Days, ICU-type only in HDU/ICUs										
	Total days	Ventilator days		PAFC days		Inotrope days		RRT days		ICP Monitor days	
	N	N	%	N	%	N	%	N	%	N	%
Wishaw*^	1639	1184	72.24	91	5.55	419	25.56	2	0.12	2	0.12
VOL*^	651	419	64.36	14	2.15	110	16.90	1	0.15	0	0.00
FDRI*^	1641	742	45.22	39	2.38	79	4.81	0	0.00	0	0.00
HM*^	1790	1016	56.76	88	4.92	433	24.19	100	5.59	2	0.11
Scotland	**46643**	**33786**	**72.44**	**2513**	**5.39**	**11532**	**24.72**	**4212**	**9.03**	**666**	**1.43**

D.4. Admission source.

51. A trend has previously been demonstrated towards a diminishing contribution made by patients admitted to the ICU from theatre [1]. As all 26 adult ICUs participated in the audit in 2001, there is an increase in number of admissions from almost every source since 2000 seen in Figure 20. Proportionately, however, Figure 21 demonstrates the continued trend in a decreasing proportion of patients admitted to ICU directly from theatre or a ward in the same hospital. The probable reason is the increasing availability of HDU facilities and more patients admitted to HDU post-operatively.

Figure 20. Trend over time of admission sources (N) to Scottish ICUs. Increased numbers in 2001 as all 26 adult, general ICUs participated in 2001, unlike other years.

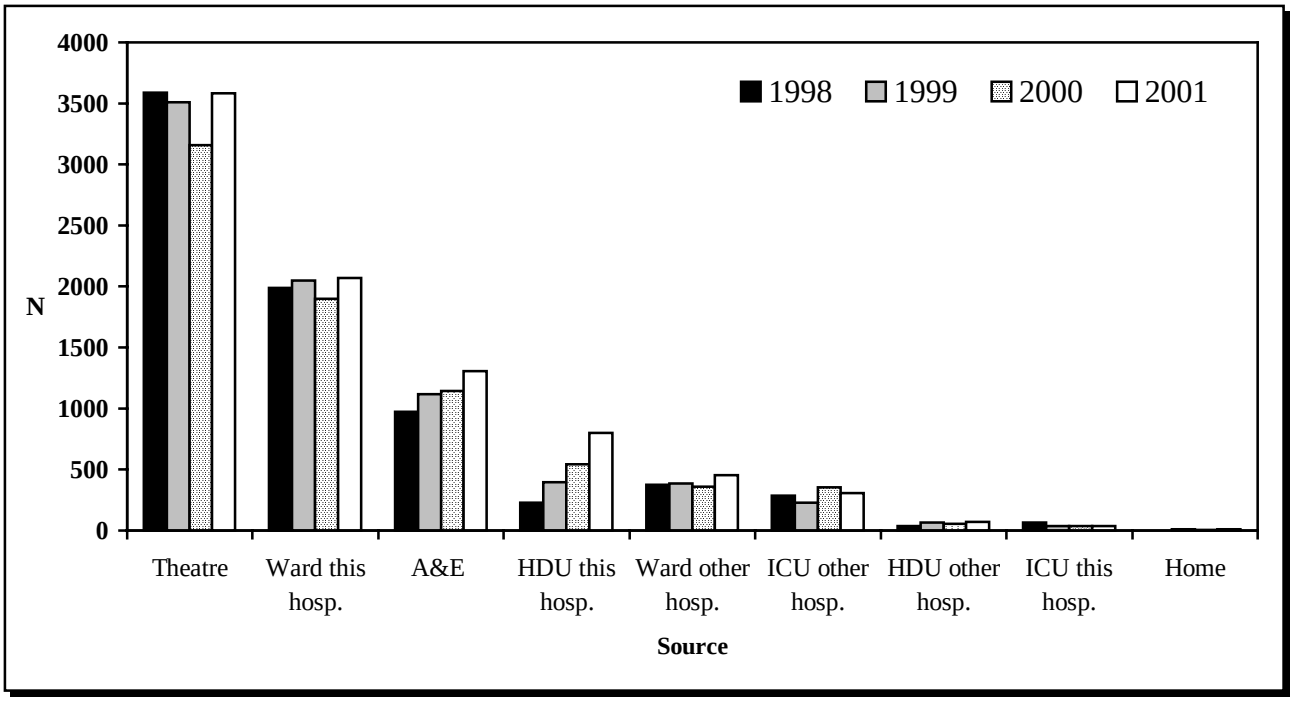
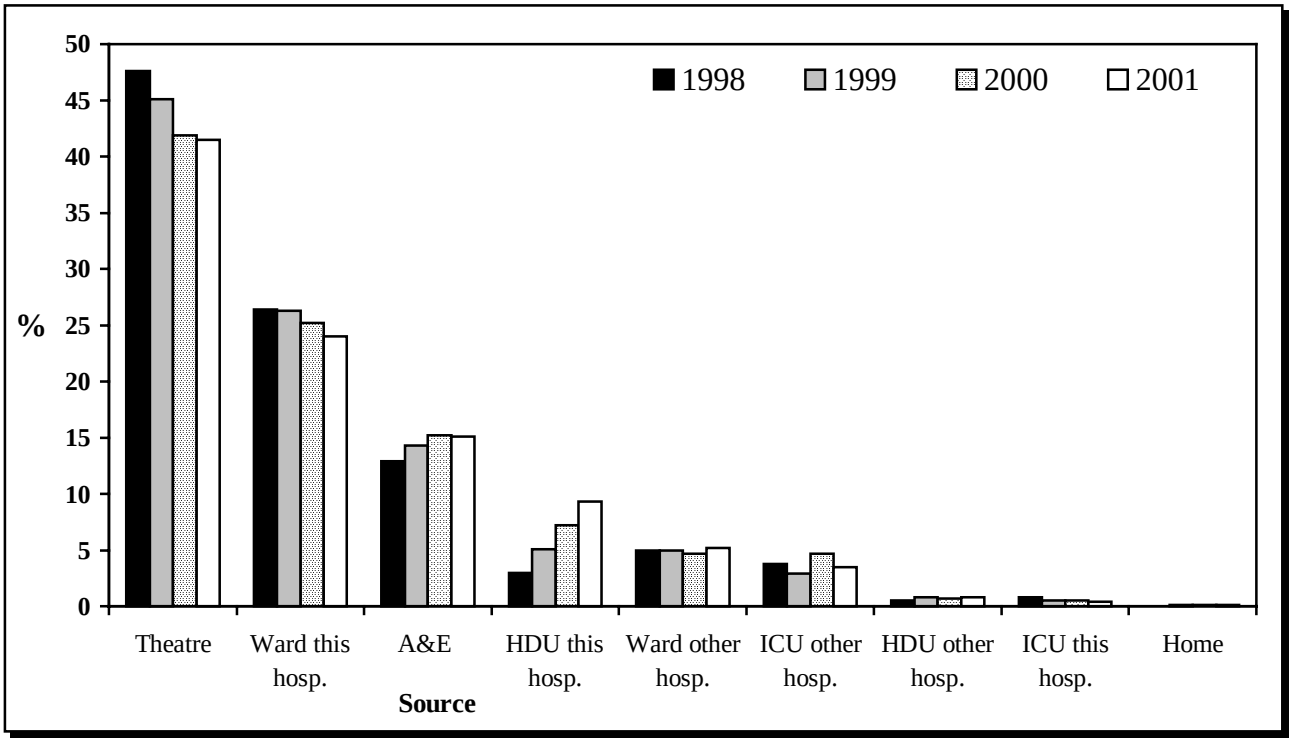
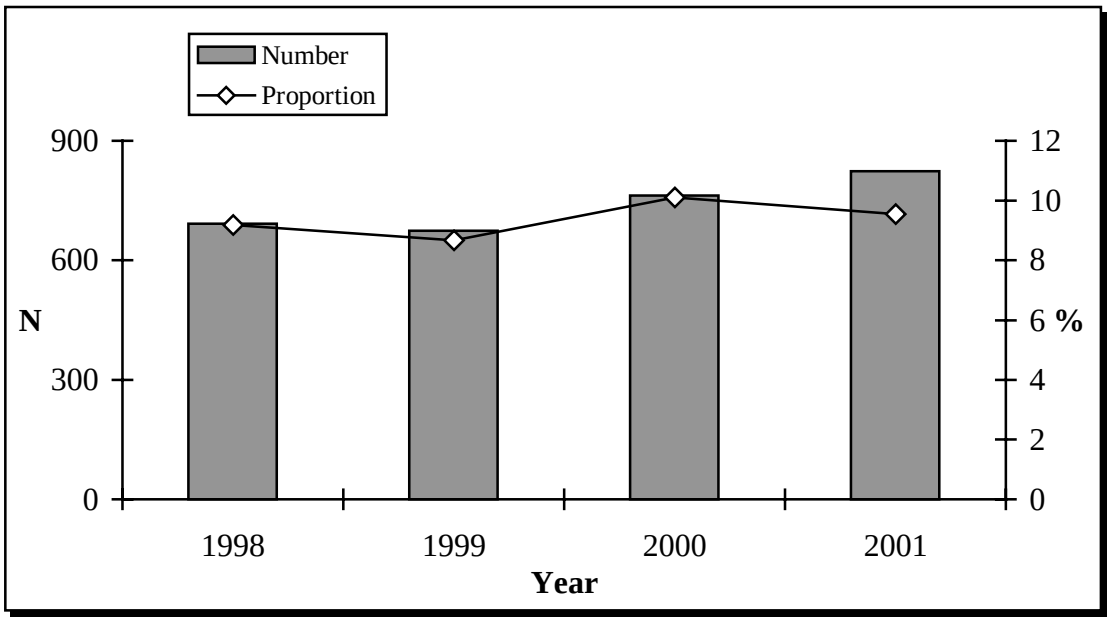


Figure 21. Trend over time of admission sources (%) to Scottish ICUs. Gives better representation of variation in admissions sources, incorporating all ICUs.



52. Patients may require to be transferred from their base hospital to another hospital's ICU for a variety of reasons: the referring hospital may have no ICU or lack ICU beds (bed-space transfer), specific expertise may exist within the receiving ICU (e.g., renal support) or hospital (e.g., burns care). Figure 22 aggregates admissions recorded on the database as being admitted from another hospital (Other area in another hospital, ICU or HDU in another hospital). On average there has been little variation in the overall rate of admissions from other hospitals, however, there is considerable variation between units as demonstrated in Table 7.

Figure 22. Variation in admissions to ICU from other hospitals.



53. Table 7 demonstrates the variation in admission sources in individual units.

Table 7. Proportion (%) of admissions to ICUs from the sources indicated.

	Theatre	Ward this hosp.	A&E	HDU this hosp.	Ward other hosp.	ICU other hosp.	ICU this hosp.	HDU other hosp.	Home
ARI	30.8	34.9	9.7	8.4	13.0	0.3	1.8	1.0	0.0
Ayr*	50.0	21.4	17.5	8.5	1.3	1.3	0.0	0.0	0.0
BGH*	56.5	36.2	7.0	0.0	0.0	0.3	0.0	0.0	0.0
CH*	41.8	18.1	23.5	8.0	4.0	3.7	0.0	0.9	0.0
DGRI*	55.0	13.4	9.1	19.8	2.0	0.7	0.0	0.0	0.0
FDRI*^	60.1	25.2	10.3	1.0	0.6	0.4	1.4	0.0	0.8
GRI	28.1	26.2	15.3	15.6	6.2	7.8	0.0	0.8	0.0
HM*^	47.4	33.3	10.3	2.3	3.2	2.9	0.0	0.6	0.0
IRH*	37.8	29.7	13.5	14.9	0.0	4.1	0.0	0.0	0.0
MK	40.1	24.6	20.4	7.0	2.8	4.9	0.0	0.0	0.0
NW	46.1	19.3	16.3	13.0	3.3	2.1	0.0	0.0	0.0
PRI*	55.9	18.8	14.7	5.3	2.9	2.4	0.0	0.0	0.0
QMH*	54.1	15.9	16.8	7.6	1.2	3.1	0.0	0.9	0.3
RAH*	47.8	19.1	14.4	7.9	7.2	1.8	0.0	1.8	0.0
RM*	34.7	34.1	16.1	7.3	4.4	0.9	0.0	1.9	0.6
RIE	35.6	8.7	20.5	24.5	3.8	5.1	0.9	0.9	0.0
SGH	25.0	14.5	21.9	20.2	7.0	5.7	3.1	2.6	0.0
St. J*	44.0	19.4	20.6	9.3	3.6	2.8	0.0	0.4	0.0
SRI*	43.2	22.9	27.1	3.6	1.6	1.6	0.0	0.0	0.0
SH	26.9	28.1	10.4	8.5	16.9	7.3	0.0	1.9	0.0
VOL*^	52.7	31.9	12.8	0.0	0.5	1.6	0.0	0.5	0.0
VHK*	24.8	33.0	24.3	5.8	7.3	3.9	0.0	1.0	0.0
VIG	30.1	33.5	15.9	5.7	8.5	4.5	0.0	1.7	0.0
WGH	36.4	22.4	11.2	12.6	11.5	5.6	0.0	0.0	0.3
WIG	31.2	21.6	13.9	9.3	10.7	10.3	0.9	2.1	0.0
Wishaw*^	52.8	24.0	12.6	3.2	2.6	4.0	0.0	0.9	0.0
Scotland	**41.5**	**24.0**	**15.1**	**9.3**	**5.2**	**3.5**	**0.4**	**0.8**	**0.1**

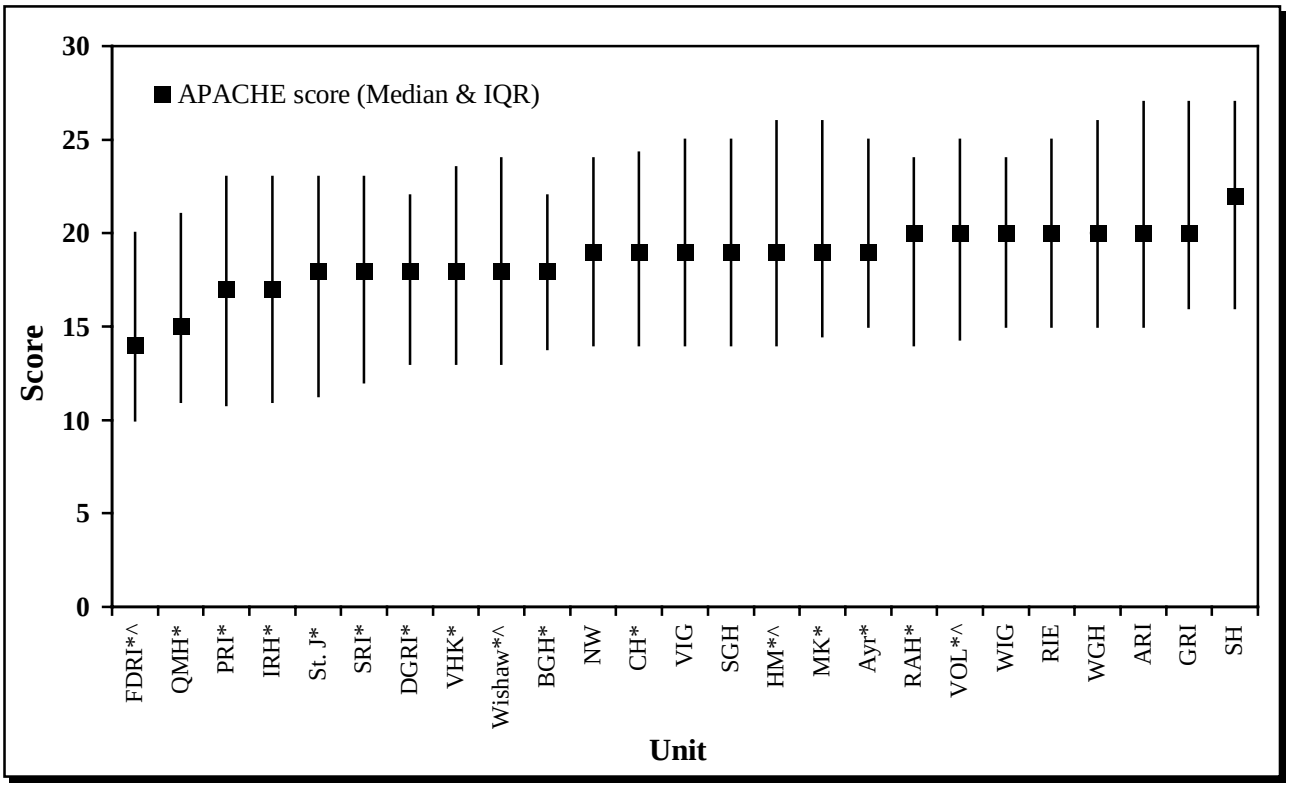
- **'Ward this hosp'** incorporates the sources '03. Recovery/theatre in this hospital', 04. Ward in this hospital', '07. Other intermediate care area' & '08. X-ray endoscopy suite CT' recorded on the audit software.
- **'Ward other hosp'** incorporates source '11. Other area in another hospital' recorded on the audit software.

D.5. Severity of illness and standardised mortality ratios

The letter code for an individual ICU can be obtained from the local ICU audit co-ordinator.

54. We continue to employ the APACHE II methodology [18] to assess severity of illness and attempt to adjust mortality for variation in case mix. The APACHE score is derived from 12 acute physiological variables, age points and chronic health points. The higher the score, the greater the severity of the acute illness. The maximum score of 71 is almost never seen. The mean and median scores in Scotland are 19.7 & 19 respectively. These have been consistent over a number of years with mean and median scores of 19.1 and 18 for the period 1998-2000. The median APACHE II scores (plus inter-quartile ranges) are given for each ICU in Figure 23. Although these scores give some indication of severity of illness, the expected mortality is also influenced by diagnostic coefficients and is not directly proportional to the APACHE II score. This stratification of illness severity can be used in conjunction with the organ support data discussed in Section D.2. when addressing workload and resource issues.

Figure 23. Illness severity: Median APACHE II scores (inter-quartile range), 2001. Scottish median: 19 (interquartile range 14 & 25).



55. As in previous years, we are publishing the outcome data for individual units on an anonymised basis. The code identifying a unit will be given to the lead audit clinician in that unit and to relevant Trust staff on request.

56. The standardised mortality ratios presented are generated using outcome on ultimate hospital discharge where available rather than outcome from the individual hospital. This helps avoid generating apparent differences in performance between units due to patient transfer. It is also clearly what matters to patients. This form of reporting is only possible because of the existence of a national audit and collaboration with ISD to provide linkage to Scottish Morbidity Record returns. The methodology employed is that where no ultimate hospital outcome is available from the central database, the outcome recorded at the end of the continuous in-patient stay, gained via linkage to the Scottish Morbidity Records, is used as the ultimate outcome. If the linkage has failed, the hospital outcome on the central database is used. This is an in-depth process during which data linkage queries are confirmed. A common discrepancy is encountered when patients are admitted close to midnight. The morbidity record often has a date after midnight whilst the ICU record admission date is prior to midnight and the linkage subsequently fails. Each of these episodes is reviewed to confirm the outcome status. This process undoubtedly improves the accuracy of the data but in view of the extensive work involved and the time delay in producing reports we are re-considering whether it would be more advantageous to revert to individual hospital outcomes. The views of clinicians and managers would be appreciated on this point.

Uses and Limitations.

57. Standardised mortality ratios compare actual outcome against that ‘expected’ on the basis of a model. This approach is necessary because the varying case mix of different units means that a comparison of simple mortality rates gives no indication of quality. The approach is widely used and accepted, but several points require emphasis:

– All of these systems have limitations

- They may be biased to the system or population on which they were developed: international comparisons have been difficult to interpret.
- They do not fully adjust for case mix. As an example, we have previously demonstrated how the mortality of patients with a neurological diagnosis may be under-estimated [19].
- They were developed on what are, by present standards, relatively small data sets.
- There has been no new system since APACHE III [14], the Simplified Acute Physiology Score [20] (SAPS II) or the Mortality Probability Model [21] (MPM II), which were developed 10 years ago.
- They are more susceptible than is often appreciated to treatment effects. This includes, but is not limited to, 'lead time bias'- the effect of resuscitation prior to ICU admission [22]. Changes in ICU management strategies since the systems were developed may have increased this effect.

58. Following our careful evaluation of the available systems [23], we have used APACHE II as our standard reporting tool. We have also continued to calculate SAPS II probabilities, however, since this model performed almost as well. In this report we include summary data using both systems (Figure 24, 26 and 27 and Tables 8 - 12). These results highlight firstly that these models are indicative, not a gold standard, and secondly that the 'ranking' of units may be significantly altered by the choice of system even when it is one which apparently fits the data.

59. Clinicians, managers and commissioners should use the data included in this section as a source of information and to identify areas requiring further study, but not as a basis for judgement. These systems can be used as a valuable tool to improve care, but this requires a sophisticated understanding of their potential and limitations, which is often lacking [24]. We are considering whether interpreting the results using control charts would help use these data to identify areas for quality improvement [25].

60. Subject to the limitations already given, this information can be used to compare different units, to compare Scottish intensive care with other countries and to assess trends over time. The latter is relatively difficult to do for individual units because of the wide confidence intervals associated with small patient numbers, but is feasible on a national basis.

61. Figure 24 demonstrates the SMRs generated using the APACHE II model in the 25 units participating in the audit during 2001. Those units annotated with an * are District General Hospitals. No data were available for Raigmore Hospital.

62. For most units, but not all, the 95% confidence intervals overlap with the Scottish mean. Nonetheless, it appears that some units are 'outliers' in terms of performance. It is of interest that those, which appear to be doing better than expected, are predominantly DGH units and those which appear to be doing less well are larger teaching hospitals. These units will certainly wish to study this information closely, but we would stress (see above) that no immediate conclusions can be drawn. The apparent differences may be due to chance, may actually reflect quality of care, may be due to resource constraints or may reflect limitations in the methodology failing to adjust fully for case mix. One of these units is known to be disadvantaged by the failure of APACHE II to work well with its high neurological workload.

63. Figure 25 shows the hospital mortality for *all* admissions to 25 ICUs (31.5%). These units are anonymised and the identifiers are the same as those in the SMR graphs. Although the ultimate hospital mortality is used in SMR calculations where available (35% mortality), in comparison with Figure 24, Figure 25 demonstrates that the hospital mortality rate and SMR do not correlate. There is much less variation in SMR than there is in a raw mortality not corrected for case mix. On average, approximately 9% of those discharged alive from ICU died prior to hospital discharge.

Figure 24. Scottish overall SMRs (APACHE II model) in 25 units in 2001. Mean: 1.02, 0.995-1.05.

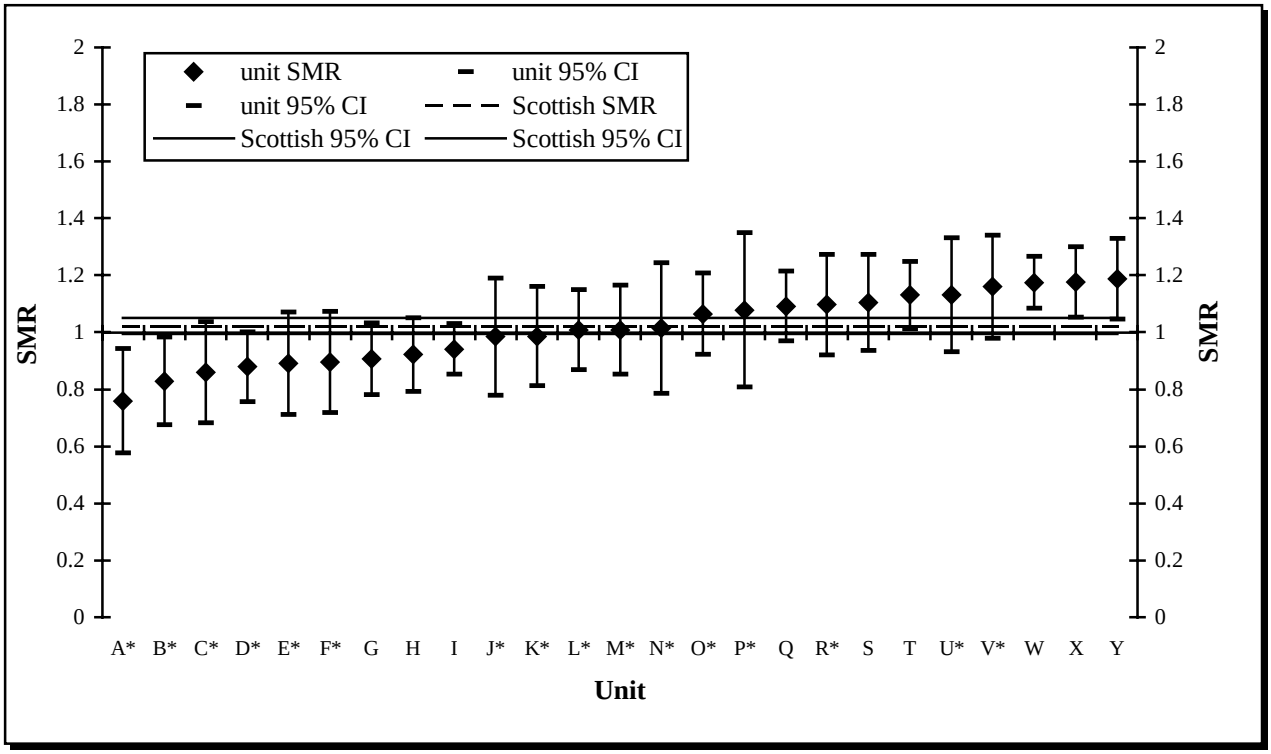
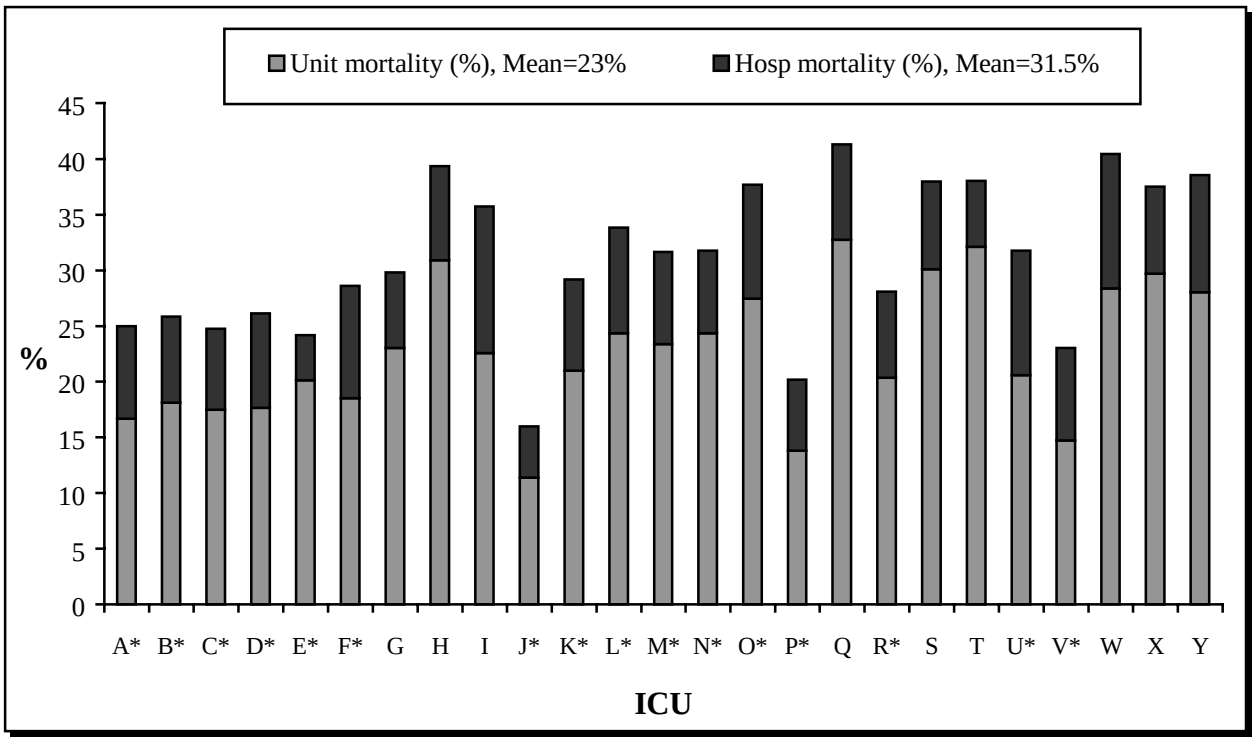


Figure 25. In-hospital mortality of all admissions to Scottish ICUs, 2001.



64. Table 8 provides the data for Figure 24. It also demonstrates the continuous movement in rank order over time.

65. Summary characteristics provided in Table 9 are representative of the 6224 intensive care episodes in 2001 with APACHE probabilities. In Figure 26 the SAPS II model is used.

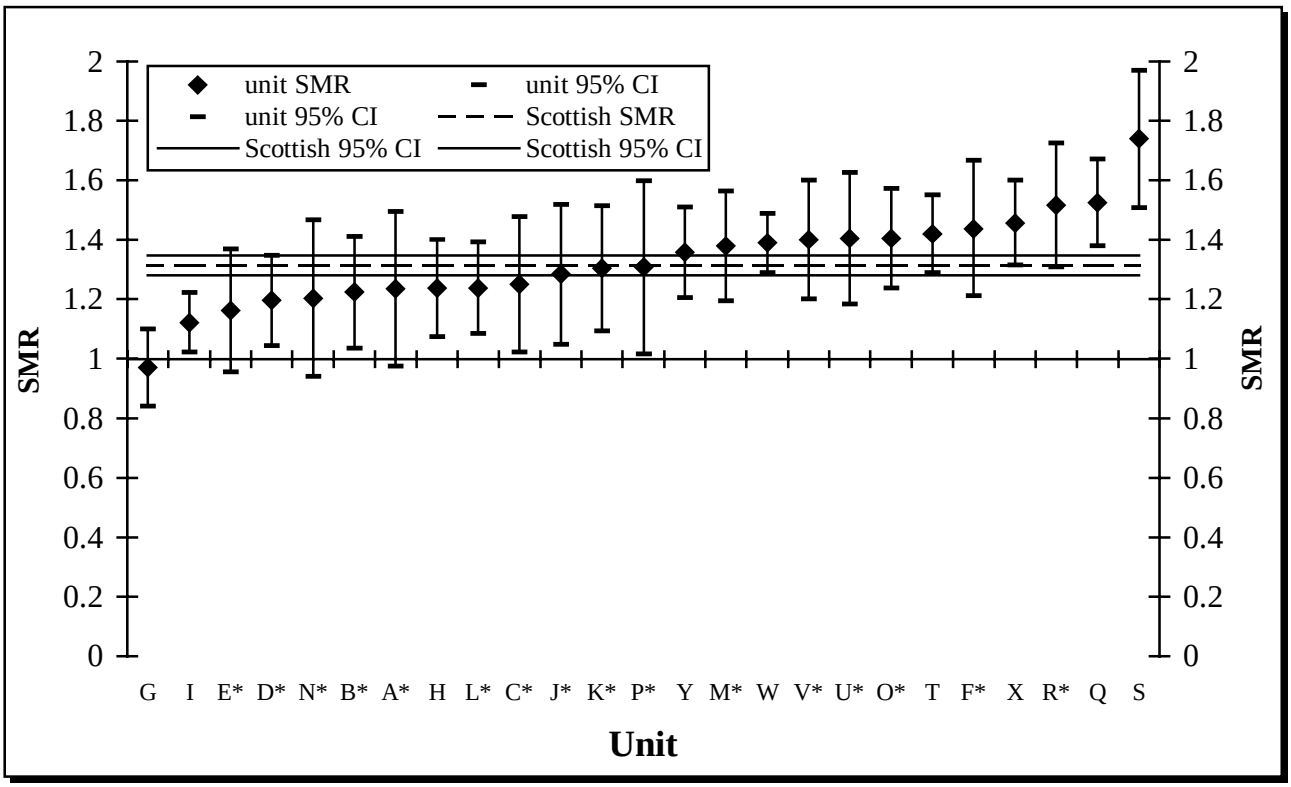
Table 8. Annual variation in APACHE II SMRs.

	2001			2000		
Unit	**SMR**	**95% LCI**	**95% UCI**	**SMR**	**95% LCI**	**95% UCI**
A*	0.760	0.576	0.943	0.920	0.736	1.10
B*	0.829	0.675	0.984	0.784	0.638	0.931
C*	0.860	0.683	1.04	1.08	0.898	1.26
D*	0.879	0.757	1.00	0.911	0.759	1.06
E*	0.892	0.712	1.07	0.847	0.627	1.07
F*	0.895	0.718	1.07	0.829	0.681	0.977
G	0.907	0.781	1.03	0.996	0.858	1.13
H	0.922	0.792	1.05	1.08	0.946	1.21
I	0.941	0.852	1.03	0.992	0.891	1.09
J*	0.985	0.780	1.19	-	-	-
K*	0.986	0.812	1.16	1.00	0.855	1.15
L*	1.01	0.869	1.15	0.888	0.739	1.04
M*	1.01	0.853	1.17	0.959	0.817	1.10
N*	1.01	0.785	1.24	1.14	0.916	1.36
O*	1.06	0.922	1.21	1.08	0.926	1.22
P*	1.08	0.809	1.35	0.895	0.609	1.18
Q	1.09	0.970	1.21	0.914	0.820	1.01
R*	1.10	0.921	1.27	0.857	0.669	1.05
S	1.11	0.936	1.27	1.08	0.907	1.25
T	1.13	1.013	1.25	1.06	0.937	1.19
U*	1.13	0.931	1.33	0.746	0.573	0.919
V*	1.16	0.979	1.34	1.14	0.936	1.34
W	1.17	1.08	1.27	1.10	1.00	1.19
X	1.18	1.05	1.30	1.16	0.998	1.31
Y	1.19	1.05	1.33	1.41	1.26	1.56
Scotland	**1.02**	**0.995**	**1.05**	**1.00**	**0.971**	**1.03**

Table 9. Summary demographic characteristics, 2001.

	Patients with APACHE prediction
Admissions (n)	6224
Operative (%)	40
Non-operative (%)	60
Mean length of ICU stay (d)	5.7
Median length of ICU stay (d)	2.3
Range of ICU Stay (d)	0-395
ICU mortality (%)	24
Hospital Mortality (%)	33
Ultimate Hospital Mortality (%)	35.2
APACHE II Score (mean)	19.7
APACHE II prediction (%)	34.4
SMR (95% CIs)	1.02 *(0.995-1.05)*

Figure 26. Scottish SAPS overall SMRs in 25 units, 2001. Mean: 1.31, *1.28-1.35.*



System Classification.

66. Using the APACHE diagnostic classification, patients can be grouped according to the primary organ system failure leading to ICU admission. Table 10 illustrates the variations in the proportions of all admissions to Scottish ICUs falling within these nine categories during the 3-year period, 1998-2000.

Table 10. Variation in illness severity, length of ICU stay and admission APACHE system categories: 1998-2000.

Admission APACHE Diagnostic System Category	Proportion (%) of patients	LOS (d) mean	APACHE II	
			Score	Probability (%)
Gastrointestinal (GI)	31	4.6	18.1	36.92
Respiratory (Resp)	22	7.6	20.21	33.08
Cardiovascular (CVS)	21	4.9	22.96	43.33
Neurological (Neuro)	10	3.3	17.62	21.22
Trauma	7	5.7	13.46	12.15
General	5	2.2	15.13	21.09
Renal	3	4.4	19.55	25.98
Metabolic/endocrine (Metabolic)	1	3.4	19.50	24.40
Haematological (Haem)	0	3.8	22.33	50.21

67. Table 11 demonstrates the similarity in admissions during 2001. The majority (70%) has either a gastrointestinal, respiratory or cardiovascular classification. Variation in the duration of intensive care is marked, from 2 days in the general category to 8.1 days in the respiratory category. As 23% of patients are classified as respiratory, considerable resource is required in caring for this subgroup.

68. The ranges of illness severity and expected hospital outcomes between each system category in those patients with APACHE II mortality probabilities are also illustrated in Table 11. Apart from the haematological category in which there are few patients, cardiovascular diagnoses have, on average, the highest severity of illness and mortality probability.

Table 11. Variation in illness severity, length of ICU stay and admission APACHE system categories in all scored patients: 2001.

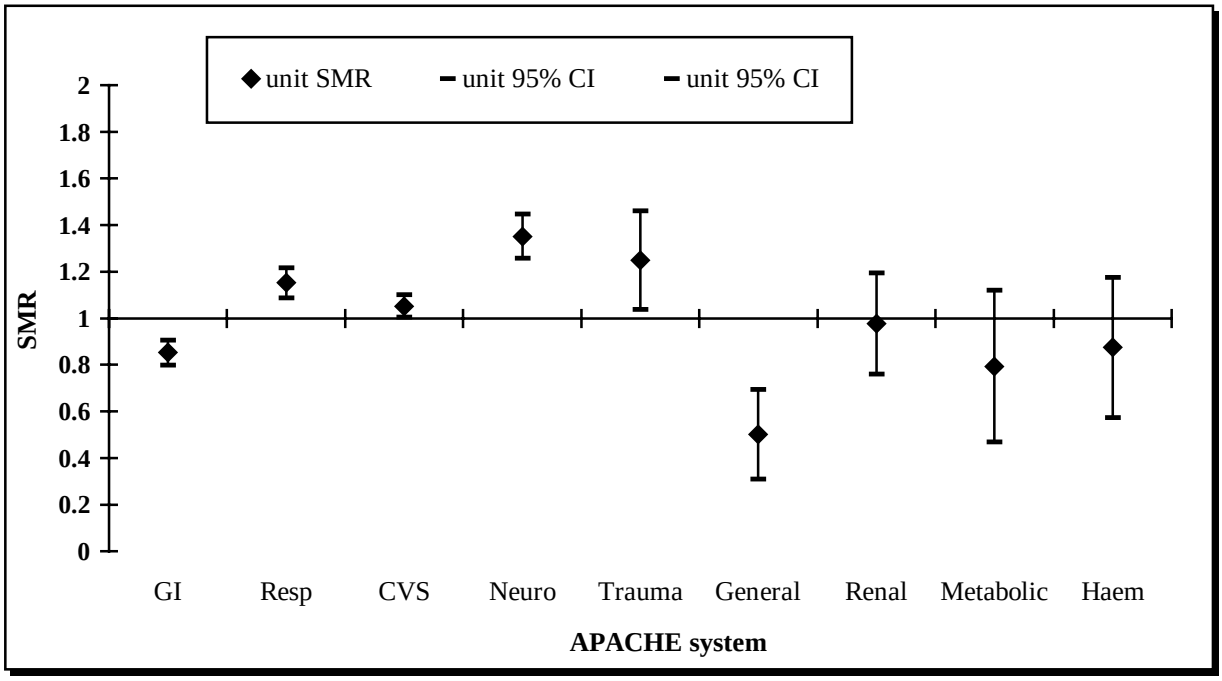
Admission APACHE Diagnostic System Category	Number of patients	Proportion (%) of patients	LOS (d) mean	APACHE II	
				Score	Probability (%)
Gastrointestinal (GI)	1709	27.5	5.3	18.62	38.72
Respiratory (Resp)	1420	22.8	8.1	20.13	33.16
Cardiovascular (CVS)	1302	20.9	5.4	23.74	46.71
Neurological (Neuro)	756	12.1	4.2	18.79	25.75
Trauma	453	7.3	6.8	14.28	13.62
General	316	5.1	2.2	15.06	20.14
Renal	153	2.5	4.3	20.59	28.78
Metabolic/endocrine (Metabolic)	84	1.3	3.5	21.13	25.50
Haematological (Haem)	31	0.5	7.4	22.03	47.98
Scotland	**6224**	**100**	**5.7**	**19.66**	**34.4**

69. The SMRs for these data are given in Table 12 and Figure 27. The SMRs for several groups, particularly neurological and trauma patients, are clearly greater than 1 whilst those for gastrointestinal and general are lower. There are limitations to the APACHE system, making it an imperfect system for case mix adjustment. It illustrates the danger that apparent differences in performance between units may, in fact, be partly due to varying case mix.

Table 12. Comparison of SMRs within each admission APACHE diagnostic system during 2001 and 1998-2000.

	2001			1998-2000		
APACHE system	SMR	95% LCI	95% UCI	SMR	95% LCI	95% UCI
Gastrointestinal (GI)	0.852	0.799	0.905	0.818	0.781	0.855
Respiratory (Resp)	1.151	1.087	1.216	1.106	1.060	1.152
Cardiovascular (CVS)	1.052	1.004	1.100	1.102	1.066	1.139
Neurological (Neuro)	1.351	1.257	1.445	1.274	1.187	1.36
Trauma	1.248	1.037	1.458	1.259	1.098	1.419
General	0.503	0.311	0.695	0.553	0.421	0.685
Renal	0.976	0.759	1.194	0.826	0.669	0.984
Metabolic/endocrine (Metabolic)	0.794	0.468	1.120	0.772	0.531	1.012
Haematological (Haem)	0.874	0.573	1.175	0.953	0.711	1.194

Figure 27. Scottish SMRs by APACHE system: 2001.



D.6. Audit of the use of Drotrecogin alfa (activated).

70. In our Annual Report 2002 [1], interim results of a prospective audit of sepsis in Scottish ICUs were discussed. Sepsis has long been recognised as a major cause of morbidity and mortality in ICU, but data on its epidemiology is surprisingly sparse. Treatment has been based around eradication of infection with antimicrobials, surgery (when appropriate) and organ support. Attempts at specific treatment for sepsis have been disappointing but Drotrecogin alfa (Activated) does appear, from the PROWESS [3] trial, to be an effective, though expensive, treatment when used in addition to best current practice.

71. The prospective, observational, multi-centre, epidemiological study of sepsis in Scottish ICUs was undertaken from 1st January 2002 to 31st May 2002 with 25 of the 26 adult intensive care units participating. This audit was conducted to provide epidemiological and outcome data on sepsis prior to a new treatment becoming available. Results showed that almost half of the admissions to ICU during this 5-month period developed at least one episode of sepsis during their ICU stay. Within this group of patients 83% had severe sepsis or septic shock accounting for 38% of all ICU admissions. Overall, 8% had severe sepsis or septic shock with at least 2 organ failures and an APACHE II score of 25 or more. Preliminary results have been presented at the International Symposium on Intensive Care and Emergency Medicine in Brussels in March 2003 [5]. A review of this abstract was also reported recently in the British Journal of Intensive Care [7].

72. Since the study was conducted, Drotrecogin alfa (activated) has been licensed for use in the UK, for the treatment of patients with severe sepsis, with multi-organ failure and at increased risk of dying.

73. The SICS decided at the AGM in January 2002 that if this drug became available, the Society would wish to audit its use. Every attempt was made to discuss this widely. The President, Dr Shearer, wrote to all members in July 2002. It was further discussed at the Audit Meeting in November 2002 and at the AGM in January 2003.

74. During the latter part of 2002, the Society developed guidelines to aid the assessment of patients suitable to receive the drug Drotrecogin Alfa (Activated), Xigris®. The guidelines are a synthesis of available information, as were the conclusions of the USA and EU licensing authorities. They are partly based on post hoc analysis of the PROWESS trial [3]. The guidelines are to aid clinical judgement of the suitability of patients to receive Drotrecogin Alfa (Activated) and are not intended to be binding. These guidelines are available at http://www.scottishintensivecare.org.uk.

75. The guideline suggests that patients should fulfil the following criteria for use of the drug:

1. **S.I.R.S.:** Meet 3 of the 4 criteria for Systemic Inflammatory Response Syndrome.

2. **Organ Failure:** Have at least 2 new organ failures, which are of less than 48 hours duration.

3. **Infection:** Have evidence of infection as the cause of **1** and **2.**

4. **High Risk of Death:** It is suggested that an APACHE II score of 25 or more be used to define this.

76. Based on the Society's guidelines and its recommendations for audit, a dataset was developed which enabled clinicians to record appropriate data and determine if a patient fulfilled recommended criteria. Data collection was initially conducted in paper format but, to date, Ward Watcher (Critical Care Audit Ltd, Yorkshire) has been suitably modified in almost every ICU to provide a consistent means of data collection for patients considered for treatment. Data should be collected prospectively by consultants, prior to commencing the drug.

77. An important objective of the audit is to assess whether the guidelines are appropriate. The audit is also being conducted to assess the impact of the use of this drug in our own practice. It is intended to:

- Record all patients who receive Drotrecogin alfa (activated).
- Record the diagnosis, severity of illness, microbiology and outcome of these patients.
- Assess whether the drug is used broadly in line with the guidelines or whether it is also used in other circumstances. Nobody pretends that guidelines can cover all eventualities and we would very much like to obtain information on all use.

78. In order to achieve these objectives, staff in the units were requested to collect the relevant data and inform the SICS audit office of all patients who receive the drug. The Audit Group produced folders containing the guidelines and data collection packs. These were taken to every ICU and discussed with consultants in every unit. Laminated information sheets detailing the audit were posted in every ICU. Participation, however, was voluntary and variable.

79. The decision of the Scottish Medicines Consortium (SMC) to approve the use of Drotrecogin alfa (activated) in the NHS in Scotland has allowed easier and more uniform access to this drug in Scotland than in many parts of England. The SMC stated that 'A register of recipients of this treatment should be established and maintained'. The SMC was aware of the draft SICS guidelines and of the audit plans.

80. The audit is being funded by a grant from Eli Lilly and Company, the manufacturer of Drotrecogin alfa (activated). This has enabled the Society to employ an audit nurse to work with the Scottish Intensive Care Society Audit Group, which is conducting the audit on behalf of the Society. The Society has control over the data and is not acting as an agent of the company. Information will be shared with Eli Lilly, the SMC and Health Boards as well as participating units. This will not include patient-identifiable information.

81. An experienced ICU nurse, Linda Patterson, has been employed to assist with this audit. She has visited all the ICUs to introduce herself, helped develop data collection packs, demonstrated data collection on Ward Watcher, validated data and reported variations in data entries to ICU staff. Linda is validating APACHE scores and that is an important part of the audit. If the guideline suggests using APACHE as a guide, we need to assess the utility of this. The present audit is due to finish September 29th 2003.

82. Based on the evidence of the severity of patients most likely to benefit from Drotrecogin alfa (activated), projections of the number of patients potentially suitable to receive the drug in Scotland have been generated from results of the sepsis audit, conducted in 2002. Table 13 illustrates the numbers of patients within Scottish ICUs who had at least one episode of severe sepsis, had more than one organ dysfunction and also had an APACHE II score of at least 25. Based on these 5-months data, the number of comparable patients *per annum* has been projected to be approximately 760. It has been estimated that 50% of patients would be ineligible to receive this drug [26] hence, the totals are given less 50% (380 *per annum*). In Falkirk Royal Infirmary and Raigmore Hospital, APACHE data were not available, however, 45 and 54 patients were identified as septic in these units respectively. Of all septic patients identified in the audit, 18% also had severe sepsis or septic shock, more than one organ dysfunction and an APACHE II score of 25 or more. From this information, it is estimated that 8 patients would have met these criteria in Falkirk and 10 patients in Raigmore.

Table 13. Projections of patients meeting guideline criteria based on 5-month prospective audit of sepsis, conducted 01/01/2002-31/05/2002.

		Patient fulfilling these criteria (N)		
NHS Board	**INTENSIVE CARE UNIT**	**5 month audit**	**Projected *per annum***	**Less 50%**
Argyll & Clyde	Inverclyde Royal Hospital	3	7	4
	Vale of Leven DGH	3	7	4
	Royal Alexandra Hospital	21	50	25
	TOTAL	**27**	**65**	**32**
Ayrshire & Arran	Ayr Hospital	6	14	7
	Crosshouse Hospital	13	31	16
	TOTAL	**19**	**46**	**23**
Borders	Borders General Hospital	14	34	17
	TOTAL	**14**	**34**	**17**
Dumfries & Galloway	Dumfries & Galloway Royal Infirmary	14	34	17
	TOTAL	**14**	**34**	**17**
Fife	Queen Margaret Hospital *(no data)*	-	-	-
	Victoria Hospital	7	17	8
	TOTAL	**7**	**17**	**8**
Forth Valley	Falkirk Royal Infirmary *(estimated)*	8	19	10
	Stirling Royal Infirmary	11	26	13
	TOTAL	**19**	**46**	**23**
Grampian	Aberdeen Royal Infirmary	33	79	40
	TOTAL	**33**	**79**	**40**
Greater Glasgow	Southern General Hospital	10	24	12
	Victoria Infirmary	14	34	17
	Stobhill Hospital	15	36	18
	Glasgow Royal Infirmary	16	38	19
	Western Infirmary	21	50	25
	TOTAL	**76**	**182**	**91**
Highland	Raigmore *(estimated)*	10	24	12
	TOTAL	**10**	**24**	**12**
Lanarkshire	Hairmyres Hospital	8	19	10
	Monklands Hospital	14	34	17
	Wishaw General Hospital	9	22	11
	TOTAL	**31**	**74**	**37**
Lothian	Royal Infirmary of Edinburgh	24	58	29
	St John's Hospital	12	29	14
	Western General Hospital	15	36	18
	TOTAL	**51**	**122**	**61**
Tayside	Ninewells Hospital	11	26	13
	Perth Royal Infirmary	5	12	6
	TOTAL	**16**	**38**	**19**
SCOTLAND	**TOTAL**	**317**	**761**	**380**

83. By 31st July 2003, 96 patients had received the licensed drug in Scotland. Figure 28 is a frequency distribution of its administration since the drug was licensed in the UK, in October 2002.

84. For the 6-months, January to June 2003, 70 patients received the drug. This is lower than anticipated from the projections generated from the Sepsis study results indicated above (380 patients *p.a.*).

85. Figure 29 demonstrates the pattern of prescribing across the NHS Boards. These numbers represent the number of patients treated in ICUs within these NHS Boards, irrespective of the patients' Boards of residence.

86. Table 14 illustrates the prescribing profile within each ICU in Scotland for the 9-months since licensed in the UK until June 2003.

Figure 28. Frequency distribution of prescribing Drotrecogin alfa (activated). N=96. October was an incomplete month.

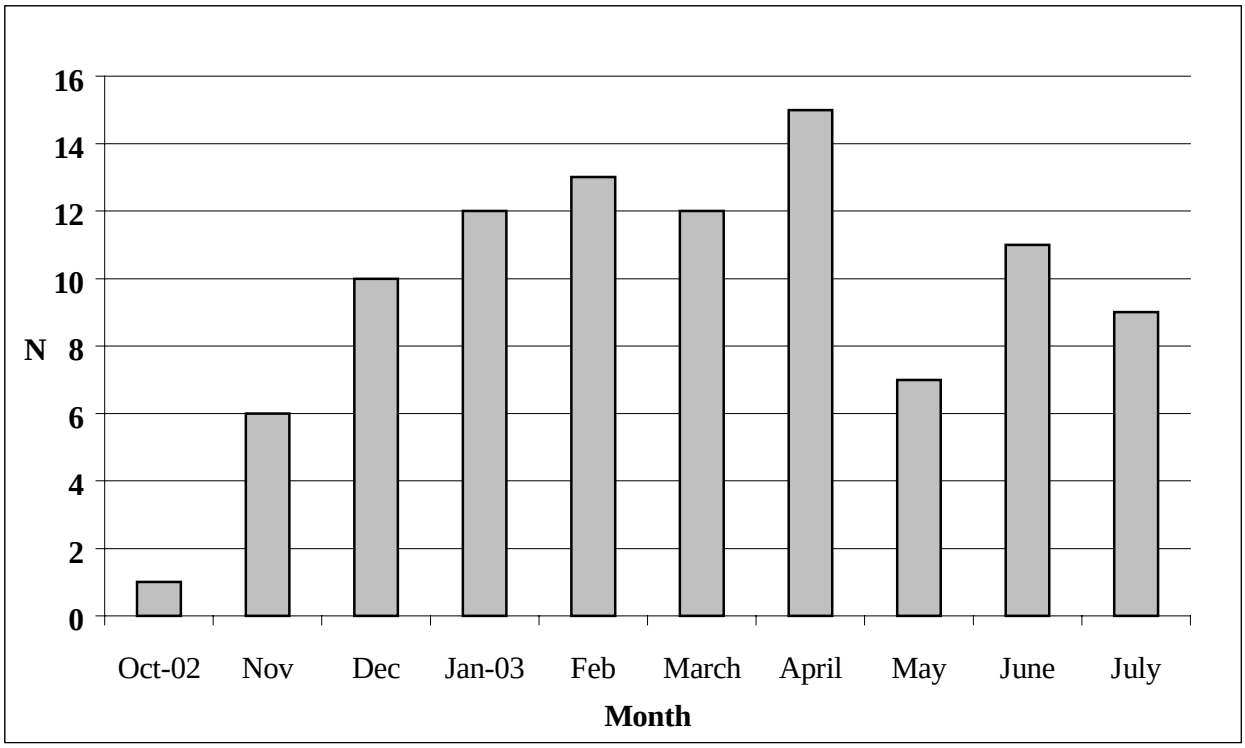


Figure 29. Use of Drotrecogin alfa (activated) within NHS Boards, N=96 until 31st July.

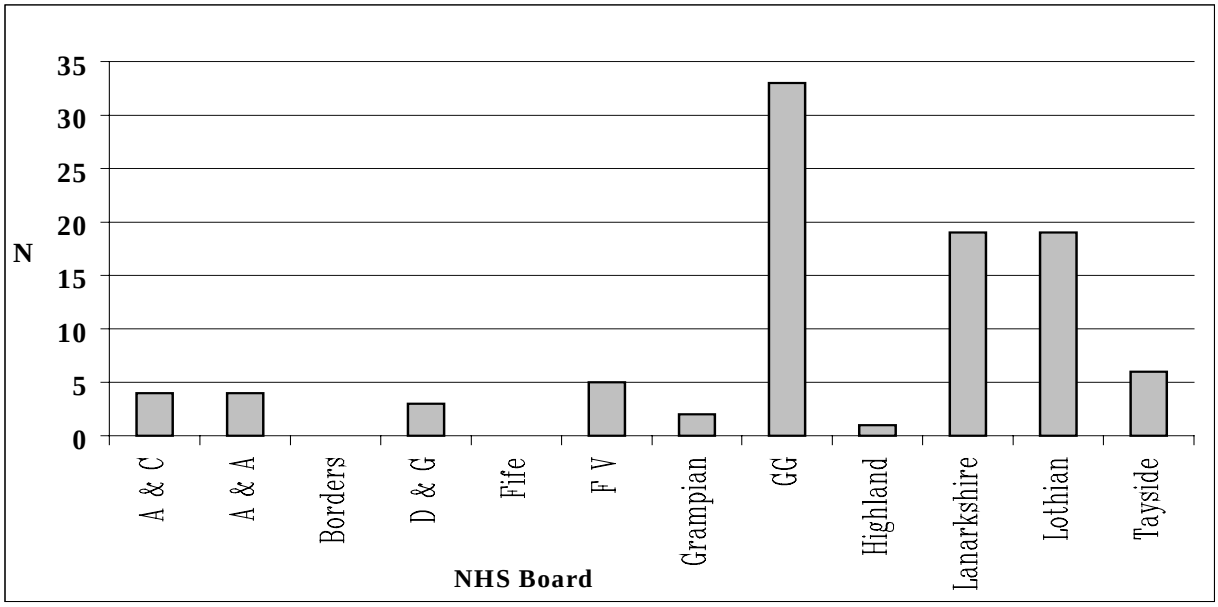


Table 14. Distribution of patients treated with Drotrecogin alfa (activated) until 31st July 2003.

Unit	N
A	2
B	3
C	1
D	0
E	2
F	1
G	9
H	10
I	4
J	0
K	1
L	7
M	0
N	0
O	3
P	8
Q	3
R	1
S	5
T	3
U	10
V	9
W	6
X	1
Y	3
Z	3
AA	1
SCOTLAND	**96**

87. Each patient should be assessed based on the criteria described in the Society's guideline, prior to administration of the drug. The dataset enables calculation of the number of SIRS criteria fulfilled (recommended 3), organ dysfunctions present for less than 48 hours (recommended >1), an APACHE II score (recommended >24) and presence of infection

Fulfilment of the guideline.

88. Summary of data collected by Consultants. As mentioned previously, participation in this audit was voluntary and has been found to be variable. Table 15 provides summary data of all assessments completed by consultants prior to administering Drotrecogin alfa (activated). At the time of compiling this report, 45 of 80 recipients had assessments completed.

Of the 45 patients who received the drug and had completed assessments:

- Almost 100% fulfilled SIRS, Infection and Organ dysfunction criteria.
- 69% fulfilled all criteria.

Table 15. All consultants' assessments.

Recipient	Age (Y)	S.I.R.S.	Infection	Organ Dysfunctions	APACHE II Score
All 45	52.9	43	45	45	28.5
Patients (N)	**Mean**	**Patients With Criteria Fulfilled**			
45	52.9	95.5%	100%	100%	N=31 (68.9%), Mean = 28.5

89. Summary of data validated by Audit Nurse. Table 16 is representative of data validated by the Audit Nurse employed by the Society to help implement the guideline, aid data collection and conduct extensive data validation. Although at time of writing this report, 80 records have been validated, presented here are those recipients for whom consultants' assessments are available. Validation is an important part of quality assurance of the audit. When errors are identified, these are fed back to the unit. The intention is to provide education, not to criticise individuals.

Of the 45 patients who received the drug and had completed assessments:

- Over 90% fulfilled SIRS, Infection and Organ dysfunction.
- 57.8% fulfilled the APACHE II criteria as well.

Table 16. All validated assessments.

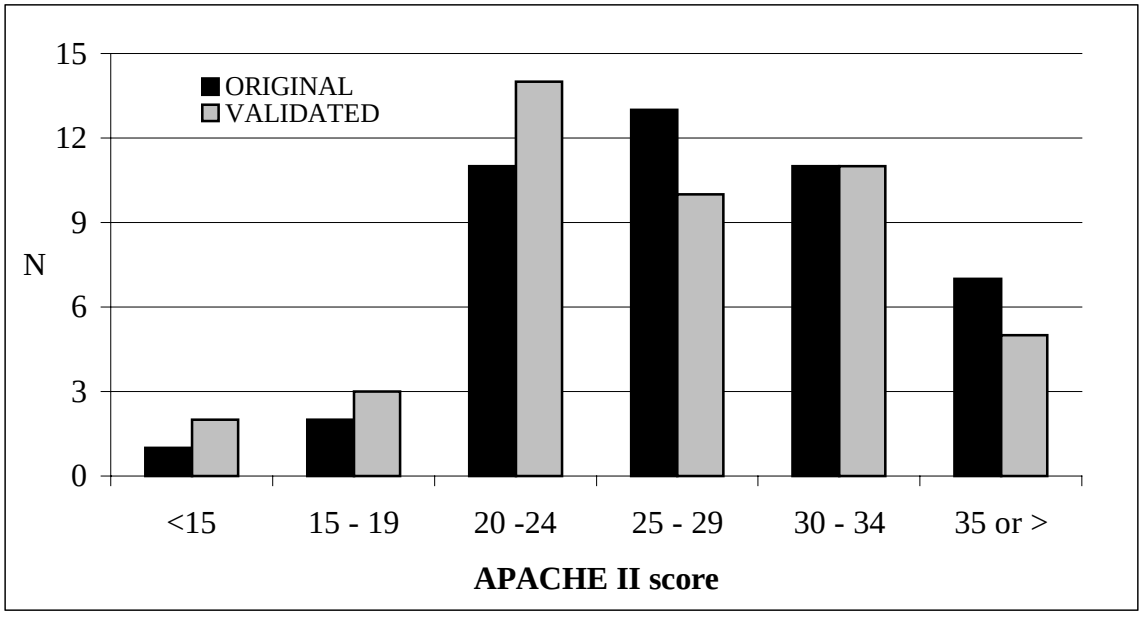
Recipient	S.I.R.S.	Infection	Organ Dysfunctions	APACHE II Score
All 45	42	45	42	26.4
Patients (N)	**Patients With Criteria Fulfilled**			
45	93.3%	100%	93.3%	N=26 (57.8%), Mean =26.4

90. The differences in APACHE scores are demonstrated in Table 17 and Figure 30. The validated scores are, on average, lower than the original scores.

Table 17. Comparison of summary data from 45 original and validated assessments.

	APACHE II score	
	Original	**Validated**
Mean	28.5	26.4
Median	28	27
Range	12-47	5-43

Figure 30. Comparison between original and validated APACHE II score for recipients of Drotrecogin alfa (activated).



91. Common issues identified in the validation process include:

- **Arithmetical errors** made in the paper-based copy of the assessment. Such errors should disappear with the integration of electronic assessment on the audit software.
- **Organ dysfunctions** present for more than 48 hours should not be included as Organ Dysfunctions in the assessment. On the electronic system, the correct response to the question, "Present for less than 48 hours?" will prevent incorrect inclusion of organ dysfunctions.
- **Definitions:** There is not complete agreement between medical staff about the definitions given for organ dysfunction. Not everyone may agree with the definitions, but they are an objective measure of dysfunction. Most commonly, renal dysfunction is argued with, the reason given is that creatinine concentrations are more indicative of dysfunction rather than urine output.
- **Missing data** in case notes and ward charts hinder accurate assessments. For example, pre-ICU fluid charts are often not available, or inconsistent (lack of dates/times). This makes assessment of organ dysfunction, SIRS and APACHE extremely difficult when pre-ICU data are required.
- **APACHE II**:
  - The time period for APACHE score when assessing for Drotrecogin alfa (activated) is the 24-hours prior to the time of assessment. In a number of cases, this will include laboratory and physiology data obtained prior to ICU admission. This is contrary to the routine data collection for the 1st 24-hour APACHE II score, when only ICU data are valid.
  - Laboratory results from samples obtained outwith the score period being used. If only 1 set of results is available within the score period then these should be used.
  - Total urine output being calculated wrongly and therefore having an impact on the score allocated for creatinine concentrations. If urine voided is less than 409 ml in a 24-hour period then double points are generated for creatinine concentrations. Commonly, urine output is totalled for the wrong time period, or includes other outputs, e.g., nasogastric aspirate volumes.

- **GCS assessment**. Recording a GCS continues to present problems.
  - If the patient has been sedated for the whole of the 24-hours prior to your assessment, and there is no valid pre-sedation GCS available, then the GCS should be recorded as 15 and, thus, there will be no APACHE II points for neurology.
  - If the pre-sedation GCS is a few days old, then a reasoned clinical judgement will be appropriate. It is never legitimate to use a GCS recorded when the patient is sedated. You may feel that the patient who appears to require very little sedation has a low underlying GCS, but this feeling (which we all have from time to time) is often wrong.
  - If you feel as a result of this that the patient's APACHE score has been underestimated then please record this fact. These are exactly the sorts of practical issues that we hope the audit will bring out. (e.g. '*Decided to give Drotrecogin alfa (activated) to this patient with an APACHE II score of 22 because I strongly believe that had I been able to assess neurology the patient would have been significantly obtunded*').
  - ***NB.*** In the routine first 24-hour APACHE score, although the audit system allows you to record a pre-sedation GCS if the patient is sedated for the whole of the time, no APACHE points are awarded for this. Points are only awarded if you can make an assessment on the patient during a time in the first 24-hours in which he/she is not receiving continuous or intermittent doses of agents to produce and maintain a continuous decreased level of consciousness.

92. The following summaries are based on the completed assessments and validated data available at the time of writing this report. They are not complete for all 96 recipients of the drug. For each recipient, there follows summaries of the assessments made by ICU staff. Extensive data validation is conducted by one experienced ICU nurse for every recipient of the drug. This involves the nurse reviewing the ICU charts, any ward charts, case notes and laboratory results for the time period

corresponding to the time of assessment. Where no assessment had been made by clinicians the validated assessments were made based on the 24-48 hours preceding drug administration. Summary data of the validation findings are also presented. Final results of validation process will be distributed to the ICUs.

UNIT A

Summary of data collected by Consultants.

Table 18 represents summary data collected by consultants for patients who received the drug in Unit A. Only 1 of the 2 patients treated had an assessment completed and fulfilled the criteria, described previously, for use of the drug (100% of those assessed, 50% of recipients).

Table 18. Unit A, Consultants' assessments.

Recipient	Age (Y)	S.I.R.S.	Infection	Organ Dysfunctions	APACHE II Score
A/1	65	N/R	SS	4	N/R
A/2	36	4	SS	5	47
Patients (N)	**Mean**	**Patients With Criteria Fulfilled (N)**			
2	50.5	1	2	2	N=1, Mean = 47

Summary of data validated by Audit Nurse.

Table 19 is representative of data validated by the Audit Nurse employed by the Society to help implement the guideline, aid data collection and conduct extensive data validation.

Of the 2 patients who received the drug:

- Both Patients fulfilled the criteria for S.I.R.S., Infection and Organ Dysfunction
- One fulfilled all of the criteria for use of the drug (50% of those assessed and 50% of recipients).

Table 19. Unit A, Validated assessments.

Recipient	S.I.R.S.	Infection	Organ Dysfunctions	APACHE II Score
A/1	4	SS	4	22
A/2	4	SS	5	30
Patients (N)	**Patients With Criteria Fulfilled (N)**			
2	2	2	2	N=1, Mean = 26

UNIT B

Summary of data collected by Consultant.

Table 20 represents summary data collected by consultants for patients who received the drug in Unit B. One of the 2 patients treated had an assessment completed and fulfilled the criteria for use of the drug (100% of those assessed, 50% of recipients).

Table 20. Unit B, Consultants' assessments.

Recipient	Age (Y)	S.I.R.S.	Infection	Organ Dysfunctions	APACHE II Score
B/1	48	N/R	N/R	N/R	N/R
B/2	67	4	C	5	36
Patients (N)	**Mean**	**Patients With Criteria Fulfilled (N)**			
2	58	1	1	1	N=1, Mean = 36

Summary of data validated by Audit Nurse.

Table 21 is representative of data validated by the Audit Nurse employed by the Society to help implement the guideline, aid data collection and conduct extensive data validation.

Of those 2 patients who received the drug and for whom validation was possible:

- both fulfilled all of the criteria for use of the drug (100% of recipients).

Table 21. Unit B, Validated assessments.

Recipient	S.I.R.S.	Infection	Organ Dysfunctions	APACHE II Score
B/1	3	C	5	30
B/2	4	C	5	35
Patients (N)	**Patients With Criteria Fulfilled (N)**			
2	2	2	2	N=2, Mean = 32.5

UNIT C

Summary of data collected by Consultant.

Table 22 represents summary data collected by the consultant for the patient who received the drug and who fulfilled all of the criteria for use of the drug in Unit C. Note, patient C/1, was assessed but did not receive the drug. This record is not included in these results. Patient C/2(a) was assessed initially at 6.30pm but did not receive the drug at that time. A second assessment was made 8 hours later at which point the drug was prescribed and administered (C/2(b)).

Table 22. Unit C, Consultant's assessment.

Recipient	Age (Y)	S.I.R.S	Infection	Organ Dysfunctions	APACHE II Score
C/2(a)	42	3	C	4	23
C/2(b)	42	4	C	5	29
Patients (N)	**Mean**	**Patients With Criteria Fulfilled (N)**			
1	42	1	1	1	N=1, Mean = 29

Summary of data validated by Audit Nurse.

Table 23 is representative of data validated by the Audit Nurse employed by the Society to help implement the guideline, aid data collection and conduct extensive data validation.

The patient fulfilled all of the criteria for use of the drug (100% of recipients) in both assessments.

Table 23. Unit C, Validated assessments.

Recipient	S.I.R.S	Infection	Organ Dysfunctions	APACHE II Score
C/2(a)	4	C	5	26
C/2(b)	4	C	5	28
Patients (N)	**Patients With Criteria Fulfilled (N)**			
1	1	1	1	N=1, Mean=28

UNIT E

Summary of data collected by Consultant.

Table 24 represents summary data collected by consultants for the patient who received the drug in Unit E.

- The criteria for S.I.R.S., Infection and Organ Dysfunctions were fulfilled.
- The APACHE score was 23.

Table 24. Unit E, Consultants' assessments.

Recipient	Age (Y)	S.I.R.S.	Infection	Organ Dysfunctions	APACHE II Score
E/1	57	3	C	5	23
Patients (N)	Mean	Patients With Criteria Fulfilled (N)			
1	57	1	1	1	N = 0, Mean = 23

Summary of data validated by Audit Nurse.

Table 25 is representative of data validated by the Audit Nurse employed by the Society to help implement the guideline, aid data collection and conduct extensive data validation.

- Fulfilment of the criteria for S.I.R.S., Infection and Organ Dysfunctions were confirmed.
- The APACHE score was 22.

Table 25. Unit E, Validated assessment.

Recipient	S.I.R.S.	Infection	Organ Dysfunctions	APACHE II Score
E/1	3	C	4	22
Patients (N)	Patients With Criteria Fulfilled (N)			
1	1	1	1	N =0, Mean = 22

UNIT F

Summary of data collected by Consultant.

Table 26 represents summary data collected by the consultant for the patient who received the drug in Unit F. The criteria for S.I.R.S., Infection, Organ Dysfunction were fulfilled with an APACHE II of 24.

Table 26. Unit F, Consultant's assessment.

Recipient	Age (Y)	S.I.R.S.	Infection	Organ Dysfunctions	APACHE II Score
F/1	33	3	SS	2	24
Patients (N)	**Mean**	**Patients With Criteria Fulfilled (N)**			
1	33	1	1	1	N=0, Mean=24

Summary of data validated by Audit Nurse.

Table 27 is representative of data validated by the Audit Nurse employed by the Society to help implement the guideline, aid data collection and conduct extensive data validation.

The patient fulfilled the criteria for S.I.R.S., Infection and Organ Dysfunction.

Table 27. Unit F, Validated assessment.

Recipient	S.I.R.S.	Infection	Organ Dysfunctions	APACHE II Score
F/1	4	SS	2	21
Patients (N)	**Patients With Criteria Fulfilled (N)**			
1	1	1	1	N=0, Mean =21

UNIT G

Summary of data collected by Consultant.

Table 28 represents summary data collected by consultants for patients who received the drug in Unit G. The Audit Group is aware of only 1 completed assessment for 8 patients treated. All criteria were fulfilled for use of the drug in that assessment.

Table 28. Unit G, Consultants' assessments.

Recipient	Age (Y)	S.I.R.S.	Infection	Organ Dysfunctions	APACHE II Score
G/1	17	N/R	N/R	N/R	N/R
G/2	78	N/R	N/R	N/R	N/R
G/3	48	N/R	N/R	N/R	N/R
G/4	63	N/R	N/R	N/R	N/R
G/5	53	4	SS	5	40
G/6	61	N/R	N/R	N/R	N/R
G/7					
G/8					
Patients (N)	**Mean**	**Patients With Criteria Fulfilled (N)**			
8	53.3	1	1	1	N = 1, Mean = 40

Summary of data validated by Audit Nurse.

Table 29 is representative of data validated by the Audit Nurse employed by the Society to help implement the guideline, aid data collection and conduct extensive data validation. Records for 6 of the 8 patients have been validated to date.

Of those 6 patients who received the drug and for whom validation was possible:

- 6 fulfilled the criteria for S.I.R.S. and Infection.
- 5 fulfilled the criteria for Organ Dysfunctions.
- 3 have fulfilled all of the criteria for use of the drug (50% of those assessed and validated to date).

Table 29. Unit G, Validated assessments.

Recipient	S.I.R.S.	Infection	Organ Dysfunction	APACHE II Score
G/1	3	C	4	16
G/2	4	C	4	32
G/3	3	SS	4	25
G/4	3	SS	5	22
G/5	4	SS	4	26
G/6	4	C	1	15
G/7				
G/8				
Patients (N)	**Patients With Criteria Fulfilled (N)**			
8	6	6	5	N=3, Mean = 22.6

UNIT H

Summary of data collected by Consultant.

Table 30 represents summary data collected by consultants for patients who received the drug in Unit H. Four of the 8 patients treated had assessments completed (50% of recipients). Of the 4 assessed:

- 4 fulfilled the criteria for Infection and Organ Dysfunctions.
- 3 fulfilled SIRS criteria.
- 2 fulfilled all of the criteria for use of the drug (50% of those assessed, 25% of recipients).

Table 30. Unit H, Consultants' assessments.

Recipients	Age (Y)	S.I.R.S.	Infection	Organ Dysfunctions	APACHE II Score
H/1	81	2	SS	4	23
H/2	64	3	C	3	21
H/3	74	4	SS	4	34
H/4	57	4	SS	4	31
H/5	43	N/R	N/R	N/R	N/R
H/6		N/R	N/R	N/R	N/R
H/7		N/R	N/R	N/R	N/R
H/8	67	N/R	N/R	N/R	N/R
Patients (N)	**Mean**	**Patients With Criteria Fulfilled (N)**			
8	64	3	4	4	N=2, Mean=27.3

Summary of data validated by Audit Nurse.

Table 31 is representative of data validated by the Audit Nurse employed by the Society to help implement the guideline, aid data collection and conduct extensive data validation.

Six records of the 8 patients who received the drug have been validated.

- 5 fulfilled SIRS, Infection and Organ dysfunction.
- 3 fulfilled APACHE.

Table 31. Unit H, Validated assessments.

Recipients	S.I.R.S.	Infection	Organ Dysfunctions	APACHE II Score
H/1	2	SS	4	20
H/2	3	C	3	17
H/3	4	SS	3	29
H/4	4	SS	4	31
H/5	3	U/C	4	17
H/6	U/V	U/V	U/V	U/V
H/7				
H/8	4	SS/C	5	27
Patients (N)	**Patients With Criteria Fulfilled (N)**			
8	5	5	5	N = 3, Mean = 23.5

UNIT I

Summary of data collected by Consultant.

Table 32 represents summary data collected by consultants for patients who received the drug in Unit I. Of the 3 assessed:

- all 3 fulfilled the criteria for S.I.R.S., Infection and Organ Dysfunction
- 2 fulfilled all of the criteria for use of the drug (67% of recipients).

Table 32. Unit I, Consultants' assessments.

Recipient	Age (Y)	S.I.R.S.	Infection	Organ Dysfunctions	APACHE II Score
I/1	75	3	C	2	23
I/2	57	4	C	4	28
I/3	57	4	C	3	32
Patients (N)	**Mean**	**Patients With Criteria Fulfilled (N)**			
3	63	3	3	3	N=2, Mean=27.7

Summary of data validated by Audit Nurse.

Table 33 is representative of data validated by the Audit Nurse employed by the Society to help implement the guideline, aid data collection and conduct extensive data validation.

Of the 3 patients who received the drug:

- 3 fulfilled the criteria for S.I.R.S., Infection and Organ Dysfunctions.
- 2 fulfilled all of the criteria for use of the drug (67% of recipients).

Table 33. Unit I, Validated assessments.

Recipient	S.I.R.S.	Infection	Organ Dysfunctions	APACHE II Score
I/1	3	C	3	20
I/2	4	C	5	32
I/3	4	C	3	35
Patients (N)	**Patients With Criteria Fulfilled (N)**			
3	3	3	3	N=2, Mean = 29

UNIT K

Summary of data collected by Consultant.

Table 34 represents summary data collected by the consultant for the patient who received the drug and who did fulfil all of the criteria for use of the drug, in Unit K.

Table 34. Unit K, Consultant's assessment.

Recipient	Age (Y)	S.I.R.S.	Infection	Organ Dysfunctions	APACHE II Score
K/1	34	3	SS	2	34
Patients (N)	Mean	Patients With Criteria Fulfilled (N)			
1	34	1	1	1	N=1, Mean = 34

Summary of data validated by Audit Nurse.

Table 35 is representative of data validated by the Audit Nurse employed by the Society to help implement the guideline, aid data collection and conduct extensive data validation. The patient fulfilled all of the criteria for use of the drug.

Table 35. Unit K, Validated assessment.

Recipient	S.I.R.S.	Infection	Organ Dysfunctions	APACHE II Score
K/1	4	SS	3	28
Patients (N)	Patients With Criteria Fulfilled (N)			
1	1	1	1	N=1, Mean = 28

UNIT L

Summary of data collected by Consultant.

Table 36 represents summary data collected by consultants for patients who received the drug. Five of the 7 patients treated had assessments completed and available. Data were collected electronically for a seventh, although the data were lost following a malfunction of the PC. L/4 was assessed twice. Only after the second assessment was the drug was administered. The second assessment is reported here (L/4b).

Of the 5 assessed:

- all fulfilled the criteria for S.I.R.S. and infection and organ dysfunction.
- 4 fulfilled all of the criteria for use of the drug (80% of those assessed, 57% of recipients).

Table 36. Unit L, Consultants' assessments.

Recipient	Age (Y)	S.I.R.S.	Infection	Organ Dysfunctions	APACHE II Score
L/1	62	N/A	N/A	N/A	N/A
L/2	59	4	SS	4	24
L/3	55	4	C	3	43
L/4b, 8pm, drug	60	4	SS	3	26
L/5	57	4	SS	4	33
L/6	57	4	SS	5	41
L/7	33	N/A	N/A	N/A	N/A
Patients (N)	**Mean**	**Patients With Criteria Fulfilled (N)**			
7	54.7	5	5	5	N = 4, Mean = 33.4

Summary of data validated by Audit Nurse.

Table 37 is representative of data validated by the Audit Nurse employed by the Society to help implement the guideline, aid data collection and conduct extensive data validation.

Validation of the 7 records demonstrated:

- all patients fulfilled the criteria for S.I.R.S. and Organ Dysfunction.
- infection status in one could not be confirmed.
- 3 fulfilled all of the criteria for use of the drug (43% of recipients).
- APACHE scores were all 20 or greater, with a mean of 29.7.

Table 37. Unit L, Validated assessments.

Recipient	S.I.R.S.	Infection	Organ Dysfunctions	APACHE II Score
L/1	4	U/C	5	20
L/2	4	SS	4	23
L/3	4	C	3	43
L/4b, 8pm, drug	4	SS	3	21
L/5	4	SS	4	38
L/6	4	SS	4	24
L/7	4	C	4	39
Patients (N)	**Patients With Criteria Fulfilled (N)**			
7	7	6	7	N=3, Mean = 29.7

UNIT O

Summary of data collected by Consultant.

Table 38 represents summary data collected by consultants for patients who received the drug in Unit O. Two of the 3 patients who received the drug had assessments recorded (67% of recipients). Patient O/1 was assessed prior to commencing the drug and the decision made not to give the drug at that time. The patient did, however, receive the drug a few hours later but no further assessment was completed.

Of the 2 assessed:

- 1 fulfilled the criteria for S.I.R.S., although an arithmetical error was found by the audit nurse and both patients did fulfil the criteria.
- 2 fulfilled the criteria for Infection and Organ Dysfunction
- Neither fulfilled the criteria of an APACHE II score of 25 or more.

Table 38. Unit O, Consultants' assessments.

Recipient	Age (Y)	S.I.R.S.	Infection	Organ Dysfunctions	APACHE II Score
O/1	37	N/R	N/R	N/R	N/R
O/2	35	2	C	3	12
O/3	58	3	C	2	17
Patients (N)	**Mean**	**Patients With Criteria Fulfilled (N)**			
3	43.3	1	2	2	N=0, Mean = 14.5

Summary of data validated by Audit Nurse.

Table 39 is representative of data validated by the Audit Nurse employed by the Society to help implement the guideline, aid data collection and conduct extensive data validation.

Of those 3 patients who received the drug:

- 3 fulfilled the criteria for S.I.R.S. and Infection.
- 1 fulfilled the criteria for Organ Dysfunction, however, O/3 requires confirmation.
- No patients fulfilled all of the criteria for use of the drug.

Table 39. Unit O, Validated assessments.

Recipient	S.I.R.S.	Infection	Organ Dysfunctions	APACHE II Score
O/1	3	C	3	13
O/2	3	C	1	5
O/3	3	C	?	13
Patients (N)	**Patients With Criteria Fulfilled (N)**			
3	3	3	1	N=0, Mean = 10

UNIT P

Summary of data collected by Consultant.

Table 40 represents summary data collected by consultants for patients who received the drug in Unit P. Data validation for a 7th patient is to be completed. Of the 6 patients assessed:

- All fulfilled the criteria for S.I.R.S., Infection and Organ Dysfunction.
- 4 fulfilled all of the criteria for use of the drug (67% of recipients).

Table 40. Unit P, Consultants' assessments.

Recipient	Age (Y)	S.I.R.S.	Infection	Organ Dysfunctions	APACHE II Score
P/1	66	3	SS	5	34
P/2	39	4	SS	4	26
P/3	73	3	SS	4	24
P/4	64	4	C	4	32
P/5	51	4	SS	3	24
P/6	47	4	SS/C	3	29
Patients (N)	**Mean**	**Patients With Criteria Fulfilled (N)**			
6	56.7	6	6	6	N=4, Mean=28.2

Summary of data validated by Audit Nurse.

Table 41 is representative of data validated by the Audit Nurse employed by the Society to help implement the guideline, aid data collection and conduct extensive data validation.

- All 6 validated fulfilled SIRS, Infection and Organ Dysfunction criteria.
- 5 fulfilled all criteria (83% of those validated).

Table 41. Unit P, Validated assessments.

Recipient	S.I.R.S.	Infection	Organ Dysfunctions	APACHE II Score
P/1	4	SS	5	31
P/2	4	SS	4	25
P/3	3	SS	4	24
P/4	3	C	4	31
P/5	4	SS	3	26
P/6	4	C	3	33
Patients (N)	**Patients With Criteria Fulfilled (N)**			
6	6	6	6	N=5, Mean 28.3

UNIT Q

Summary of data collected by Consultant.

Table 42 represents summary data collected by consultants for patients who received the drug in Unit Q. All 3 patients fulfilled all of the criteria for use of the drug.

Table 42. Unit Q, Consultants' assessments.

Recipient	Age (Y)	S.I.R.S.	Infection	Organ Dysfunctions	APACHE II Score
Q/1	52	4	SS	4	29
Q/2	65	4	C	3/4	35
Q/3	68	4	C	3	26
Patients (N)	**Mean**	**Patients With Criteria Fulfilled (N)**			
3	61.7	3	3	3	N=3, Mean =30

Summary of data validated by Audit Nurse.

Table 43 is representative of data validated by the Audit Nurse employed by the Society to help implement the guideline, aid data collection and conduct extensive data validation.

Of the 3 patients validated:

- 3 fulfilled the criteria for S.I.R.S., Infection and Organ Dysfunctions.
- 1 fulfilled all of the criteria for use of the drug (33% of recipients).
- APACHE scores were all 22 or greater.

Table 43. Unit Q, Validated assessments.

Recipient	S.I.R.S.	Infection	Organ Dysfunctions	APACHE II Score
Q/1	4	SS	4	24
Q/2	4	C	3	31
Q/3	4	C	2	22
Patients (N)	**Patients With Criteria Fulfilled (N)**			
3	3	3	3	N=1, Mean =25.7

UNIT R

Summary of data collected by Consultant.

No assessment was completed for the patient who received the drug in Unit R (Table 44).

Table 44. Unit R, Consultants' assessments.

Recipient	Age (Y)	S.I.R.S.	Infection	Organ Dysfunctions	APACHE II Score
R/1	72	N/R	N/R	N/R	N/R
Patients (N)	**Mean**	**Patients With Criteria Fulfilled (N)**			
1	72	0	0	0	0

Summary of data validated by Audit Nurse.

Table 45 is representative of data validated by the Audit Nurse employed by the Society to help implement the guideline, aid data collection and conduct extensive data validation. This assessment was based on the 24 hours prior to commencement of the drug, as there was no assessment made by ICU staff to guide the validation exercise.

The patient fulfilled the criteria for S.I.R.S., Infection and APACHE II criteria but not for Organ Dysfunction.

Table 45. Unit R, Validated assessments.

Recipient	S.I.R.S.	Infection	Organ Dysfunctions	APACHE II Score
R/1	4	C	1	28
Patients (N)	**Patients With Criteria Fulfilled (N)**			
1	1	1	0	N=1, Mean = 28

UNIT S

Summary of data collected by Consultants.

Table 46 represents summary data collected by consultants for patients who received the drug in Unit S. Only 3 of the 5 patients treated had assessments completed, all of whom fulfilled the criteria for use of the drug (60% of recipients).

Table 46. Unit S, Consultants' assessments.

Recipient	Age (Y)	S.I.R.S.	Infection	Organ Dysfunctions	APACHE II Score
S/1	37	N/R	N/R	N/R	N/R
S/2	57	N/R	N/R	N/R	N/R
S/3	30	4	SS	3	30
S/4	70	3	SS	3	25
S/5		3	SS	4	29
Patients (N)	**Mean**	**Patients With Criteria Fulfilled (N)**			
5	48.5	3	3	3	N=3, Mean =28

Summary of data validated by Audit Nurse.

Table 47 is representative of data validated by the Audit Nurse employed by the Society to help implement the guideline, aid data collection and conduct extensive data validation. Records for 4 of the 5 patients could be validated. One record could not be validated due to poor documentation prior to ICU. Of those 4 patients who received the drug and for whom validation was possible:

- 4 patients fulfilled the criteria for S.I.R.S., Infection and Organ Dysfunction.
- 3 fulfilled the APACHE criteria.
- 3 fulfilled all of the criteria for use of the drug (75% of those assessed, 60% of recipients).

Table 47. Unit S, Validated assessments.

Recipient	S.I.R.S.	Infection	Organ Dysfunctions	APACHE II Score
S/1	3	SS	3	14
S/2	3	SS	2	33
S/3	4	C	3	30
S/4	3	SS	3	25
S/5	U/V	U/V	U/V	U/V
Patients (N)	**Patients With Criteria Fulfilled (N)**			
5	4	4	4	N=3, Mean = 25.5

UNIT T

Summary of data collected by Consultants.

Table 48 represents summary data collected by consultants for patients who received the drug in Unit T. Two of the three patients treated had assessments completed (67% of recipients) and both fulfilled all of the criteria.

Table 48. Unit T, Consultants' assessments.

Recipient	Age (Y)	S.I.R.S.	Infection	Organ Dysfunctions	Apache II Score
T/1	54	3	SS	3	25
T/2	55	N/R	N/R	N/R	N/R
T/3	50	4	SS	5	32
Patients (N)	**Mean**	**Patients With Criteria Fulfilled (N)**			
3	53	2	2	2	N=2, Mean = 28.5

Summary of data validated by Audit Nurse.

Table 49 is representative of data validated by the Audit Nurse employed by the Society to help implement the guideline, aid data collection and conduct extensive data validation.

Of the 3 patients who received the drug:

- 2 fulfilled the criteria for S.I.R.S.
- 3 fulfilled the criteria for Infection and Organ Dysfunctions.
- 2 fulfilled all of the criteria for use of the drug (67% of recipients).

Table 49. Unit T, Validated assessments.

Recipient	S.I.R.S.	Infection	Organ Dysfunctions	APACHE II Score
T/1	2	SS	3	20
T/2	4	SS	3	27
T/3	4	SS	5	31
Patients (N)	**Patients With Criteria Fulfilled (N)**			
3	2	3	3	N=2, Mean =26

UNIT U

Summary of data collected by Consultants.

Table 50 represents summary data collected by consultants for patients who received the drug in Unit U. Six of the 9 patients treated had assessments completed. Of the 6 assessed:

- all fulfilled the criteria for S.I.R.S., Infection and Organ dysfunction (100% of assessed, 66% of recipients).
- 3 fulfilled all of the criteria for use of the drug (50% of those assessed, 33% of recipients). The mean APACHE score was, however, 25.

Table 50. Unit U, Consultants' assessments.

Recipient	Age (Y)	S.I.R.S.	Infection	Organ Dysfunctions	APACHE II Score
U/1	34	4	SS	4	24
U/2	37	4	C	5	35
U/3	72	N/R	N/R	N/R	N/R
U/4	64	N/R	N/R	N/R	N/R
U/5	77	4	SS	4	28
U/6	50	N/R	N/R	N/R	N/R
U/7	53	4	SS	4	16
U/8	26	4	SS/C	3	19
U/9	76	4	C	4	29
Patients (N)	**Mean**	**Patients With Criteria Fulfilled (N)**			
9	54.3	6	6	6	N=3, Mean=25.2

Summary of data validated by Audit Nurse.

Table 51 is representative of data validated by the Audit Nurse employed by the Society to help implement the guideline, aid data collection and conduct extensive data validation.

Of those 9 patients who received the drug and for whom validation was possible:

- 9 fulfilled the criteria for S.I.R.S.
- 7 fulfilled the criteria for Infection.
- 8 fulfilled the criteria for Organ Dysfunctions. Clarification of an organ dysfunction is required in Recipient U/9, however, the criteria are still met.
- 4 fulfilled all of the criteria for use of the drug (44.4% of recipients). Only 2 had an APACHE score less than 21.

Table 51. Unit U, Validated assessments.

Recipient	S.I.R.S.	Infection	Organ Dysfunctions	APACHE II Score
U/1	4	SS	4	24
U/2	4	C	4	34
U/3	3	SS	5	36
U/4	4	U/C	2	22
U/5	4	SS	5	27
U/6	4	U/C	3	21
U/7	4	SS	3	17
U/8	4	C	1	15
U/9	4	C	2/3	29
Patients (N)	**Patients With Criteria Fulfilled (N)**			
9	9	7	8	N=4, Mean=25

UNIT V

Summary of data collected by Consultant.

Table 52 represents summary data collected by consultants for patients who received the drug in Unit V. Six of the 9 patients treated had assessments completed. Two assessments were apparently completed but no forms were found. In a third, no assessment was recorded at all.

Of the 6 assessed:

- all fulfilled the criteria for S.I.R.S., Infection and Organ Dysfunctions.
- 4 fulfilled all of the criteria for use of the drug (66.7% of those assessed, 44.4% of recipients).

Table 52. Unit V, Consultants' assessments.

Recipient	Age	S.I.R.S.	Infection	Organ Dysfunctions	APACHE II Score
V/1	44	4	C	4	33
V/2	67	3	SS	3	25
V/3	54	N/A	N/A	N/A	N/A
V/4	33	4	SS	2	24
V/5	73	N/A	N/A	N/A	N/A
V/7	37	4	C	2	20
V/8	71	3	C	3	26
V/9	45	N/R	N/R	N/R	N/R
V/10	74	3	C	5	30
Patients (N)	**Mean**	**Patients With Criteria Fulfilled (N)**			
9	55.3	6	6	6	N=4, Mean 26.3

Summary of data validated by Audit Nurse.

Table 53 is representative of data validated by the Audit Nurse employed by the Society to help implement the guideline, aid data collection and conduct extensive data validation.

Of those 9 patients who received the drug and for whom validation was possible:

- 9 fulfilled the criteria for S.I.R.S. and Organ Dysfunction.
- 8 fulfilled the criteria for Infection.
- 6 fulfilled all of the criteria for use of the drug (66.7% of recipients).

Table 53. Unit V, Validated assessments.

Recipient	S.I.R.S.	Infection	Organ Dysfunctions	APACHE II Score
V/1	4	C	4	28
V/2	3	SS	3	25
V/3	3	U/C	3	17
V/4	3	SS	2	13
V/5	4	SS	5	31
V/7	4	C	2	21
V/8	3	C	3	27
V/9	4	SS	4/5	33
V/10	4	C	5	30
Patients (N)	**Patients With Criteria Fulfilled (N)**			
9	9	8	9	N=6, Mean = 25

UNIT W

Summary of data collected by Consultant.

Table 54 represents summary data collected by consultants for patients who received the drug in Unit W. Four of the 6 patients treated had assessments completed. Two assessments were apparently completed but no forms or data were found. W/2 was assessed but did not receive the drug. This record is not included in these results.

Of the 4 assessed:

- all 4 fulfilled the criteria for S.I.R.S. and Infection and Organ Dysfunctions.
- 3 fulfilled all of the criteria for use of the drug (75% of those assessed, 50% of recipients).
- In record W/3, an arithmetical error by the ICU staff resulted in the APACHE II score being recorded as 24 rather than 29. This type of error will be eliminated by recording raw data on the audit system and subsequent electronic calculation of scores.

Table 54. Unit W, Consultants' assessments.

Recipient	Age(Y)	S.I.R.S.	Infection	Organ Dysfunctions	APACHE II Score
W/1	72	N/A	N/A	N/A	N/A
W/3	74	4	C	4	24
W/4	53	4	SS	2	28
W/5	31	N/A	N/A	N/A	N/A
W/6	65	3	SS	3	27
W/7	58	4	SS	4	32
Patients (N)	**Mean**	**Patients With Criteria Fulfilled (N)**			
6	58.8	4	4	4	N=3, Mean = 27.7

Summary of data validated by Audit Nurse.

Table 55 is representative of data validated by the Audit Nurse employed by the Society to help implement the guideline, aid data collection and conduct extensive data validation.

Validation was not possible in one of the 6 recipients due to missing notes.

Of those 5 patients who received the drug and for whom validation was possible:

- 5 fulfilled the criteria for S.I.R.S. and Infection.
- 3 fulfilled the criteria for Organ Dysfunctions. In one other record organ dysfunction could not be validated due to charts being unavailable.
- 2 fulfilled the criteria for an APACHE II score of 25 or more.
- 1 fulfilled all of the criteria for use of the drug (20% of those assessed, 17% of recipients).
- The APACHE score for W/3 requires clarification of a definition, however, it is greater than 24.

Table 55. Unit W, Validated assessments.

Recipient	S.I.R.S.	Infection	Organ Dysfunctions	APACHE II Score
W/1	4	SS	4	23
W/3	4	C	U/V	1=25, 2=30
W/4	4	SS	4	23
W/5	4	SS	0	17
W/6	U/V	U/V	U/V	U/V
W/7	4	SS	4	27
Patients (N)	**Patients With Criteria Fulfilled (N)**			
6	5	5	3	N=2, Mean ≈ 23.5

UNIT X

Summary of data collected by Consultant.

Table 56 represents summary data collected by the consultant for the patient who received the drug in Unit X. The patient fulfilled all the criteria.

Table 56. Unit X, Consultant's assessment.

Recipient	Age (Y)	S.I.R.S.	Infection	Organ Dysfunctions	APACHE II Score
X/1	50	4	SS	4	30
Patients (N)	Mean	Patients With Criteria Fulfilled (N)			
1	50	1	1	1	N=1, Mean = 30

Summary of data validated by Audit Nurse.

Table 57 is representative of data validated by the Audit Nurse employed by the Society to help implement the guideline, aid data collection and conduct extensive data validation. Criteria for SIRS, Infection and Organ Dysfunction were met. An outstanding query with the APACHE score remains to be clarified to generate a score of either 23 or 26.

Table 57. Unit X, Validated assessment.

Recipients	S.I.R.S.	Infection	Organ Dysfunctions	APACHE II Score
X/1	4	SS	4	23 / 26
Patients (N)	Patients With Criteria Fulfilled (N)			
1	1	1	1	To check

UNIT Y

Summary of data collected by Consultants.

Table 58 represents summary data collected by consultants for patients who received the drug in Unit Y. Both patients fulfilled all of the criteria for use of the drug (100% of recipients). Y/1 was assessed but did not receive the drug and is not included in this report.

Table 58. Unit Y, Consultants' assessments.

Recipient	Age (Y)	S.I.R.S.	Infection	Organ Dysfunctions	APACHE II Score
Y/2	36	4	C	4	35
Y/3	69	4	SS	2	30
Patients (N)	**Mean**	**Patients With Criteria Fulfilled (N)**			
2	52.5	2	2	2	N=2, Mean=32.5

Summary of data validated by Audit Nurse.

Table 59 is representative of data validated by the Audit Nurse employed by the Society to help implement the guideline, aid data collection and conduct extensive data validation. Of the 2 patients who received the drug:

- Both fulfilled the criteria for S.I.R.S. and Infection.
- 1 fulfilled the criteria for Organ Dysfunction.
- Both fulfilled the APACHE criteria. (The APACHE II score for Y/3 requires clarification is greater than 24).
- 1 fulfilled all of the criteria for use of the drug (50% of recipients).

Table 59. Unit Y, Validated assessments.

Recipient	S.I.R.S.	Infection	Organ Dysfunctions	APACHE II Score
Y/2	4	C	3	36
Y/3	4	SS	1	≥25 confirmation awaited
Patients (N)	**Patients With Criteria Fulfilled (N)**			
2	2	2	1	N=2, Mean ≈ 30

UNIT Z

Summary of data collected by Consultant.

Table 60 represents summary data collected by consultants for patients who received the drug in Unit Z. All of the patients had an assessment completed and all fulfilled the criteria for use of the drug.

Table 60. Unit Z, Consultants' assessments.

Recipient	Age (Y)	S.I.R.S.	Infection	Organ Dysfunctions	APACHE II Score
Z/1	49	4	C	5	25
Z/2	32	4	SS	3	28
Z/3	48	4	C	5	40
Patients (N)	**Mean**	**Patients With Criteria Fulfilled (N)**			
3	43	3	3	3	N=3, Mean = 31

Summary of data validated by Audit Nurse.

Table 61 is representative of data validated by the Audit Nurse employed by the Society to help implement the guideline, aid data collection and conduct extensive data validation.

- all 3 patients fulfilled the criteria for S.I.R.S., Infection and Organ Dysfunction.
- 2 patients fulfilled all of the criteria for use of the drug (67% of recipients).

Table 61. Unit Z, Validated assessments.

Recipient	S.I.R.S.	Infection	Organ Dysfunctions	APACHE II Score
Z/1	3	C	5	23
Z/2	4	SS	2	27
Z/3	4	C	5	43
Patients (N)	**Patients With Criteria Fulfilled (N)**			
3	3	3	3	N=2, Mean = 31

UNIT AA

Summary of data collected by Consultant.

An assessment was completed for S.I.R.S., Infection and Organ Dysfunction but not an APACHE II score. Table 62 represents summary data collected by a consultant for the patient who received the drug in Unit AA.

Table 62. Unit AA, Consultant's assessment.

Recipient	Age (Y)	S.I.R.S.	Infection	Organ Dysfunctions	APACHE II Score
AA/1	41	4	C	1	N/R
Patients (N)	**Mean**	**Patients With Criteria Fulfilled (N)**			
1	41	1	1	0	N/R

Summary of data validated by Audit Nurse.

Table 63 is representative of data validated by the Audit Nurse employed by the Society to help implement the guideline, aid data collection and conduct extensive data validation.

Data validation concurred that the SIRS and infection criteria were fulfilled but not organ dysfunction or APACHE II.

Table 63. Unit AA, Validated assessment.

Recipient	S.I.R.S.	Infection	Organ Dysfunctions	APACHE II Score
AA/1	4	C	1	16
Patients (N)	**Patients With Criteria Fulfilled (N)**			
1	1	1	0	Mean = 16

Conclusions.

93. Paper-based assessments have now been replaced by electronic assessments on the ICU audit software. The aim is to provide staff with a standard facility to determine if patients fulfil the criteria indicated in the Society's guideline prior to the administration of Drotrecogin alfa (activated). Thus aiding clinical decision-making, based on the best available evidence.

94. As mentioned previously, participation in this audit continues to be voluntary. Assessments should be completed prospectively by consultants when considering a patient for treatment. As the number of patients continues to be small, there is minimal additional work. There is great variation between units, but it is disappointing that assessments are being made on only just over half of patients receiving the drug. It has also been disappointing that the audit staff have had to rely on pharmacists informing them of drug use as much as from ICU staff. This makes the audit more difficult although we have managed to obtain data on most patients. The greater concern is that it is then difficult to determine whether or not the guidelines are being considered when deciding whether to prescribe.

95. By referring to the guidelines and including every patient in the audit at the time that we consider using the drug we demonstrate that we are using it responsibly. This benefits us collectively, and as individuals if our prescribing costs are queried. The intensive care community has been very fortunate to be able to develop and audit our own guidelines for a new and expensive drug.

96. The software will continue to have this facility once the period of implementation and validation ceases on 29th September 2003. Until then, the Audit Office should be contacted at the first available opportunity when patients are assessed. This enables prompt data validation.

97. This has been a good educational exercise to remind all staff about the rules of the APACHE scoring system.

D.7. Effect of socio-economic deprivation and intensive care mortality.

98. The effect of socio-economic deprivation has been demonstrated in many areas such as risk of myocardial infarction [27]. There is, however, little on its effect on the ICU population. The Scottish Intensive Care Society Audit Group is now in a position to investigate this further. A first, small audit was presented at the Annual Audit Meeting in November 2002. This looked at the effect of socio-economic deprivation category (DepCat) on ICU mortality. DepCat in Scotland is allocated by a person's postcode sector (i.e. G45 7) with 1 being the most affluent and 7 the most deprived [28].

99. The Information and Statistics Division of the NHS Scotland undertook to link all adult general ICU admissions from 01/01/1995 and 31/12/2000 to hospital activity episodes and Registrar General death records. All data were standardised for age and sex. From this a Standardised Mortality Rate by deprivation category could be calculated by comparing the expected and observed mortality for each category.

100. Over the six-year period there were 44,000 admissions to ICU. Patients' post-codes were not part of the minimum dataset when the audit began in 1995. They were only made so when the group highlighted the need to determine the distribution of deprivation across ICU admissions in comparison with general admissions to the same hospitals and the impact of deprivation on outcome. A DepCat score could be allocated for 33,337 case records. The SMR for these patients ranged from 0.968 for DepCat 1 to 1.32 for DepCat 7 (Table 64).

Table 64: Standardised mortality ratio by deprivation category.

	DepCat						
	1	**2**	**3**	**4**	**5**	**6**	**7**
Observed mortality (N)	282	760	1283	1683	1081	906	706
Expected mortality (N)	291	820	1451	1707	1079	821	532
SMR	**0.968**	**0.927**	**0.880**	**0.986**	**1.00**	**1.10**	**1.32**

101. Socio-economic deprivation appears to affect ICU mortality with a worsening mortality with worsening deprivation. Further work developing Kaplan-Meier curves looking at the longer-term survival of these patients is ongoing.

102. The current work has been presented as a poster at the 23rd International Symposium on Intensive Care and emergency Medicine, Brussels, March 18-21, 2003 [6]. It is also being prepared for submission to a leading journal.

103. Further reports will be forthcoming in the future as this data set is analysed further.

Malcolm G Booth
Consultant Anaesthetist
Glasgow Royal Infirmary

D.8. Audit of Sedative Use.

104. A few years ago, efforts were made by the Audit Group to involve pharmacists in providing a specialist view of drug use within Scottish ICUs. Unfortunately there was not a suitable grouping of pharmacists to do this at that time. Recently, such a group has been established. It is hoped that it will be able to contribute to SICSAG by raising potential areas for audit, provision and collection of data relating to drug use; to the preparation of treatment guidelines and monitoring adherence to them and possibly helping move towards standardisation of some aspects of drug use.

105. An initial meeting in the summer of 2002 produced a few possible ideas for joint projects, and it was agreed to pick one to use as a pilot to see if the approach would work. For this first project it was decided to look at a fairly narrow area where data should be easily available. An examination of different strategies for sedation of ventilated patients was, therefore, chosen.

106. Information was obtained from 8 units, 7 ICUs and 1 combined ICU/HDU. Expenditure figures were collected from each unit for sedatives, analgesics and neuro-muscular blocking agents (NMBAs) for the financial year 2001/2002. In practice this covered Morphine, Alfentanil, Remifentanil, Midazolam, Propofol and Haloperidol. Since these are all purchased on national agreements, expenditure can be compared between units in the knowledge that this relates directly to usage. The annual number of ventilated patient days and the total augmented care period days for each unit was obtained from the SICSAG database for 2000 (the latest available figures). Though the data collection periods differed, analysis of the SICSAG database showed that there was not much variation between years in the ventilation figures. It was, therefore, felt that a useful picture could be obtained, it not a scientifically exact one.

107. The total annual expenditure on analgesics, sedatives and NMBAs for the eight units is shown in Figure 31, while Figure 32 shows this figure as a percentage of total ICU drug expenditure for six of the eight units. It can be seen that there is a considerable variation in the amounts used between units, but that generally the

proportion of the total ICU expenditure is similar. The exception to this is hospital 3 who, at the time, were using pre-filled syringes of Propofol rather than the much less expensive vials. From the figures supplied, it seems that hospital 3 could have purchased sufficient volumetric infusion pumps and moved to using vials, and still made a saving.

Figure 31. Annual expenditure on sedatives and NMBAs: 2001/02.

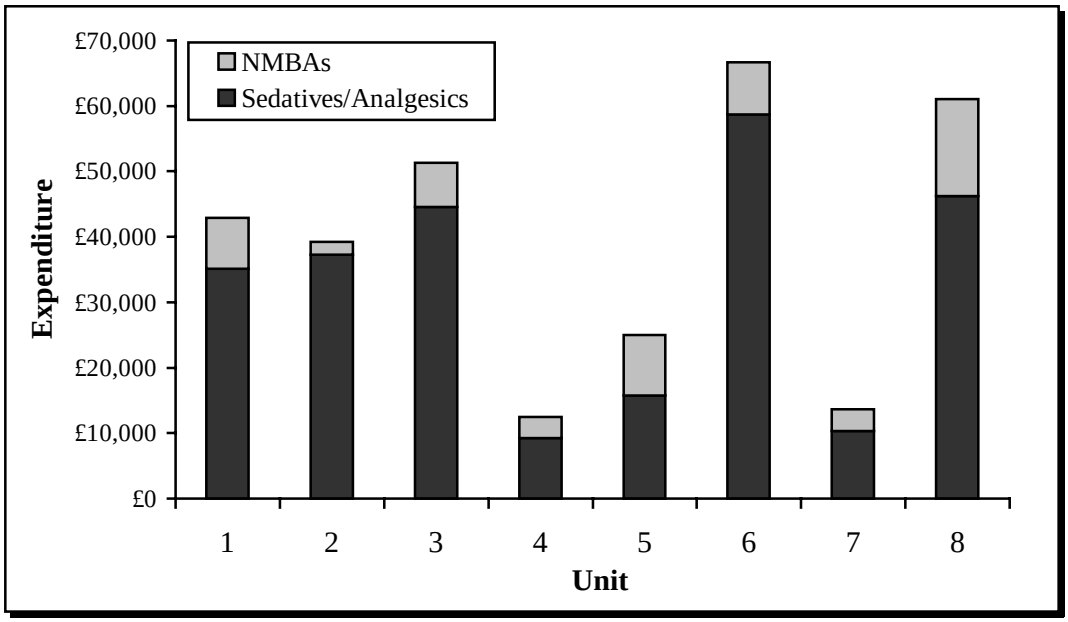
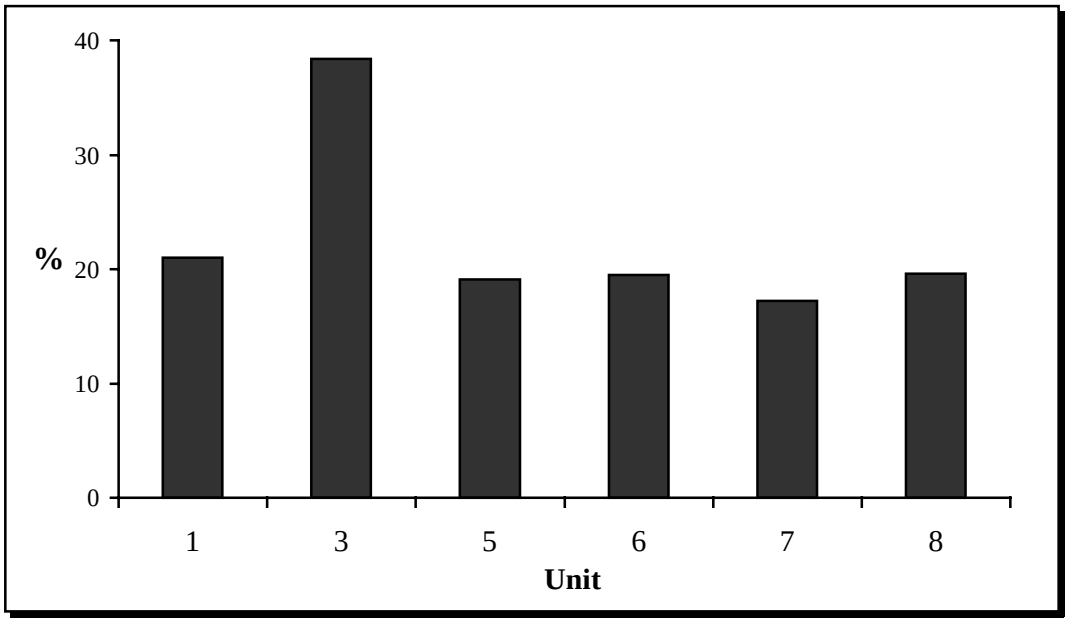
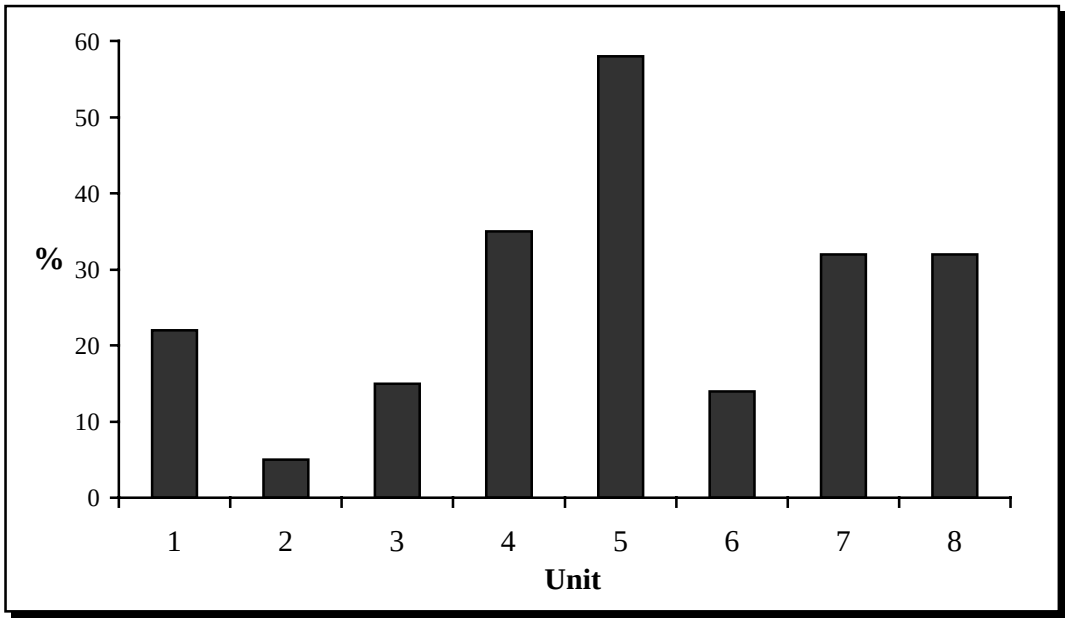


Figure 32. Sedatives and NMBAs as a percentage of ICU drug expenditure.



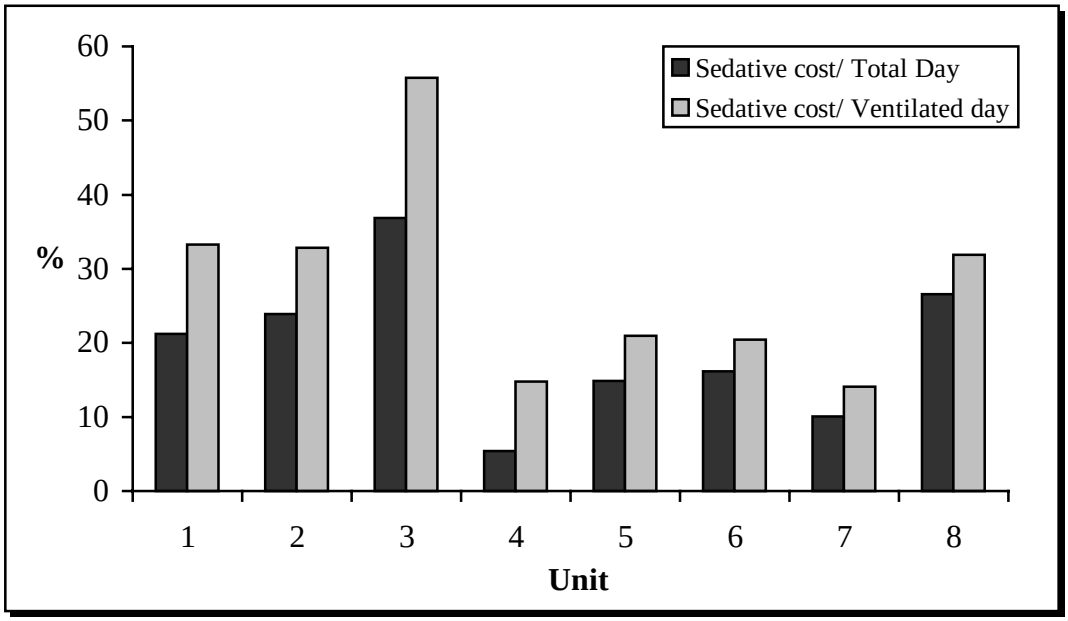
108. Figure 33 shows the ratio of expenditure of NMBAs to that for sedatives and analgesics. The range of results seems to indicate that there may be a wide variation in practices between units. If the level of NMBA use is standard, then some hospitals must use either a lot more sedatives and analgesics, or more expensive agents. Conversely, if sedative use is similar, some units must use a lot more NMBAs than others. It is particularly interesting to note that of the 8 units that supplied information, there are three cases where two of the units belong to the same Trust, and in each of these cases the ratios in the two units were considerably different

Figure 33. Ratio of expenditure of NMBAs:Sedatives.



109. With the exception of hospital 4, which has a combined ICU/HDU, the number of ventilated days as a percentage of the total ICU days was broadly similar across all units. The variation between units in the sedative cost per day is, therefore, quite striking (Figure 34). It could be argued that if the outcomes are similar, some units are spending an extra £20 per patient per day on sedation that could be put to better use.

Figure 34. Sedative costs per day.



110. Moves are currently afoot to repeat this exercise across all ICUs participating in SICSAG. If similar results are obtained there may be scope to make considerable resource savings across Scotland.

Alan Timmins
Principal Pharmacist – Clinical Services
Queen Margaret Hospital

D.9. Audit of all ICU admissions with a pregnancy-related diagnosis.

111. This audit was prompted by a request from Greater Glasgow NHS Board to provide information on obstetric patients who required admission to ICU, as part of its current review of obstetric services. The specific question, which the data attempts to address, relates to the value of an on-site adult intensive care service to support a major obstetric unit. In the analyses reported in this section, for the period 1999 – 2001, we have included information on all obstetric patients whether or not the acute illness developed around the time of delivery.

112. At the Annual Meeting held in October 2001 [29], Dr Young reported the incidence, severity of illness and outcomes for obstetric patients admitted to ICU as a consequence of pre-eclampsia and its complications. The methodology employed in that retrospective audit encompassed searching for APACHE diagnoses of eclampsia/pre-eclampsia in all admissions during the 5-year period 1995-99. In each of these consecutive years, 16, 16, 19, 12 and 21 admissions were identified respectively. Table 65 summarises the data. On average, severity of illness was not high, however, there was a significant mortality probability at 20%. Two deaths occurred in 1999, a third in 1998 (3.6% hospital mortality).

Table 65: Audit of admissions with an APACHE diagnosis of Pre-eclampsia during 1995-1999.

		1995-1999
Pre-eclampsia 1995-1999 (APACHE diagnosis only)	**Episodes (n)** ***(%)***	84 *(0.23)*
	Mean Age (y)	27.2
	Median Age (y)	28
	Age Range (y)	15 - 40
	Mortality Probability (%)	20
	APACHE Score	11.2
	Mean LOS (d)	2.27
	Median LOS (d)	1
	LOS Range (d)	0.2 - 33.1
	Unit Mortality (n)	3
	Hospital Mortality (n)	3

113. That review was limited by the exclusive use of APACHE diagnostic categories. The problem of identifying patients in our database with more specific diagnoses was identified several years ago. A working group was, therefore, set up to develop a more meaningful diagnostic list. This enables staff to record the diagnoses which led to a) hospital admission, b) ICU admission and c) up to 6 other co-existing diagnoses. For all ICU admissions since 1999, it has been mandatory that the diagnoses leading to both the hospital admission and the ICU admission be recorded.

114. For this current review of the period 1999, 2000 and 2001, the search procedure consisted of the following:

Any ICU diagnosis OR Primary diagnosis (HOSPITAL) equals:

- Amniotic fluid embolism, or
- Co-existing pregnancy, or
- Ectopic pregnancy, or
- Other obstetric problem, or
- Post-partum haemorrhage, or
- Toxaemia/PIH/Eclampsia/pre-eclampsia,

Or APACHE diagnosis equals:

- 221. Septic abortion, or 222. Pre-eclampsia/eclampsia

115. The search of the database revealed 182 out of 24,600 ICU episodes (0.74% of all ICU admissions) during the 3-year period. Table 66 provides summary characteristics of these admissions. This is a greater proportion of ICU admissions than that in the previous audit (Table 65) due to the availability of additional diagnostic fields and this audit not exclusively reviewing eclampsia/pre-eclampsia.

Table 66: All pregnancy-associated hospital or ICU diagnoses.

		1999	2000	2001
ALL Diagnostic Codes	**Episodes (n)** ***(%)***	45***** *(0.57)*	65***** *(0.80)*	72***** *(0.83)*
	Mean Age (y)	29.9	30.5	29.1
	Median Age (y)	31	31	29
	Age Range (y)	17-41	17-40	16-41
	Mortality Probability (%)	19.9	16.5	14.1
	APACHE Score	11.9	10.6	9.1
	Mean LOS (d)	2.76	1.3	2.5
	Median LOS (d)	1.85	0.9	1.2
	LOS Range (d)	0.1 to 23.3	0 to 7.7	0 to 44.2
	Unit Mortality (n)	2	2	1
	Hospital Mortality (n)	2	2	1

***** In total these figures include 8 episodes for 4 patients who were readmitted to ICU or transferred to another ICU during the same hospital episode. The breakdown is as follows:

- 1999: 2 episodes for 1 patient. Diagnostic codes for both of 2. Post-partum haemorrhage.
- 2000 & 2001: 1 episode in each year for 1 patient, originally admitted 2000 and readmitted 2001. Diagnostic code of 3. Amniotic Fluid Embolus.
- 2001: 2 episodes for 1 patient. Diagnostic codes for both of 1. Pre-Eclampsia.
- 2001: 2 episodes for 1 patient. Diagnostic codes for both of 2. Post-partum haemorrhage.

This represents an insignificant level of double counting.

116. The average annual admission rate for the three-year period was 60 *per annum*. This includes septic abortion and ectopic pregnancy, which together average 6 admissions per annum. Given that the number of births for these three years was approximately 50,000 [30], we can estimate that one ICU admission can be expected for every thousand deliveries. This concurs with the ratio quoted in the recent report from the Expert Group on Acute Maternity Services [31].

117. The APACHE II scores are lower than that of the general ICU population. This results from the absence of points generated by age and co-morbidity and consequently these points will equate to the acute physiology score. Nonetheless, predicted mortality is again significant at approximately 17% overall. This compares with an observed hospital mortality of only 2.7%. Clearly the APACHE II model consistently overestimates mortality. In particular these data emphasise that when a critically ill obstetric patient reaches an intensive care unit, there is a very high likelihood of survival.

118. For each record there were potentially nine diagnoses recorded: an APACHE Diagnosis, the Primary Hospital Diagnosis, the Primary ICU Diagnosis and up to six Other ICU Diagnoses. These were reviewed and each record assigned to one of the nine diagnoses listed :

1. Pre-Eclamspia
2. Post-partum Haemorrhage
3. Amniotic Fluid Embolus
4. Subarachnoid Haemorrhage
5. Other Obstetric Problem
6. Septic Abortion
7. Ectopic Pregnancy
8. Co-existing Pregnancy
9. Pulmonary Thrombo-Embolism

119. Summary data on each of these categories are given in Tables 67 to 75. Pre-eclampsia (and its complications) was the single most common cause for ICU admission (Table 67), followed by post partum haemorrhage (Table 68).

120. In comparison with the earlier audit, only an additional 2 admissions were identified for 1999 with pre-eclampsia using this modified diagnostic search (N=23). The severity of illness and outcomes are similar. Both deaths occurring in 1999 accounted for 66.7% of deaths in the 1995-99 audit. Consequently, for the 7-year period 1995 to 2001 the total number of eclampsia/pre-eclampsia admissions was 131, with a mortality of 2.29% (N=3).

121. The third largest group of patients were a mixed bag which included inter-current illness occurring in a pregnant patient or patients in whom a definitive diagnosis could not be determined from the patient audit record.

Table 67: Pre-eclampsia.

		1999	2000	2001
1. Pre-Eclamspia	Episodes (n)	23	20	25
	Mean Age (y)	27.3	30.45	28.7
	Median Age (y)	28	31.5	29
	Age Range (y)	17-40	18-39	17-41
	Mortality Probability (%)	25.1	16.3	11.7
	APACHE Score	13.2	9.9	8.0
	Mean LOS (d)	1.5	1.12	1.9
	Median LOS (d)	1	0.85	1.5
	LOS Range (d)	0.1 to 9.9	0.3 to 4.6	0.3 to 6.9
	Unit Mortality (n)	2	0	0
	Hospital Mortality (n)	2	0	0

Table 68: Post-partum haemorrhage.

		1999	2000	2001
2. Post-partum Haemorrhage	N	12	12	23
	Mean Age (y)	32.3	30.8	30.0
	Median Age (y)	32	31.5	30
	Age Range (y)	27-39	19-39	19-33
	Mortality Probability (%)	11.2	14.7	16.4
	APACHE Score	8.8	10.1	10.0
	Mean LOS (d)	2.9	1.3	2.2
	Median LOS (d)	1.0	0.95	1.3
	LOS Range (d)	0.2 to 16.3	0 to 4.9	0 to 14.4
	Unit Mortality (n)	0	0	0
	Hospital Mortality (n)	0	0	0

122. The confidential enquiry into maternal deaths for 1997-99 [31] observed that the mortality from amniotic fluid embolism had reduced by half compared with the previous report. The reasons for this reduction were stated to be “not clear” however the report notes that “some women are now surviving this previously fatal condition”. This is supported out by our data where all 3 patients admitted to ICU with this condition survived (Table 69).

Table 69: Amniotic fluid embolus.

		1999	2000	2001
3. Amniotic Fluid Embolus	N		3	
	Mean Age (y)		24.3	
	Median Age (y)		17	
	Age Range (y)		17-39	
	Mortality Probability (%)		11.7	
	APACHE Score		12	
	Mean LOS (d)		2	
	Median LOS (d)		1.8	
	LOS Range (d)		1.3 to 2.9	
	Unit Mortality (n)		0	
	Hospital Mortality (n)		0	

Table 70: Subarachnoid haemorrhage.

		1999	2000	2001
4. Subarachnoid Haemorrhage	N	1		
	Mean Age (y)	41		
	Median Age (y)	41		
	Age Range (y)	41		
	Mortality Probability (%)	20.3		
	APACHE Score	16		
	Mean LOS (d)	23.3		
	Median LOS (d)	23.3		
	LOS Range (d)	23.3		
	Unit Mortality (n)	0		
	Hospital Mortality (n)	0		

Table 71: Other obstetric problem.

		1999	2000	2001
5. Other Obstetric Problem	N	2	12	12
	Mean Age (y)	30.5	30.3	28.1
	Median Age (y)	30.5	29.5	28.5
	Age Range (y)	29-32	19-38	19-36
	Mortality Probability (%)	11.2	12.4	12.8
	APACHE Score	9	9.8	8.7
	Mean LOS (d)	0.5	0.9	0.9
	Median LOS (d)	0.5	0.8	0.8
	LOS Range (d)	0.4 to 0.6	0.1 to 1.9	0.5 to 2
	Unit Mortality (n)	0	0	0
	Hospital Mortality (n)	0	0	0

Table 72: Septic abortion.

		1999	2000	2001
6. Septic Abortion	N	2	3	1
	Mean Age (y)	23.5	35.7	32
	Median Age (y)	23.5	38	32
	Age Range (y)	19-28	31-38	32
	Mortality Probability (%)	39.15	40.0	21.5
	APACHE Score	17.5	17.7	12
	Mean LOS (d)	5.1	2.2	1.7
	Median LOS (d)	5.1	2.1	1.7
	LOS Range (d)	1.8 to 8.4	1.9 to 2.6	1.7
	Unit Mortality (n)	0	0	0
	Hospital Mortality (n)	0	0	0

Table 73: Ectopic pregnancy.

		1999	2000	2001
7. Ectopic Pregnancy	N	2	8	4
	Mean Age (y)	36	30.6	32.5
	Median Age (y)	36	29.5	33.5
	Age Range (y)	34-38	26-32	26-37
	Mortality Probability (%)	12.4	16.3	3.5
	APACHE Score	12	9.4	3.3
	Mean LOS (d)	0.6	1.6	1.1
	Median LOS (d)	0.6	1.2	1
	LOS Range (d)	0.4 to 0.7	0.2 to 3.5	0.9 to 1.4
	Unit Mortality (n)	0	1	0
	Hospital Mortality (n)	0	1	0

Table 74: Co-existing pregnancy.

		1999	2000	2001
8. Co-existing Pregnancy	N	3	7	5
	Mean Age (y)	36	30.6	25
	Median Age (y)	36	27	27
	Age Range (y)	32-40	24-40	16-33
	Mortality Probability (%)	12.2	18.6	27.5
	APACHE Score	10	11.9	11.9
	Mean LOS (d)	6.3	1.7	1.7
	Median LOS (d)	1.2	0.7	0.7
	LOS Range (d)	0.2 to 17.5	0.2 to 7.7	0.2 to 7.7
	Unit Mortality (n)	0	1	0
	Hospital Mortality (n)	0	1	0

123. The ICU workload generated, even by level 3 maternity units, will be relatively low, with most intensive care units seeing fewer than 5 such patients per annum. The profile of diagnoses responsible for admission is similar to those diagnoses identified as being responsible for maternal mortality. The exception, not surprisingly, is pulmonary thrombo-embolism, which although accounting for 33% of all direct maternal deaths [31], was responsible for only two admissions to ICU in our audit (Table 75).

Table 75: Pulmonary thrombo-emobolism.

		1999	2000	2001
9. Pulmonary Thrombo Embolism	N			2
	Mean Age (y)			31
	Median Age (y)			31
	Age Range (y)			27-35
	Mortality Probability (%)			9.3
	APACHE Score			11
	Mean LOS (d)			0.9
	Median LOS (d)			0.9
	LOS Range (d)			0.7 to 1
	Unit Mortality (n)			1
	Hospital Mortality (n)			1

J C Howie

Victoria Infirmary, Glasgow

E. ADDITIONAL ASPECTS OF THE AUDIT.

E.1. Data Protection.

124. In response to queries form some units, the position of the audit with regard to the Data Protection Act has been investigated. This has involved discussions with many Caldicott guardians and the Privacy Advisory Committee. A position statement is presented below, but in summary:

- We are complying with the principles of the act
- We do not require to seek consent
- We should make patients/relatives aware of the audit and the right to opt out.
- If you feel that opting out might hinder a patient's care then you may make this clear.
- If an individual opts out, anonymised data can still be held, as there is no right of opt out here.

POSITION STATEMENT

125. Summary. This paper has been prepared in response to questions about whether the SICS audit complies with the Data Protection Act. It should be noted that this is to some extent a matter of interpretation but this paper is based on advice from several Caldicott guardians, members of the Confidentiality and Security Advisory Group for Scotland (CSAGS) and the report from that group [32]. In summary:

- The SICS audit can continue as at present except that we must make efforts locally to ensure that patients (or their relatives) are informed that their data will be used unless they specifically object. This meets the requirements for implied consent. Explicit consent is not required
- The audit already complies with the principles that personal data stored, and access to it, should be limited to the minimum required.

126. Introduction. The SICS central database is registered under the Data Protection Act. The staff responsible for the database in each hospital/Trust/unit should ensure that the local database is also registered. The overriding principle is that we should behave in a responsible manner and respect the principles of the Act. Essentially this means respecting the perspective of patients about their personal data. While patients differ, the implications of law are that only necessary data should be stored, that patients should be aware of its use and that it should be handled securely. The CSAGS report recognises the importance of information derived from patient records. It says

- Data should be anonymised if possible
- If identifying (i.e. personal) data is necessary, informed consent is best practice
- Implied consent is acceptable for operational management within NHS Scotland including planning, managing and auditing.

127. Anonymised data. It is almost impossible to completely anonymise data. Data are considered to be acceptably anonymised however if identifying details such as name, address, date of birth and full post code are removed, even if there remains a theoretical risk that an individual could be identified. Patients have no right of control over the use of anonymised data but do have a right to know that their information will be anonymised and used.

128. Justification for using identifiable data. If data were anonymised then it would not be possible to link to ISD or episodes in other units. As this has been a long established and valuable part of the SICS audit identifying data is required and is acceptable under the act.

129. Explicit consent. Informed consent is not required in order to use identifying data for audit within the NHS. Whilst it might be the ideal, it is clearly impractical. Explicit, informed consent is required if this data is to be used for research or teaching, or if it is to be shared with external agencies.

130. Implied consent. The SICS audit can continue with implied consent provided generic information is given. Consent can be assumed but refusals must be acted upon. Anonymisation would seem a reasonable response, as indicated above. I suggest that acceptable anonymisation could be achieved by: change name to 'anon', DoB to '01/01/year', hospital number to something and postcode to XX1 XX1. Please tell the audit office.

131. It is clear that any significant opting out would make the audit ineffective. If opting out may affect the care of an individual patient or a group, this may be pointed out to the patient.

132. Although hospital information leaflets generally inform patients that their data will be recorded electronically (e.g. on Patient Administration Systems) it would seem sensible to include mention of the SICS audit in ICU information booklets and possibly on notice boards. A suggested form of words might be:

"*This ICU (or HDU) participates in a national audit system in co-operation with other units in Scotland. Information about your or your relative's illness and its treatment in this ward is stored on computer. The information from large numbers of patients is used to produce summaries which help us monitor and improve our performance (audit) and plan our services. The care you are receiving is the result, in part, of the use of information from previous patients. All information is handled in a confidential manner and details of individual patients are never made public. We very much hope that you will allow us to store this limited information but if you would prefer us not to do so please ask to speak to (……..).*"

133. Practical points. Implied consent is acceptable for the SICS audit. To make this acceptable, information must be available so that:

- Patients are aware of this use
- Local clinicians can interrogate their local database
- Local clinicians cannot interrogate the national database or that in another hospital
- Access to the national database should be restricted to the smallest number of people, which means the central office staff.
- Data must be transmitted to the central database in a secure manner.
- Any information published from the database should be anonymised.

134. Research or audit? It can sometimes be difficult to decide whether a particular project is audit or research. The basis of the project is clearly audit, but there are obvious possibilities for research. Any testing of a new hypothesis or treatment is clearly research and identification of patients for such studies from the database would itself be research. A descriptive report of a condition would be audit. Research using, or linking to, data collected under implied consent requires ethics committee and Caldicott guardian approval. It seems clear that the SICS database could not be used to identify patients for external research studies without seeking consent from all patients on it for their entry to be searched. It might be that the Ethics Committee would allow internal research but clearly we would have to seek permission.

135. Anonymisation. We will need to review periodically whether greater anonymisation is practical. There are likely to be developments in this area.

Simon J Mackenzie
Lead Audit Clinician
Scottish Intensive Care Society Audit Group

E.2. Remit of Critical Care Delivery Groups following *Better Critical Care*.

136. *Better Critical Care* was published by the Scottish Executive Health Department in July 2000 [11]. One of the suggestions in Sir David Carter's report was for Trusts to establish Critical Care Delivery Groups which were to be multidisciplinary, consisting of medical and allied health professionals and senior managers.

137. The Groups were to co-ordinate an "integrated and flexible" provision of critical care services (Level 1 - 3) in their respective Trusts. The Groups' mandate was to co-ordinate critical care strategy, develop a series of guidelines on best ICU/HDU practice, develop escalation policies (winter planning), define a hospital's maximal capacity for expansion at times of peak demand, encourage a single nursing administration for critical care areas and a single nursing pool, co-ordinate the equipping of critical care areas (monitoring, *etc*.) and undertake a needs assessment for individual Trusts.

138. The Society's Council asked me to convene a meeting of all CCDG Chairs, which duly happened on 8th November 2002 at St John's Hospital, Livingston. Since then we have had two other meetings – 16th December 2002 at the Western General Hospital, Edinburgh and 7th April 2003 at Perth Royal Infirmary. From our first meeting it became clear that the vast majority of Acute Trusts (all Health Boards other than Orkney have been represented) had established multidisciplinary CCDGs, the majority, however, are chaired by anaesthetists. The CCDGs are active, having achieved a number of the recommendations in *Better Critical Care*.

139. Topics discussed to date at the CCDG Chairs' meetings have been: the composition of the various CCDGs, the achievement of the various CCDGs and outstanding issues such as outreach, transport of the critically ill, critical care services strategy and Level 2 provision.

140. Common issues identified across Scotland:

- Lack of central resources to back up *Better Critical Care*.
- Under-provision of medical Level 2 beds provision.
- Outreach not a priority for many CCDGs at the moment.
- Requirement of adequate resourcing of critical care services in a number of Trusts (not just winter planning).

CCDG Chairs:

Argyll & Clyde	Dr Jeff Douglas/Dr Duncan Thomson
Ayrshire & Arran	Dr Paul Wilson
Borders	Dr Nigel Leary
Dumfries & Galloway	Dr Bryce Watson
Fife	Dr Paul Nicholas
Forth Valley	Dr Mark Worsley
Grampian	Dr Liz Robertson
Greater Glasgow North	Dr John Kinsella
Greater Glasgow South	Dr Cameron Howie
Highland	Dr Ian Skipsey
Lanarkshire	Ms Rosemary Lyness
Lothian University Hospitals Trust	Ms Isabel McCallum
Shetland	Dr Russell Garrity
Tayside	Dr John Colvin
Western Isles	Dr Andrew Hothersall
West Lothian	Dr Mike Fried

Dr M Fried
Honorary Treasurer
Scottish Intensive Care Society

E.3. Scottish Intensive Care Society Evidence-based Medicine Group Report.

141. The last twelve months have seen a lot of progress within the Evidence-Based Medicine (EBM) Group. The second annual meeting was held at the Stirling Royal Infirmary, Education & Conference Centre in January 2003. Sixteen delegates attended, many of whom have now contributed substantially to the work of the Group.

142. The Group website was launched in February this year (accessible from www.scottishintensivecareorg.uk or www.sicsebm.org.uk). The purpose of the site is to provide the Scottish intensive care community with an easily accessible EBM resource and a medium for the Group to publish its work. The site contains a wide range of EBM material as well as reviews of several intensive care topics that should be of interest to EBM novices as well as experts.

143. Since its launch, the site has proved to be very popular with nearly 3,000 visitors from all around the world. For the technically minded this equates to 11,559 page view hits, 6472 sessions and 4,020 hours spent browsing the site.

144. Currently the Group is reviewing the following:

Topic	Sub-group Team leader
ARDS: proning & nitric oxide	Brian Cuthbertson
Infection prevention	David Swann
Non-invasive ventilation	Egbert Pravinkumar
Nutrition	Gill Harris
Renal replacement therapy	Stephen Digby
Therapeutic hypothermia	Chris Cairns

145. We hope to have all of these reviews completed by early 2004. The results will be discussed at the next EBM meeting (March 2004) and published on the website in due course.

Chris Cairns
Specialist Registrar, ICU.

E.4. Scottish Intensive Care Society Research Group Report.

146. Following the development of multi-centre research group within the SICS, a number of developments have moved intensive care research in Scotland forward. This has been a busy year for the research group. In January, I was elected to take over the Chair of the group from John Kinsella. Thanks are due to John, who initiated the group and laid down the principles of openness and transparency that are essential in developing successful collaborative work.

147. After discussion with members of council it was agreed that the next phase of development for collaborative, high quality research in Scottish Intensive Care was to develop a more formal trials group. As a result I invited Brian Cuthbertson (Aberdeen), Steve Cole (Dundee), and Sandy Binning (Glasgow) to form an executive committee to move this project forward. In doing so there is always the risk of other individuals feeling excluded or sidelined. We therefore made it a priority to draw up a Constitution for the group that clearly stated its aims and suggested *modus operandi*. This has been drafted and presented to council who have accepted its principles. We now have a Scottish Critical Care Trials Group (SCCTG). The constitution is published on the website, which will have been launched by the time you read this. You can access the website directly from www.scottishintensivecare.org.uk or www.scctg.org.uk.

148. It was our belief that this group should not control or dictate research carried out in Scottish Intensive Care, but support and encourage it. We do not, therefore, intend to canvas priorities from members or determine National research questions. In addition, we have tried to write a clear constitution that will prevent the group becoming either exclusive or inflexible. Your comments are very welcome. Our model is more akin to the Canadian Critical Care Trials Group, who offer experienced and detailed critique of ideas, support in developing those that are pursued, and is ultimately a widely recognised Brand name at the end of an authorship list that represents high quality. We have a long way to go to catch up with our colleagues in Canada and more recently Australasia, but the size and cohesiveness of the Scottish

Intensive Care community, held together through the SICS and the SICSAG, surely offer us a great opportunity.

149. The SCCTG therefore proposes to hold two meetings each year. The first will be in June (but in September this year to launch the group) and the second will continue the success of the research day at the annual meeting in January. We have generated a research proforma, based largely on MRC guidelines, which can be used as a template to formulate ideas and will act as a basis for group assessment of proposals/ideas. We suggest individuals/groups use this before presenting to the group at the June meeting. We hope that this meeting will turn in to a constructive forum for brainstorming of new and ongoing projects. We also hope to invite guests to this meeting to lend expertise in designing the right studies and obtaining funding. At the January meeting there will be research updates, trainee presentations, and guest speakers. Abstracts will now be published for the first time in the Scottish Medical Journal.

150. The executive committee is there to organise the SCCTG, not the studies themselves. We are establishing a "Trial Office" in the New Edinburgh Royal Infirmary, which will develop clear Research Governance and Good Clinical Practice protocols. This will hopefully help others get through the ever-increasing red tape associated with Clinical Research and avoid duplication. We will also with time have access to office equipment, research-specific software packages, pre-paid postage and maybe even secretarial support. To this end SICS council have agreed to fund Fiona McArdle, research co-ordinator at the New Edinburgh Royal Infirmary to start this process part-time (0.5 days per week). If we develop National projects we hope that the study steering groups will work closely with the executive committee and use this office.

151. The SCCTG cannot fund research itself. We hope that individuals/groups applying through Universities/Trusts for grants will use the SCCTG in those applications. If we do this, the SCCTG will acquire a standing that may strengthen such applications in the future. In the meantime, we are creating a Company Limited

By Guarantee (called the SCCTG), which can independently manage sponsorship funding without attracting additional costs. This facility can be used by any SICS member with the guarantee that their funds will be managed by professional accountants at the expense of the SCCTG.

152. All that we need now is enthusiasts and "flagship" projects that we can get funded! These can be multi-centre studies or trials, but single centre work may be equally important. We look forward to your ideas and support.

Tim Walsh
Chair, Scottish Critical Care Trials Group

E.5. Surveillance of hospital acquired infections, antimicotic prescribing and resistance in ICUs in Scotland.

153. In the 2002 Annual Report proposals to develop surveillance of hospital acquired infections (HAI), antibiotic prescribing and resistance in intensive care units in Scotland were described [1]. Considerable discussion has taken place between the Scottish Surveillance of Healthcare Associated Infection Programme team, microbiologists, infection control nurses, intensivists and SICSAG about the best way to progress this project. These discussions led to a consensus that the most appropriate way to make progress was to undertake a pilot of surveillance of HAI using a paper-based approach. It was agreed that this pilot would be undertaken in two ICUs in Glasgow. These pilots would examine the feasibility of data collection and the workload involved.

154. The pilot undertaken in early 2003 involved a two-month period of data collection in each of the two units. Data were collected on the incidence of bacteraemia, pneumonia and other lower respiratory tract infection and urinary tract infections. The data are currently being analysed.

155. There is not yet a consensus among representatives of the interested units as to the best way to proceed from here and further discussion is required before a decision can be taken to develop Ward Watcher software to include data for surveillance of HAI and antimicrobial resistance. This needs to be approached with care. Obviously there will have to be a consensus that this is a useful development and clarity is required with respect to exactly what data items are to be incorporated and their definitions. A methodology for the collection of data on antibiotic prescribing is yet to be developed.

156. The Hospitals in Europe Link for Infection Control through Surveillance (HELICS) has been funded by the EU to develop a network of surveillance of HAI. The projects planned include surveillance of HAI in ICUs. More than 20 European countries have been involved in the discussions and several of these will contribute data on HAI in ICUs. A protocol has been prepared and data transmission from participants to the HELICS Centre in Lyon, France will take place during 2004.

157. At the most recent meeting of the Scottish working group, at the Scottish Centre of Infection and Environmental Health, Carl Suetens from the Scientific Institute of Public Health in Brussels, presented the HELICS dataset. With the majority of the minimum dataset already recorded routinely as part of the SICS audit, the HELICS dataset was less daunting than had been anticipated by the group. Malcolm Booth is currently reviewing both the HELICS dataset and the SICS dataset to generate a list of the additional fields required for compatibility with HELICS. Carl has been invited to present the HELICS study at the forthcoming Annual Audit Meeting.

Dr Ahilya Noone, on behalf of the Project Development Group,
Consultant Epidemiologist
Scottish Centre for Infection and Environmental Health

F. ACKNOWLEDGEMENTS.

The Scottish Intensive Care Society Audit Group would like to thank the following:

- Medical and nursing staff who are responsible for data entry in addition to their routine duties.

- The Clinical Resource and Audit Group for financial support provided from 1994 - 2002.

- Annette Little and Karen Lorenzetti, Information Services, NHS Greater Glasgow.

- Kevin McInneny and Mike Muirhead, Information & Statistics Division, NHS Scotland.

- All IT staff who maintain network communications enabling the *e*Bed Bureau to function.

- Brian Millar, Critical Care Audit Ltd., Yorkshire.

G. REFERENCES.

1. Scottish Intensive Care Society Audit Group, *Annual Report 2002*, Scottish Intensive Care Society Audit Group, 2002.
   Available at: http://www.scottishintensivecare.org.uk.
2. Scottish Intensive Care Society *Newsletter 2003*. SICS
   Available at: http://www.scottishintensivecare.org.uk.
3. Bernard GR, Vincent J-L, Laterre P-F *et al.* Efficacy and safety of recombinant human activated protein C for severe sepsis. *New England Journal of Medicine* 2001; **344**:699-709.
4. Available at: http:// www.fda.gov
5. MacKirdy F, Harris G, Mackenzie SJ. The epidemiology of sepsis in Scottish Intensive Care Units. *Critical Care* 2003; **7**(S2):P027.
6. Booth M, Murray S, Plenderleith L, Howie C, MacKirdy F. Effect of socioeconomic deprivation on intensive care mortality. *Critical Care* 2003; **7**(S2):P233.
7. Mayor S. Encouraging findings in sepsis and percutaneous tracheostomy complications. *British Journal of Intensive Care* 2003; **13**(2):68-9.
8. Daniel M, Stuart P, MacKirdy F, Norrie. How good are ICU doctors at predicting hospital outcome? *European Journal of Anaesthiology* 2003; **20**(S30):A608.
9. Hughes M, MacKirdy FN, Ross J, Norrie J, Grant IS. ARDS. Acute respiratory distress syndrome: an audit of incidence and outcome in Scottish intensive care units. *Anaesthesia* In press.
10. Scottish Intensive Care Society Audit Group, *The Implementation of Audit in High Dependency Units in Scotland*, Scottish Intensive Care Society Audit Group, 2002. Available at: http://www.scottishintensivecare.org.uk.
11. Scottish Executive Health Department. *Better Critical Care – Report of a Short-Life Working Group on ICU and HDU issues.* Scottish Executive Health Department, 2000.
12. Scottish Intensive Care Society Audit Group, *Annual Report 1999*, Scottish Intensive Care Society Audit Group, 2000.
    Available at: http://www.scottishintensivecare.org.uk.

13. Keene AR. Cullen DJ. Therapeutic Intervention Scoring System: update 1983. *Critical Care Medicine* 1983; **11**(1):1-3.
14. Knaus WA, Wagner DP, Draper EA, *et al*. The APACHE III prognostic system. Risk prediction of hospital mortality for critically ill hospitalized adults. *Chest* 1991; **100**:1619-36.
15. Noble JS, MacKirdy FN, Donaldson SI, Howie JC. Renal and respiratory failure in Scottish ICUs. *Anaesthesia* 2001; **56**:24-129.
16. Department of Health. *Guidelines on admission to and discharge from intensive care and high dependency units*. London: HMSO, 1996.
17. Hughes M, MacKirdy FN, Norrie J, Grant IS. Outcome of long-stay intensive care patients. *Intensive Care Medicine* 2001; **27**:779-82.
18. Knaus WA, Draper EA, Wagner DP, Zimmerman JE. APACHE II: a severity of disease classification system. *Critical Care Medicine* 1985; **13**(10):818-29.
19. Livingston BM, Mackenzie SJ, MacKirdy FN, Howie JC. Should the pre-sedation GCS value be used when calculating APACHE scores for sedated patients. *Critical Care Medicine* 2000; **28**:389-94.
20. LeGall J-R, Lemeshow S, Saulnier F. A new Simplified Acute Physiology Score (SAPS II) based on a European/North American multicenter study. *Journal of the American Medical Association* 1993; **270**:2957-63.
21. Lemeshow S, Teres D, Klar J, Avrunin J, Gehibach H, Rapoport J. Mortality Probability Models (MPM II) based on an international cohort of intensive care unit patients. *Journal of the American Medical Association* 1993; **270**:2478-86.
22. Tunnell RD, Millar BW, Smith GB. The Effect of Lead Time Bias on Severity of Illness Scoring, Mortality Prediction and Standardised Mortality Ration in Intensive Care – a PILOT study. *Anaesthesia*, 1998; **53**:1045-53.
23. Livingston BM, MacKirdy FN, Howie JC, Jones R, Norrie JD. Assessment of the performance of five intensive care scoring models within a large Scottish database. *Critical Care Medicine* 2000; **28**:1820-27.
24. Mackenzie SJ, Kendrick S, Howie JC. *Current Opinion in Critical Care* 2000; **6**:181-6.
25. Mohammed MA, Cheng KK, Rouse A, Marshall T. Bristol, Shipman and clinical governance: Shewhart's forgotten lessons. *Lancet* 2001; **357**:463-67.

26. Padkin A, Goldfrad C, Brady AR, Young D, Black N, Rowan K. Epidemiology of severe sepsis occurring in the first 24 hrs in intensive care units in England, Wales, and Northern Ireland. *Critical Care Medicine* 2003; **31**:2332-38.
27. Macintyre K, Stewart S, Chalmers J *et al*. Relation between socio-economic deprivation and death from first myocardial infarction in Scotland: a population based analysis. *British Medical Journal* 2001; **322**:1152-1153.
28. Carstairs V and Russell M. *Deprivation and health in Scotland*. Aberdeen University Press, 1991.
29. Scottish Intensive Care Society *Newsletter 2002*. SICS
Available at: http://www.scottishintensivecare.org.uk.
30. Scottish Executive Health Department. *Expert Group on Acute Maternity Services Reference Report*. Edinburgh: Scottish Executive Health Department, 2003.
Available at: http://www.show.scot.nhs.uk/sehd/publications/egas/egas.pdf.
31. Confidential Enquiries into Maternal Deaths. *Why Mothers Die: Report of Confidential enquiries into Maternal Deaths in the U.K.* 1997-99. London: RCOG Press 2002. Available at: http://www.cemach.org.uk.
32. Confidentiality and Security Advisory Group for Scotland. *Protecting patient confidentiality - final report.* Edinburgh: Scottish Executive Health Department, 2002. www.show.scot.nhs.uk/sehd/publications/ppcr/ppcr.pdf

Appendix I. List of Scottish adult ICUs and the lead audit consultants during the period of reporting.

Unit ID	Intensive Care Unit	Lead Audit Consultant
ARI	Aberdeen Royal Infirmary	Dr G Adey
Ayr	Ayr Hospital	Dr I Taylor
BGH	Borders General Hospital, Melrose	Dr NP Leary
CH	Crosshouse Hospital	Dr R White
DGRI	Dumfries & Galloway Royal Infirmary	Dr D Williams
FDRI	Falkirk & District Royal Infirmary	Dr H Robb
GRI	Glasgow Royal Infirmary	Dr MG Booth
HM	Hairmyres Hospital, East Kilbride	Dr B Cook/Dr V Watson
IRH	Inverclyde Royal Hospital, Greenock	Dr F Munro
MK	Monklands Hospital, Airdrie	Dr R MacKenzie
NW	Ninewells Hospital, Dundee	Dr AJ Shearer
PRI	Perth Royal Infirmary	Dr FD Magahy
QMH	Queen Margaret Hospital, Dunfermline	Dr P Curry/Dr P Nicholas
RM	Raigmore Hospital, Inverness	Dr I Skipsey/Dr S Hunter
RAH	Royal Alexandra Hospital, Paisley	Dr S Madsen
RIE	Royal Infirmary of Edinburgh	Dr SJ Mackenzie
St. J	St. John's Hospital, Livingston	Dr M Fried
SRI	Stirling Royal Infirmary	Dr M Worsley
SH	Stobhill Hospital	Dr C Miller
SGH	Surgical ICU, Southern General Hospital	Dr P Oates
VOL	Vale of Leven DGH, Alexandria	Dr WR Easy
VHK	Victoria Hospital, Kirkcaldy	Dr C Wilson
VIG	Victoria Infirmary, Glasgow	Dr A Davidson
WGH	Western General Hospital, Edinburgh	Dr IS Grant
WIG	Western Infirmary, Glasgow	Dr L Plenderleith
Wishaw	Wishaw General Hospital (Law Hospital until mid 2001)	Dr N Willis