



*Scottish Intensive Care Society  
Audit Group*



*Audit of Critical Care in Scotland 2008  
Reporting on 2007*



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First published October 2007

ISBN: 978-1-84134-017-3

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یہ طبع مختلف زبانوں اور بڑے چھاب میں دستیاب کی جاسکتی ہے، برائلی (صرف انگریزی میں) اپنی کمیونٹی کے زبان میں اس طبع کے ترجمے کے بارے میں معلومات حاصل کرنے کے لئے، براہ کرم مندرجہ ذیل نمبر پر فون کیجئے۔

Telephone 0131 275 7777



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## Foreword

I am in the fortunate position of having taken over the chair of the Scottish Intensive Care Society Audit Group (SICSAG) following major reorganisation under the auspices of the Information Services Division (ISD) of National Services Scotland. After much hard work and a period of catch-up, this is the first SICSAG annual report published in the year following the activity reported.

The continued support of medical and nursing colleagues in all the Intensive Care Units (ICUs) and an increasing number of High Dependency Units (HDUs) in Scotland remains vital. These are important times of change, and I realise that the burden of data collection brings challenges to all the units involved. The SICSAG national office will continue to help with this wherever possible. Central data extraction and feedback to individual units on a monthly basis is planned for later this year.

Since 1995, SICSAG has maintained a continuous national database of patients admitted to adult intensive care units in Scotland. In the last year, there have been many improvements implemented in how this data is collected, validated and analysed. There is still work to do, but important changes to staff training and support by local and regional co-ordinators organised through Angela Kellacher (National Co-ordinator) and Diana Beard (National Project Manager), have been key to ensure high quality data into future years. We continue to strive for better ways to analyse and report the data collected. The use of pre-sedation GCS scoring and database linkage to SMR1 data to examine outcomes will be explored in the coming year.

SICSAG exists to improve patient care. For the first time, standardised mortality ratios for ICUs are published on a named unit basis. It should be noted that performance indicators such as this indicate that units may be different, and this requires explanation. Automatic assumptions that different standards of care exist must be avoided, as differences could arise from variations in case-mix, service provision, data collection or by chance. Unit identifiers are found on the front-flap of the report (sorted by health board) and alphabetically on the back-flap.

We have also recognised the need to look beyond mortality as our only quality of care measure. Planned changes to the WardWatcher database in each unit in 2008 will provide the means to collect Healthcare Associated Infection (HAI) incidence and care bundle compliance data which can be used to inform quality improvement.

Finally, I would like to thank the long list of those involved in making this audit successful: The Scottish Critical Care community, National Audit Team at ISD and SICSAG, the SICSAG steering group and the previous chairman Simon Mackenzie.

I would welcome your feedback as to how we can continue to improve in the coming years and invite you to join us on 10th October at the SICSAG annual audit meeting in Stirling.

**Dr Brian Cook**

Chairman



# Introduction

The Scottish Intensive Care Society Audit Group (SICSAG) set itself some challenging objectives last year and I am pleased to report that we have had success in most areas:

- All units now have their data backed up to the hospital server
- Monthly electronic downloading of data from each centre
- On-site clinical staff training on WardWatcher
- Increased validation of the dataset
- Reduced turnaround time for reporting
- Revision of WardWatcher in response to end-users needs
- Amendments to the Healthcare Associated Infection (HAI) screen and bundle compliance data collection to help with reporting requirements

In response to your feedback on last year's report, we have made some changes and increased the amount of information that is available on the website. Remember – if you would like additional information then just contact us and we'll be happy to help.

In this year's report, we are reporting on the management of over 10,000 patients admitted to Scottish Intensive Care Units (ICU) and over 18,000 patients admitted to High Dependency Units (HDU) during 2007.

The format of the report continues to follow the patient's journey through three sections: activity, interventions and outcomes. This is the first year that hospitals are identified throughout the report (including the outcomes section). This decision was taken in conjunction with the Scottish Intensive Care Society and the Critical Care community. At this time, however, we are unable to report on HDU outcomes as most units do not collect case-mix adjustment data.

## Our current programme of work

### New version of WardWatcher

The WardWatcher sub-group has produced an updated version of WardWatcher ensuring all the data collected is relevant and that anomalies in interpretation are reduced. This new version will be piloted in early summer with a national rollout thereafter. Explicit WardWatcher definitions and instructions will be provided at the time of the update.

The changes to WardWatcher can be found on our website and 'easy guide' instructions will be sent to units and are also available on the website ([www.sicsag.scot.nhs.uk](http://www.sicsag.scot.nhs.uk)).

### *Training on WardWatcher*

We have succeeded in providing on-site training to 50% of our units in the first four months of this year. The plan is to complete the training programme over the course of the summer. We realise that staff turnover is such that training will be an ongoing requirement and we have increased our staffing to make this process more timely.

### Healthcare Associated Infection (HAI)

The Scottish Patient Safety Programme (SPSP) and Health Protection Scotland (HPS) have approached SICSAG to see if we can help units to collect the HAI data that both organisations have an interest in.

To that end, WardWatcher's HAI page will be updated along with the general upgrade to ensure that all data required by these agencies can be collected, with SICSAG reporting these data back to the relevant staff in individual hospitals if they choose to collect this information via WardWatcher.



A Ventilator Associated Pneumonia (VAP) prevention bundle and Central Line Insertion (CLI) bundle have been produced by SICSAG, with the ability to collect compliance with these bundles being added to the daily page of WardWatcher with the next update. Again, if units decide to collect this information via WardWatcher SICSAG will send a report of these data back to the individual hospitals to allow local areas to report this information to SPSP.

### **IT investment**

Additional funding was provided last year to enable us to provide you with an improved service at a local level. We were aware that many units required investment in IT and we are currently in the process of liaising with local IT departments to install new equipment and enable inter-site connectivity where this has been requested.

### **New Units joining SICSAG**

The audit expanded in 2007 to include the neurological ICU at the Southern General Hospital and the medical and surgical HDUs in Stirling Royal Infirmary. Three HDUs are joining us this year: Dr Gray's Hospital in Elgin, the medical HDU in Ninewells and the surgical HDU in Inverclyde Royal Hospital.

### **Timely Feedback**

Quarterly newsletters are being produced and distributed in all contributing units. They are also available on the SICSAG website.

Monthly reporting will start later this year, giving clinical and management teams 'real time' reports. Feedback so far indicates that clinical staff would like some of the report to be data required by SPSP. If you have any other ideas, please contact me.

### **Optimising the database**

SICSAG have been putting measures in place to ensure your data is comprehensive and accurate. The central database holds an enormous amount of relevant and informative data on Critical Care in Scotland. If there is a specific aspect of care that interests you, please contact SICSAG and we will be happy to discuss performing an ad hoc analysis for you.

## **Angela Kellacher**

National Clinical Co-ordinator

[angela.kellacher@luht.scot.nhs.uk](mailto:angela.kellacher@luht.scot.nhs.uk)



## Summary and Key Findings

It is 10 years since the first SICSAG report was published. This is the second report published in collaboration between SICSAG and ISD and details Critical Care (ICU and HDU) activity, interventions and outcomes in Scotland in 2007. Previous reports are available at [www.sicsag.scot.nhs.uk](http://www.sicsag.scot.nhs.uk).

SICSAG continues its involvement in national quality improvement in healthcare through the use of audit and a collaboration with NHS Quality Improvement Scotland (NHS QIS), Health Protection Scotland and the Scottish Patient Safety Programme. Further expansion is planned with more HDUs participating in the audit.

Admissions continue to rise each year. Over 28,000 admissions are reported for 2007. Although some of the rise is due to new units participating in the audit, this increase is also apparent in cohorts of ICUs and HDUs who have contributed data since the audit started.

Critical Care activity measures are important for planning both scheduled and unscheduled care. Bed occupancy rates and length of stay vary across Scotland, particularly in HDUs. Units at the extremes of such activity may have a need to examine bed provision, admission or discharge procedures. We have also reported length of stay by APACHE II diagnostic category. This shows how case-mix may impact on expected bed use.

A large proportion of admissions to Scottish Critical Care beds occur outside 'office hours', emphasising the 24/7 nature of these services. The rising number of patients admitted from the Emergency Department reflects increasing acuity in this population.

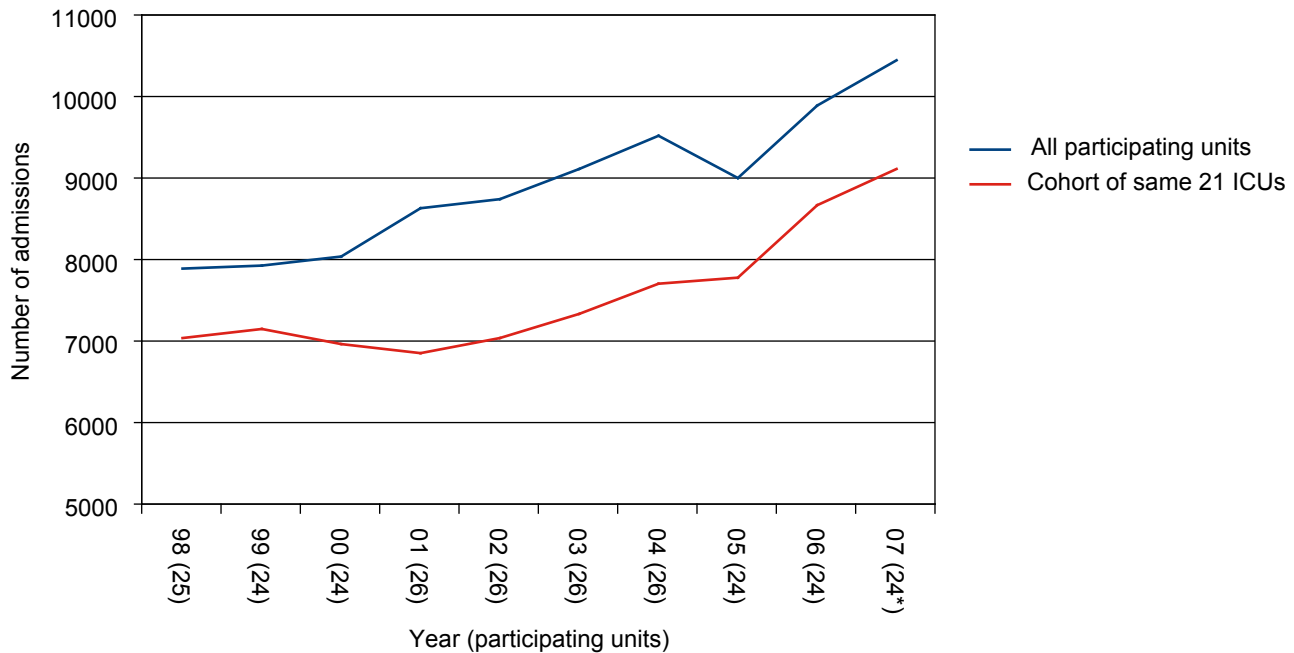
We report 'out of hours' live discharges for the first time. It is worthy of note that around one third of all discharges occur 'out of hours'. This has been highlighted as a higher risk time for discharge from Critical Care (Goldfrad 2000). Units with high 'out of hours' discharge rates may wish to examine the reasons for this.

Interventions such as mechanical ventilation, inotropic support and haemofiltration are hallmarks of Critical Care. Individual unit rates are quite stable, but variations across Scotland exist due to differences in case-mix or service provision. This, in conjunction with different proportions of maximum levels of care in each unit, is useful benchmarking information, which will assist service planning.

Following admission to a Scottish intensive care bed in 2007, 31% of patients died before hospital discharge. This reflects the severity of illness in this population. It is fewer than predicted by the APACHE II case-mix adjusted standardised mortality ratio, which fell from 1.05 in 2002 to 0.94 in 2007. Variation through time in units, and between units is small. Two units which may be different using the strict SICSAG definition have been highlighted to their respective hospital's and division's management. The Scottish public should be reassured by these findings and the action we have taken to ensure that patient safety is our first priority.

# Section 1 Activity

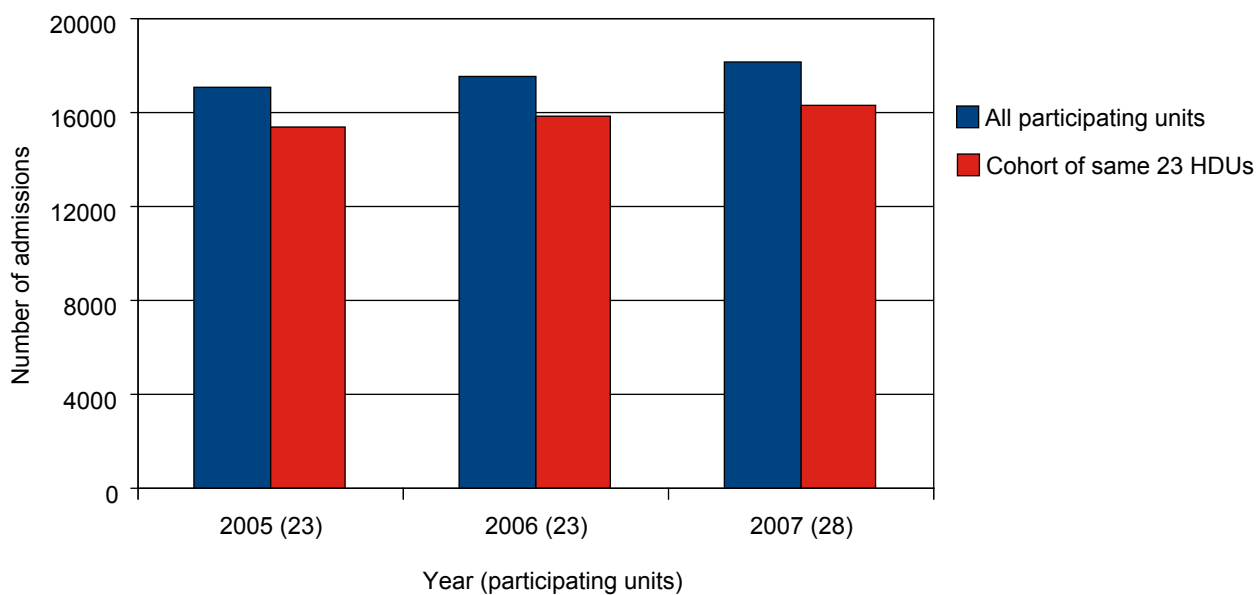
**Figure 1 Annual admissions to ICU and Combined Units (1998-2007)**



\* SGH Neuro ICU excluded from this graph.

The number of admissions continues to rise year on year for both ICU and HDU. For the first time the number of admissions to ICU is greater than 10,000 patients/year (figure 1). This reflects increasing activity and a continual increase in referrals to Intensive Care as well as additional units joining the SICSAG audit. The red line shows admissions to a cohort of 21 units that have submitted data for all years 1998-2007.

**Figure 2 Annual admissions to HDU (2005-2007)**



Annual admissions to HDU (figure 2) also continue to rise and a greater increase in bed numbers across Scotland has allowed health boards to provide patients with an increased level of care.


**Table 1 Number of annual admissions to ICU and Combined Units (1998-2007)**

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
<b>NHS Ayrshire and Arran</b>										
Ayr ICU	335	303	268	234	210	246	242	271	266	307
Crosshouse ICU	350	364	320	349	287	278	267	290	285	302
<b>NHS Borders</b>										
BGH ICU/HDU	335	375	322	301	329	337	404	398	710	692
<b>NHS Dumfries and Galloway</b>										
DGRI ICU	279	405	392	298	273	276	334	331	304	324
<b>NHS Fife</b>										
QMH ICU	549	407	354	327	367	390	374	406	377	373
VHK ICU/HDU	329	271	204	206	161	143	123	152	145	179
<b>NHS Forth Valley</b>										
SRI ICU	145	177	219	192	183	171	215	267	480	471
FDRI ICU	126			482	508	550	560			
<b>NHS Grampian</b>										
ARI ICU	561	606	624	607	735	793	806	746	781	778
<b>NHS Glasgow and Clyde</b>										
GRI ICU	436	384	387	385	317	319	310	320	321	348
IRH ICU	224	188	156	148	165	116	114	155	122	104
RAH ICU	372	426	359	278	288	276	316	310	318	367
SGH ICU	245	250	280	228	231	255	302	287	279	296
SGH Neurological ICU*										76
Stobhill ICU	225	242	236	260	207	210	218	199	220	201
VI ICU	289	318	317	352	313	294	313	314	340	392
Vale of Leven ICU	197	247	185	188	208	158	128			
WIG ICU/HDU	476	456	446	439	417	402	433	460	532	512
<b>NHS Highland</b>										
Raigmore ICU	262			317	336	326	374	359	390	436
<b>NHS Lanarkshire</b>										
Hairmyres ICU/HDU		145	504	475	398	485	411	506	531	522
MDGH ICU	323	331	334	284	297	252	265	264	307	301
Wishaw ICU/HDU	239	266	239	469	796	751	739	745	757	829
<b>NHS Lothian</b>										
RIE ICU/HDU	546	651	655	702	643	865	1123	1032	1059	1041
SJH ICU/HDU	223	260	281	248	241	261	218	225	352	367
WGH ICU/HDU**	328	339	383	358	369	449	453	497	504	714
<b>NHS Tayside</b>										
Ninewells ICU	297	337	339	332	310	330	327	339	352	370
PRI ICU	204	190	236	170	159	186	150	119	163	151
<b>Total</b>	<b>7895</b>	<b>7938</b>	<b>8040</b>	<b>8629</b>	<b>8748</b>	<b>9119</b>	<b>9519</b>	<b>8992</b>	<b>9895</b>	<b>10453</b>
<b>Total (21 units)</b>	<b>7031</b>	<b>7141</b>	<b>6959</b>	<b>6869</b>	<b>7025</b>	<b>7324</b>	<b>7712</b>	<b>7796</b>	<b>8670</b>	<b>9095</b>

\* Admissions in November-december 2007 only.

\*\* Combined Unit since April 2007.

NHS Health Boards.

Shaded areas refer to periods with incomplete data collection.

Combined Unit since ...

**Table 2 Number of annual admissions to HDU (2005-2007)**

	2005	2006	2007
<b>NHS Ayrshire and Arran</b>			
Ayr HDU *			414
Crosshouse Medical HDU	881	967	993
Crosshouse Surgical HDU	668	657	696
<b>NHS Dumfries and Galloway</b>			
DGRI Medical HDU	841	784	793
DGRI Surgical HDU	313	337	361
<b>NHS Fife</b>			
QMH Surgical HDU	828	822	855
<b>NHS Grampian</b>			
ARI Neurological HDU	90	170	251
ARI Surgical HDU	684	655	587
<b>NHS Glasgow and Clyde</b>			
GGH HDU	796	771	849
GRI Surgical HDU	900	694	1028
RAH Surgical HDU	905	1189	1201
SGH Surgical HDU	691	796	810
SGH Neurological HDU	591	642	704
Stobhill Surgical HDU	353	317	327
VI Surgical HDU	608	605	703
<b>NHS Highland</b>			
Raigmore Medical HDU	588	653	733
Raigmore Surgical HDU	689	673	715
<b>NHS Lanarkshire</b>			
Hairmyres Thoracic HDU	354	341	
MDGH Surgical HDU	445	632	628
<b>NHS Lothian</b>			
RIE HDU	1531	1530	1517
RIE Renal HDU	597	607	683
RIE Transplant HDU	306	269	330
WGH HDU**	493	503	117
WGH Neurological HDU	577	450	362
WGH Surgical (Level1) HDU	1198	1231	1139
<b>NHS Tayside</b>			
Ninewells Surgical HDU	704	653	723
PRI HDU	500	537	573
<b>NHS Shetland</b>			
GBH HDU	54	72	65
<b>Total</b>	<b>17185</b>	<b>17557</b>	<b>18157</b>
<b>Total (23 units)</b>	<b>15348</b>	<b>15849</b>	<b>16347</b>

\* April-December 2007.

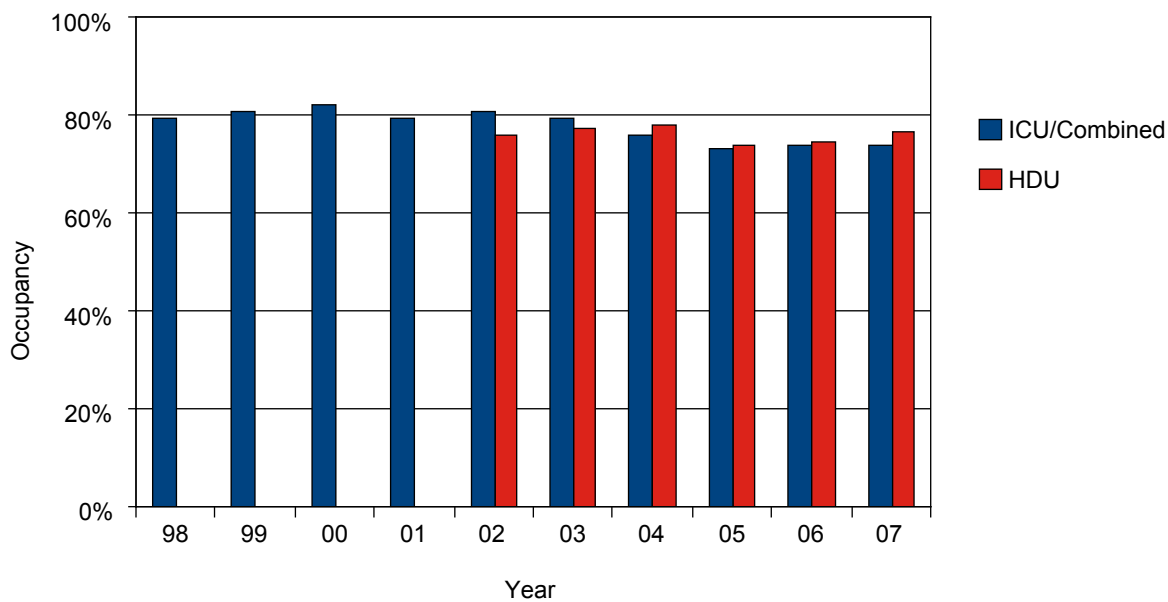
\*\* Merged with WGH ICU since April 2007.

NHS Health Boards.

Shaded areas refer to periods with incomplete data collection.



**Figure 3 Annual national bed occupancy rates in ICU/ Combined Units and HDU (1998-2007)**

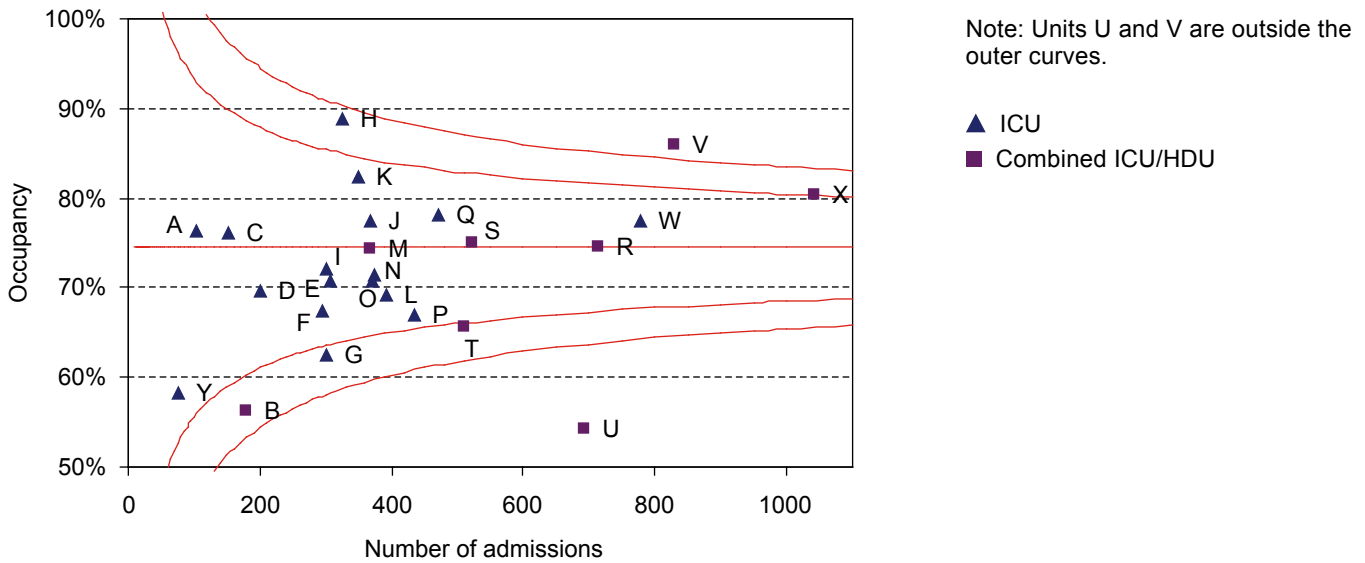


The average Scottish Critical Care bed occupancy has remained stable at 74% over the past three years (figure 3).

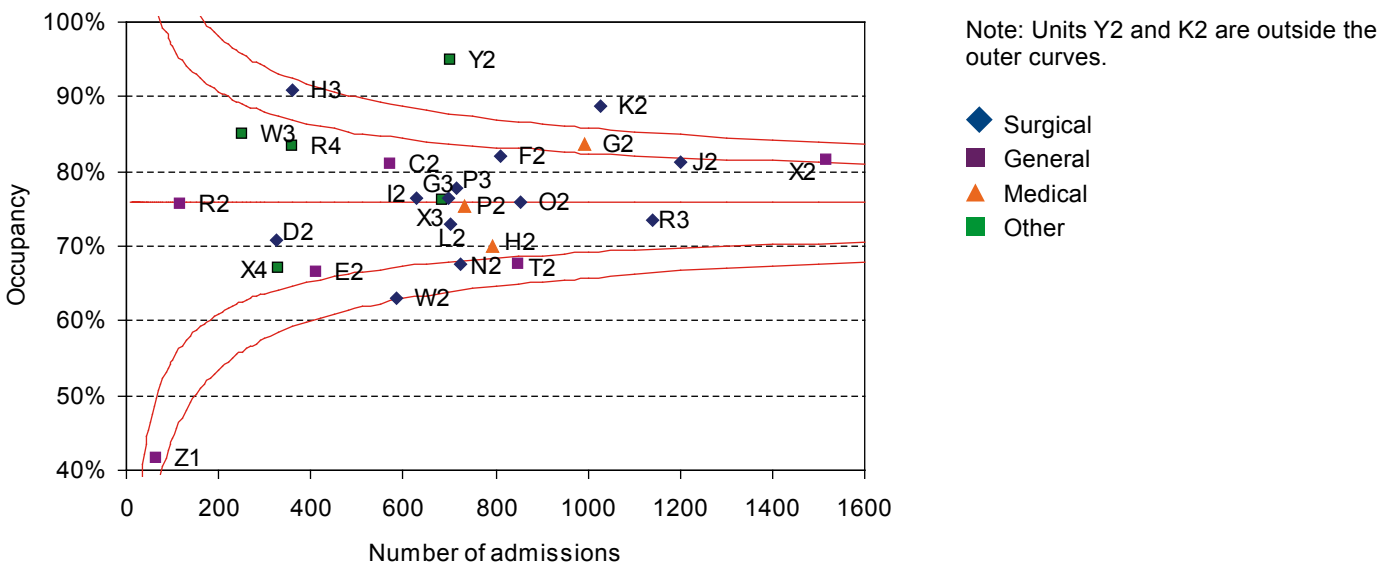
There has been a small increase in the number of ICU beds available and this may have contributed to occupancy rates remaining stable despite the year on year increase in admissions.

There is little difference in occupancy between combined ICU/HDU and ICU alone.

**Figure 4 Bed occupancy rates for ICU and Combined Units (2007)**



**Figure 5 Bed occupancy rates for HDU (2007)**



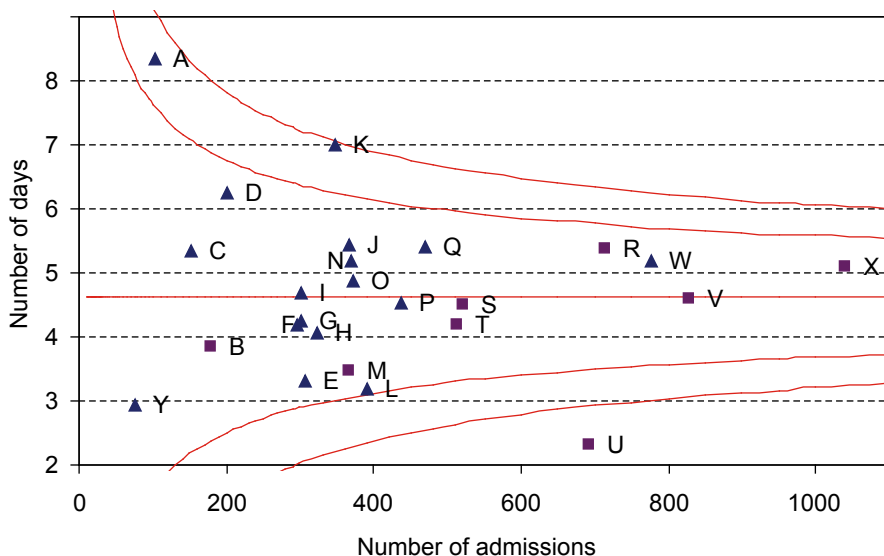
Most ICUs have bed occupancy rates close to the Scottish mean of 74%. A small number of units have significantly higher or lower bed occupancy levels (figure 4). Bed occupancy is affected by many factors but it is of note that there appears to be an increasing trend that many units are finding it increasingly difficult to discharge patients to lower levels of care.

HDU bed occupancy rates are similar to ICU rates overall (figure 5), but the pattern is more varied. Two units, K2 and Y2 have significantly higher occupancy rates according to the 99.8% confidence intervals.

SICSAG measures bed occupancy using precise times rather than a traditional 'end of day' count. Occupancy is calculated using the number of funded beds as the denominator. It may be possible for some units to open additional unfunded beds in times of greater demand.



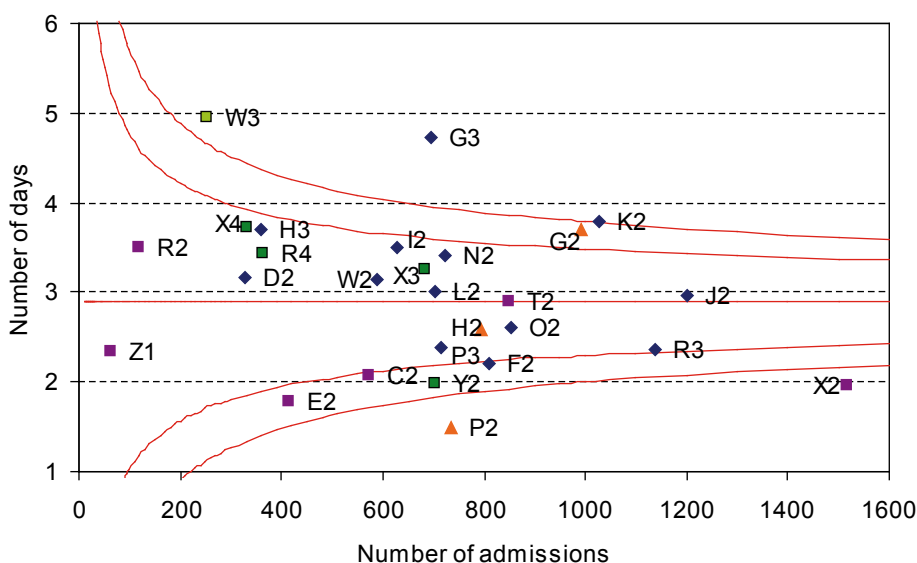
**Figure 6 Mean length of stay in ICU and Combined Units (2007)**



Note: Unit U is outside the outer curves.

- ▲ ICU
- Combined ICU/HDU

**Figure 7 Mean length of stay in HDU (2007)**



Note: Units W3, G3, K2, P2 and X2 are outside the outer curves.

- ◆ Surgical
- General
- ▲ Medical
- Other

Length of stay (LOS) in ICU and HDU is influenced by many factors, both upstream, in terms of patient referral rates and patterns; and downstream, in terms of discharge from ICU and HDU to lower levels of care.

The median length of ICU stay did not change from 4.2 days between 2005 and 2007.

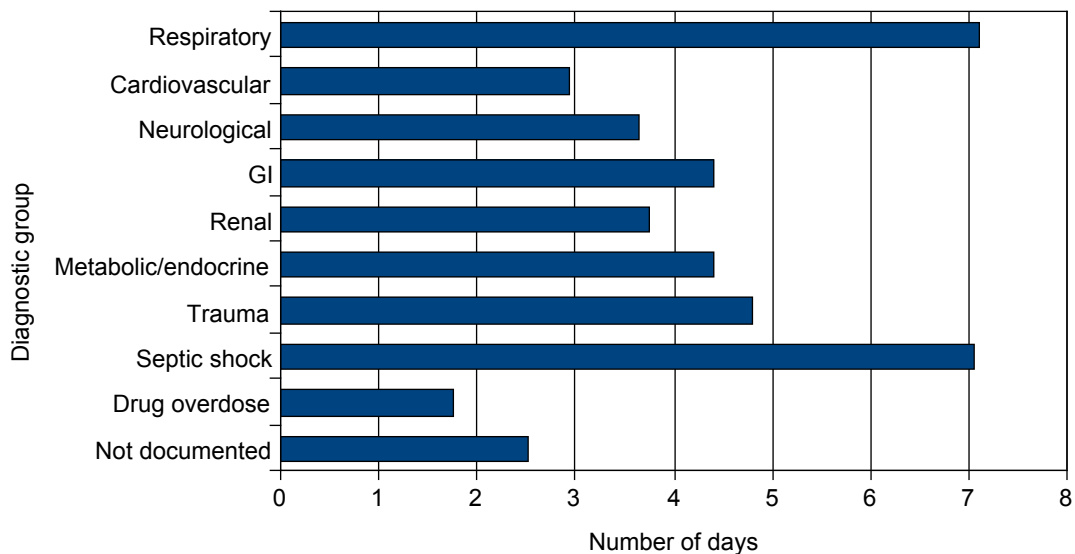
There was a statistically significant reduction in mean LOS between 2006 and 2007 (about 10%). This follows a similarly significant reduction in mean LOS between 2005 and 2006.

Studies have suggested that LOS in the UK is short by international comparisons (Woods *et al.* 2000). The variations in LOS shown between units in figure 6 and figure 7 are of interest and should generate debate as to whether they reflect differences in case-mix, service provision or practice.

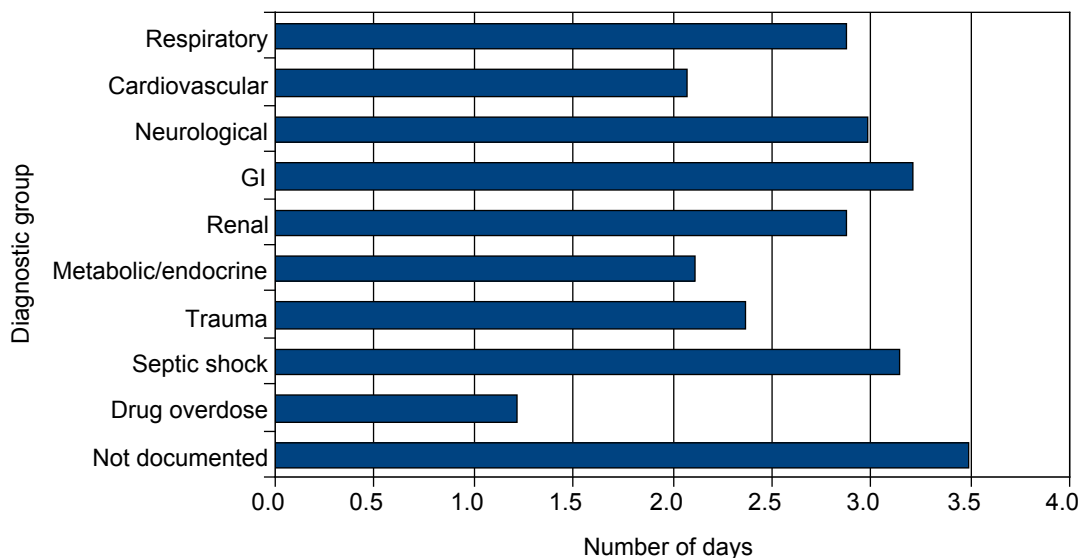
The mean LOS in HDU is similar to that shown in the 2006 report at 2.9 days.

The mean LOS for an ICU patient (4.6 days) is significantly longer than for an HDU patient (2.9 days) probably reflecting increased severity of illness of this group. This relationship is true for HDU patients in combined ICU/HDU and in standalone HDUs.

**Figure 8 Mean length of stay according to grouped APACHE II diagnosis in ICU and Combined Units (2007)**



**Figure 9 Mean length of stay according to grouped APACHE II diagnosis in HDU (2007)**

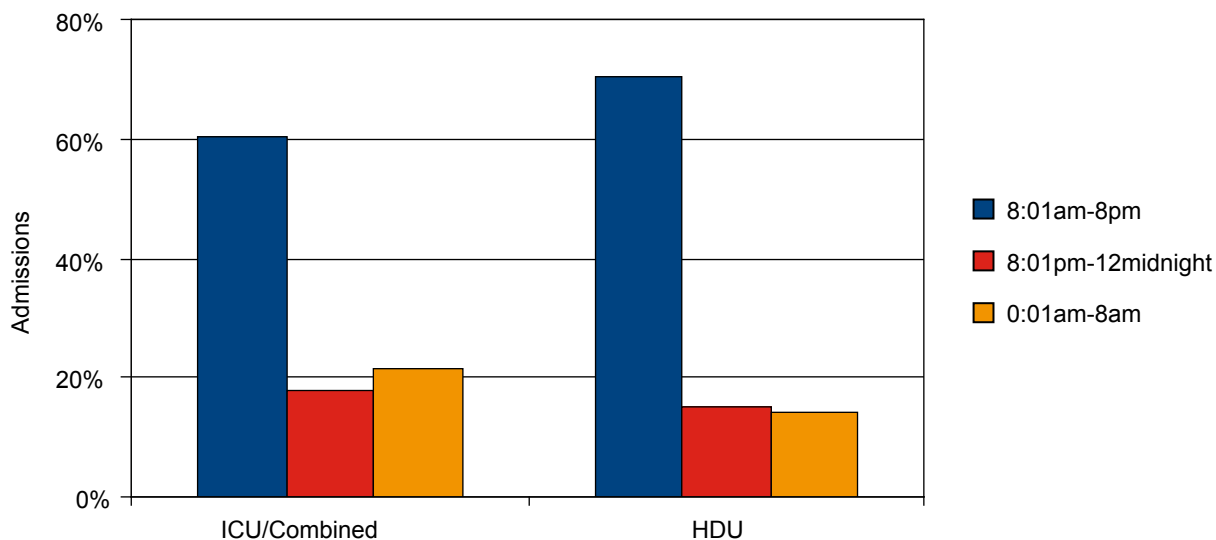


The LOS within ICU is dependent to some extent on the primary APACHE II diagnosis on admission.

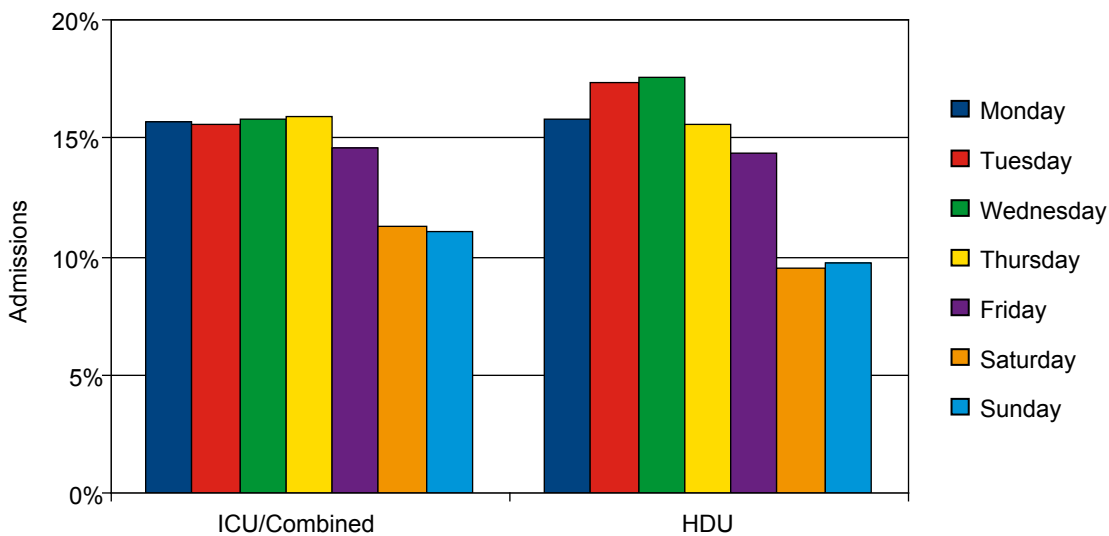
Figures 8 & 9 show LOS for Scottish patients based on APACHE II diagnosis. It is clear that patients who are admitted to ICU with a primary respiratory diagnosis or in septic shock using the APACHE II system have a significantly longer LOS than other groups of patients. This has implications for pandemic flu planning management, as these patients are likely to present in this way.



**Figure 10 Time of admission to ICU/Combined Units and HDU (2007)**

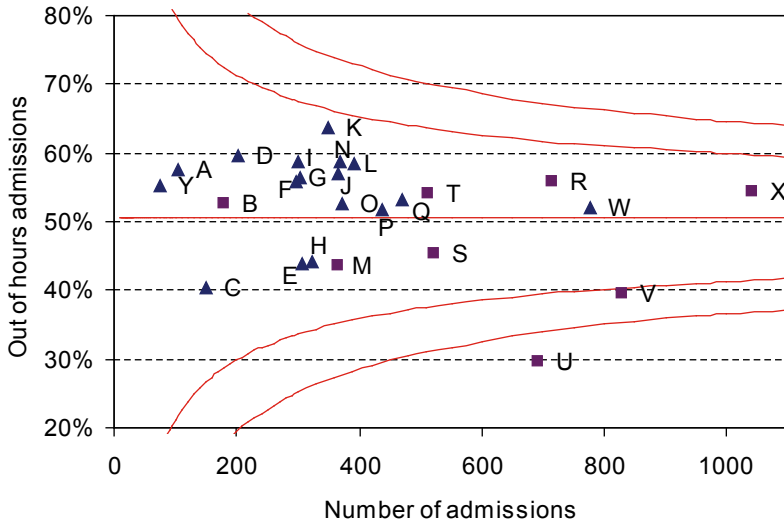


**Figure 11 Day of admission to ICU/Combined Units and HDU (2007)**



Eighteen per cent of ICU admissions and 15% of HDU admissions occur between 8pm and midnight. A further 22% of ICU admissions and 14% of HDU admissions take place between midnight and 8am. In total 40% of ICU admissions and 29% of HDU admissions are between 8pm and 8am (figure 10). Weekend admissions account for 22% of ICU and 19% of HDU admissions (figure 11).

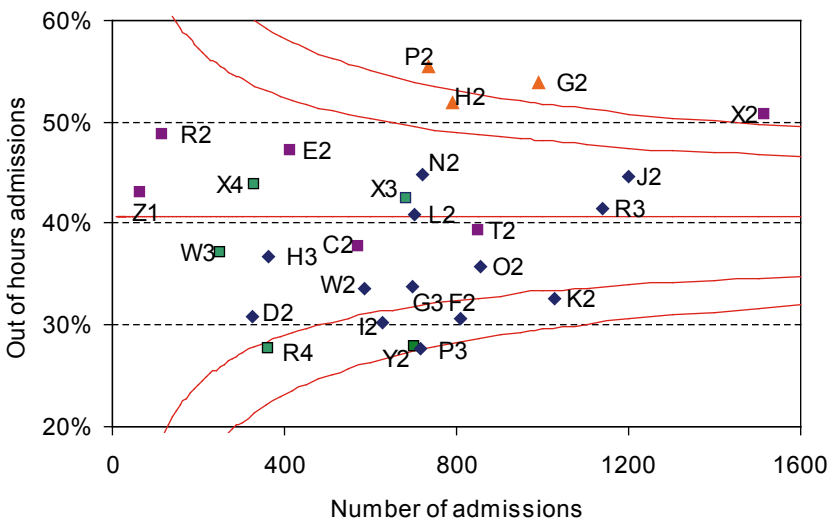
**Figure 12 Percentage of 'out of hours' admissions to ICU and Combined Units (2007)**



Note: Unit U is outside the outer curves.

- ▲ ICU
- Combined ICU/HDU

**Figure 13 Percentage of 'out of hours' admissions to HDU (2007)**



Note: Units P2, G2 and X2 are outside the outer curves.

- ◆ Surgical
- General
- ▲ Medical
- Other

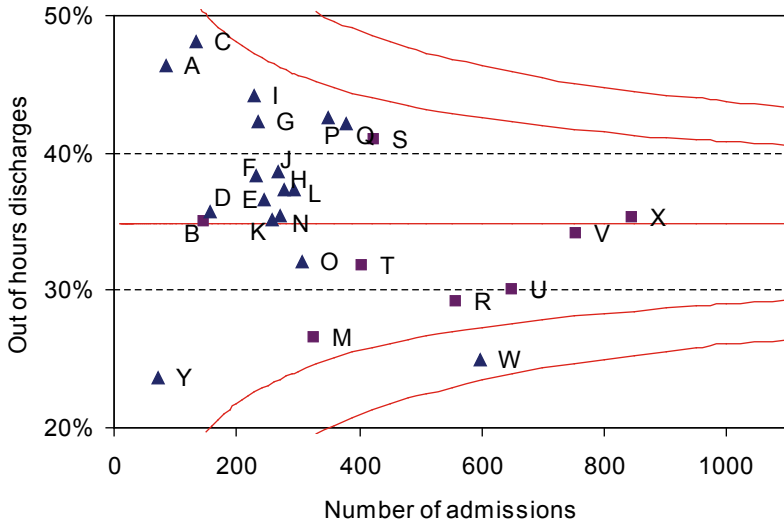
The 24/7 nature of Critical Care is immediately apparent from this data with over 50% of patients being admitted to ICU 'out of hours' and slightly less for HDU. Unit U, which has a very different case-mix to the rest of the Scottish ICU population, has a significantly lower level of 'out of hours' admissions (figure 12). However, this does not reduce the mean percentage by any great degree (from 52% to 51%).

'Out of hours' is defined as admission between 8pm and 8am and all weekend.

Admission to ICU is usually preceded by a significant amount of time assessing, stabilising and treating the critically ill patient prior to admission. It should also be remembered that not every referral to Critical Care is admitted and these patients are not universally captured by the SICSAG database. This overall picture of activity has important implications for the staffing of Critical Care at all levels and for service provision in the future throughout Scotland.



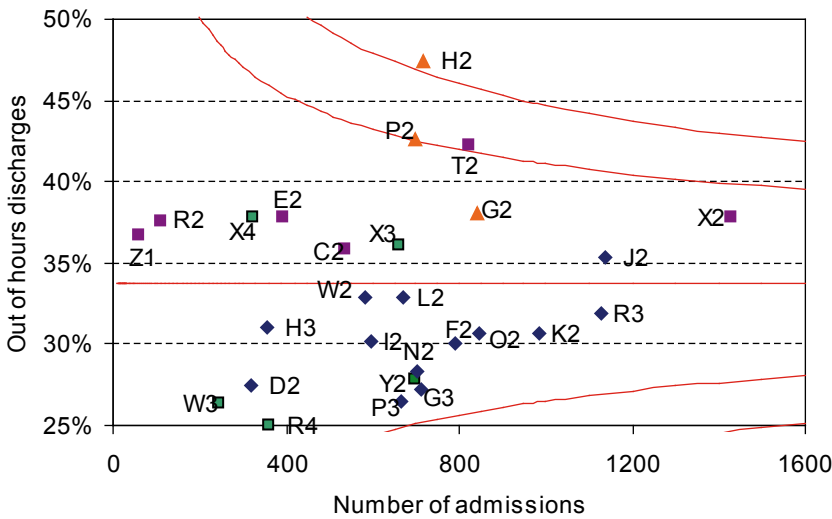
**Figure 14 Percentage of 'out of hours' discharges in ICU and Combined Units (2007)**



Note: Excludes discharges to mortuary.

- ▲ ICU
- Combined ICU/HDU

**Figure 15 Percentage of 'out of hours' discharges in HDU (2007)**



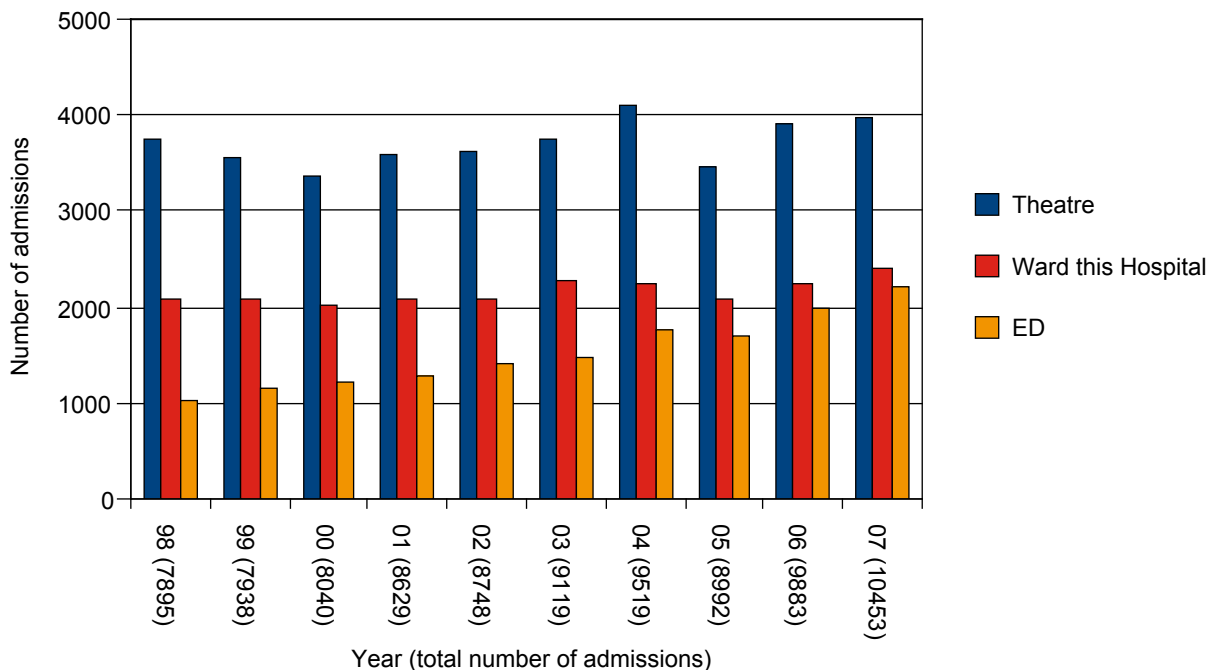
Note:  
Excludes discharges to mortuary.  
Unit H2 is outside the outer curves.

- ◆ Surgical
- General
- ▲ Medical
- Other

There appears to be an increasing trend that many units are finding it increasingly difficult to discharge patients from ICU and HDU to lower levels of care.

There is some evidence in the literature (Goldfrad 2000) that patients who are discharged from intensive care at night are placed at increased risk and may have a poorer outcome. Goldfrad used a more restricted definition of overnight (2200 - 0659 and 0000 - 0459) which is different to that used by SICSAG. Those units with a high level of 'out of hours' discharge rates may wish to look further into the reasons for this.

**Figure 16 Source of admissions to ICU and Combined Units (1998-2007)**



**Figure 17 Source of admissions to HDU (2005-2007)**

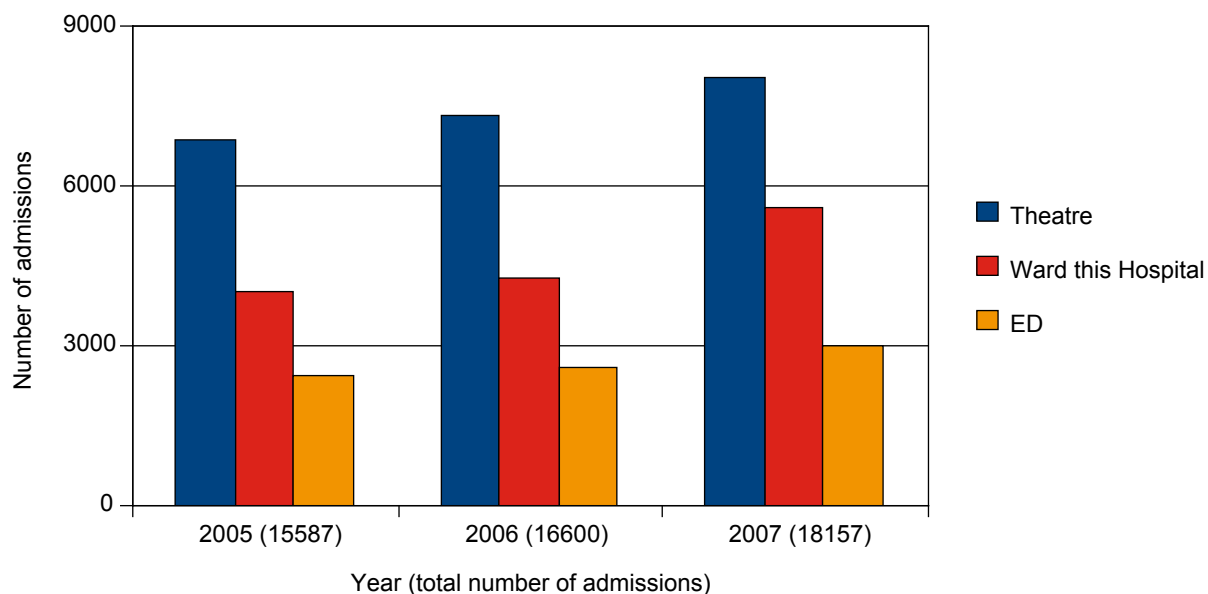


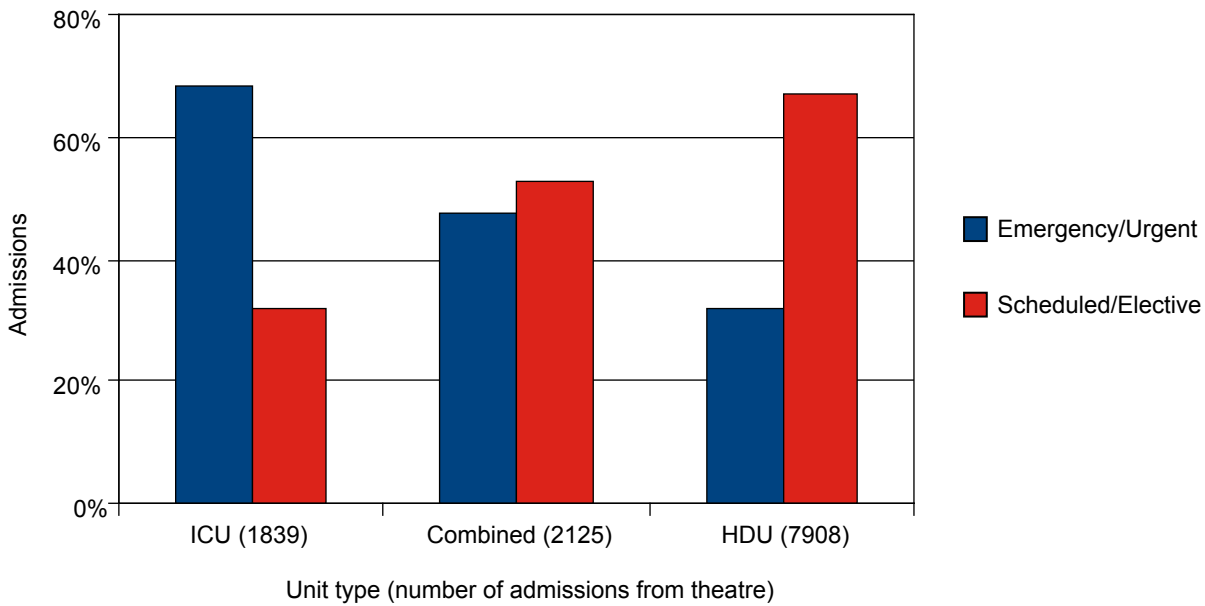
Figure 16 shows the number of admissions to ICU from Theatre, Wards and the Emergency Department over the past 10 years.

There has been a steady increase in the number of patients admitted directly to ICU from the Emergency Department. The percentage of patients admitted from the operating theatre to ICU has fallen slightly, possibly reflecting the reduction in elective theatre admissions. Theatre remains the most common single source of admissions. The level of ward admissions to ICU is unchanged at just over 20% of admissions.

Almost 44% of HDU admissions are from theatre. About 25% of admissions are from the wards and around 17% via the Emergency Department.



**Figure 18 Nature of Surgery in ICU, Combined Units and HDU (2007)**



Note: 162 Admissions with undocumented nature of surgery were excluded.

Figure 18 relates to those patients admitted directly from the operating theatre to ICU, Combined Units or HDU.

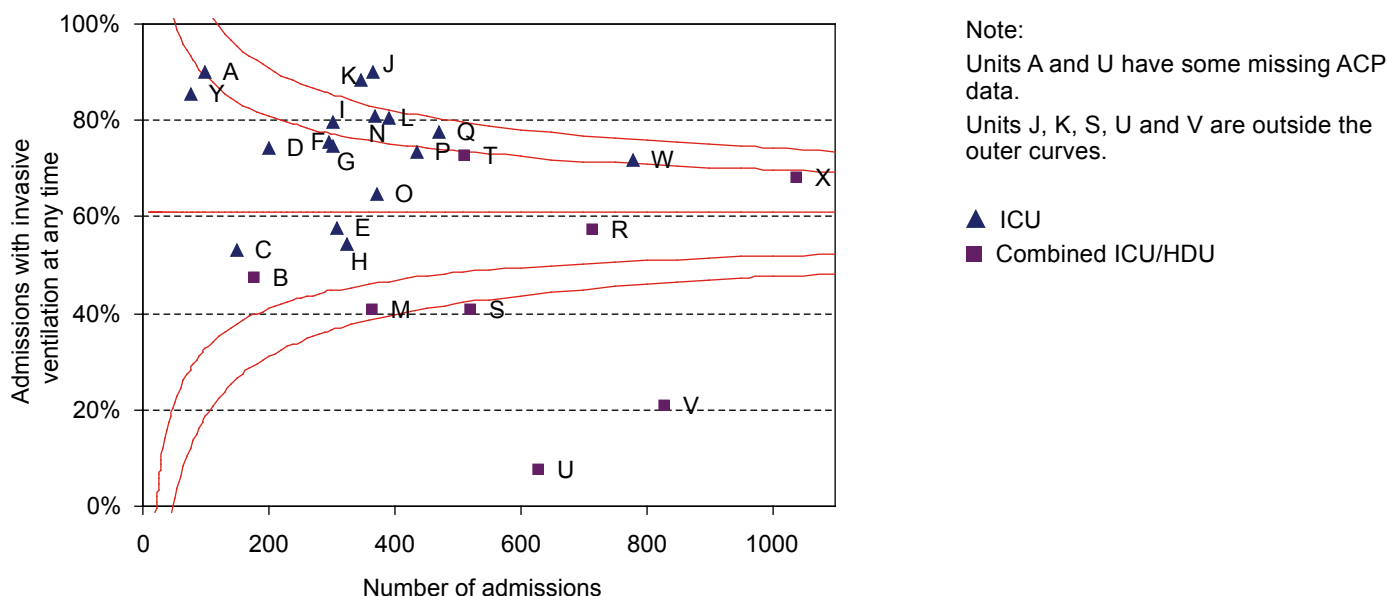
A greater proportion of patients were admitted to ICU following emergency or urgent surgery than to HDU. The majority of high-risk elective surgical cases are admitted to HDU rather than to ICU, this may reflect bed availability as much as advances in anaesthetic and Critical Care practice.

## Section 2 Interventions in Critical Care

The principal difference between Intensive Care and High Dependency Units and General Wards lies in the amount of invasive treatment and monitoring used. We continue to collect information in this area via the augmented care period (ACP) section of WardWatcher. This is contained in the following figures.

The usefulness of these graphs lies in their descriptive nature; because of the wide variation in patient population.

**Figure 19 Invasive ventilation in ICU and Combined Units (2007)**



### Invasive ventilation

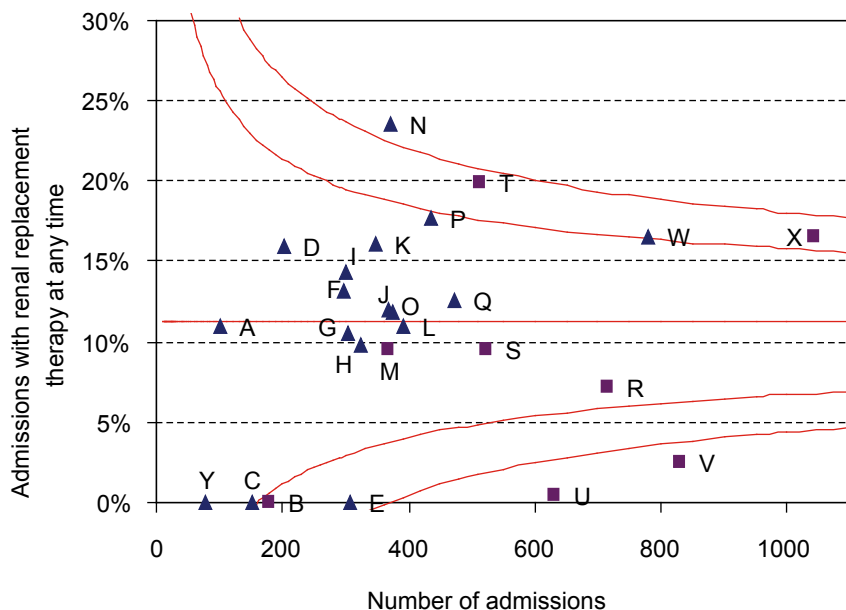
In most hospitals, artificial ventilation through an endotracheal or tracheostomy tube is only performed in ICU, so patients needing this treatment are usually priority admissions. In Scotland the absolute numbers of such patients have increased but the percentage of patients invasively ventilated has fallen slightly. While this is dependent on local circumstances such as availability of HDU beds, a very high ventilation rate may indicate the need to review ICU capacity.

In most ICUs about 60-80% of admissions require invasive ventilation. A number have a significantly higher or smaller percentage, according to the 99.8% confidence intervals (outer curves). Units U and V are combined ICU/HDU facilities. There is relatively little year to year variation within units with the exception of units which have had organisational change (unit R is now a combined unit).

Artificial ventilation using a mask is performed in ICUs but this data is not well collected in the current data set, this is being addressed in the next version of WardWatcher.



**Figure 20 Renal Replacement Therapy in ICU and Combined Units (2007)**



Note:  
 Units A and U have some missing ACP data.  
 Units N, U and V are outside the outer curves.

▲ ICU  
 ■ Combined ICU/HDU

**Renal replacement therapy (RRT)**

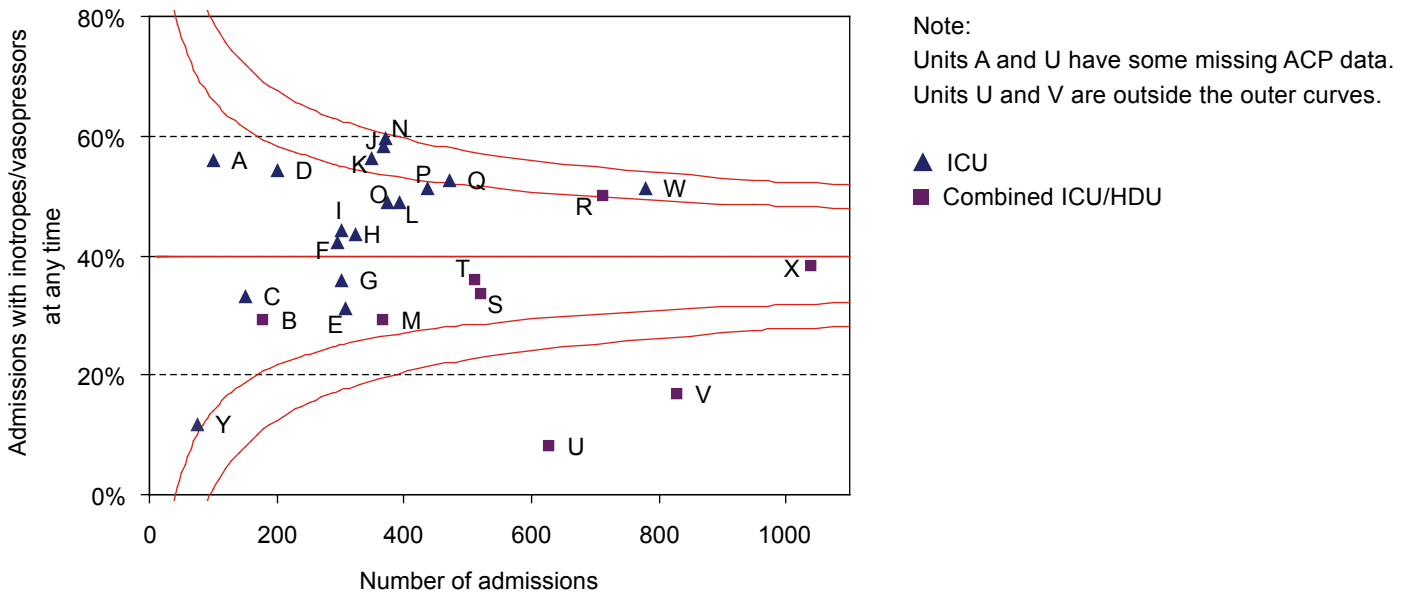
The proportion of patients who undergo renal replacement therapy, in the form of either dialysis or haemofiltration, has been stable at about 11% over the last 3 years.

ICU and combined units vary considerably in their percentage of admissions receiving RRT. For complex treatments such as this a certain number of patients are required to maintain skills and so a number of units do not offer this treatment, planning to transfer patients to other units when it is required.

**Pulmonary artery flotation catheters (PAFC)**

In previous years we have reported on the use of pulmonary artery catheters, however their use is now restricted to a small number of mainly specialist units. We currently do not have information on other forms of cardiac output monitoring which may have replaced it, such as Oesophageal Doppler or the various forms of pulse contour analysis, but this will be included in the next version of WardWatcher.

**Figure 21 Use of inotropes/vasopressors in ICU and Combined Units (2007)**

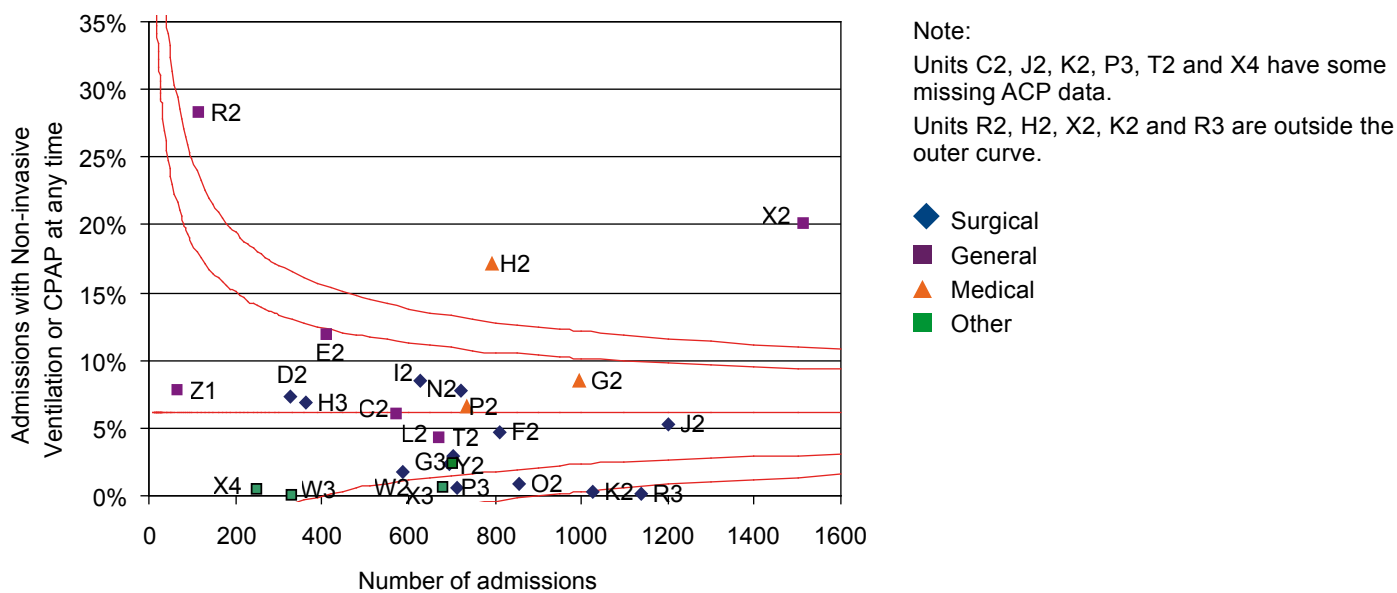


### Inotropes/Vasopressors

About 40% of patients receive inotropes or vasopressors at some point in their ICU stay (figure 21). These are drugs used to support the cardiovascular system by increasing cardiac output or blood pressure (e.g. adrenaline). As with other interventions, the units with very low use (U and V) are combined units with a high proportion of HDU patients.



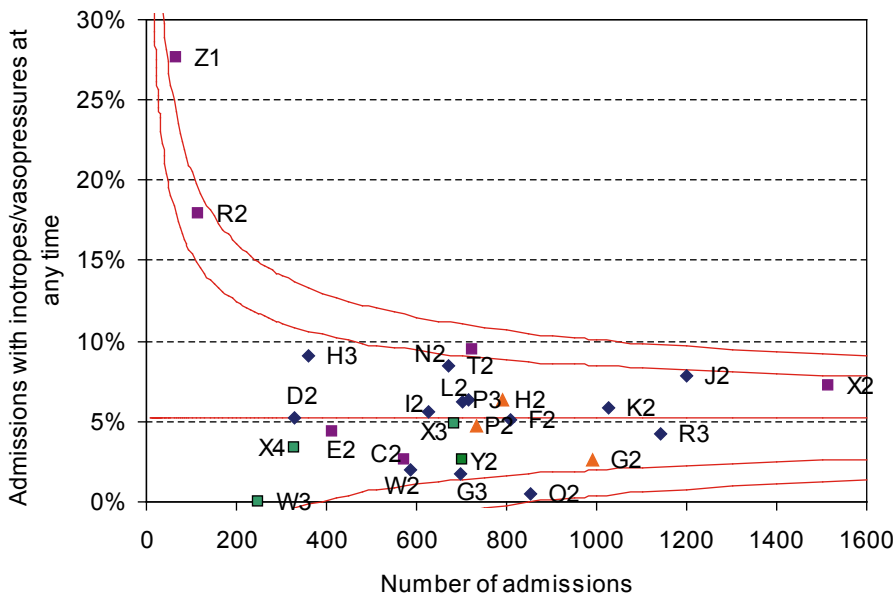
**Figure 22 NIV and CPAP rates in HDU (2007)**



**Non-invasive Ventilation (NIV) and Continuous Positive Airway Pressure (CPAP)**

Invasive ventilation occurs only rarely in HDUs while ventilation or CPAP using a face mask or hood can be performed outside the ICU. Figure 22 shows that there is a wide variation in units in the use of NIV/CPAP with very wide use in some units (H2, R2 and X2), while some units rarely, if ever, use it. This may be due to a combination of patient mix, different management strategies and possibly availability of equipment.

**Figure 23 Use of inotropes/vasopressors in HDU (2007)**



Note:  
 Units C2, J2, K2, P3, T2 and X4 have some missing ACP data.  
 Unit Z1 is outside the outer curve.

- ◆ Surgical
- General
- ▲ Medical
- Other

### Cardiovascular support

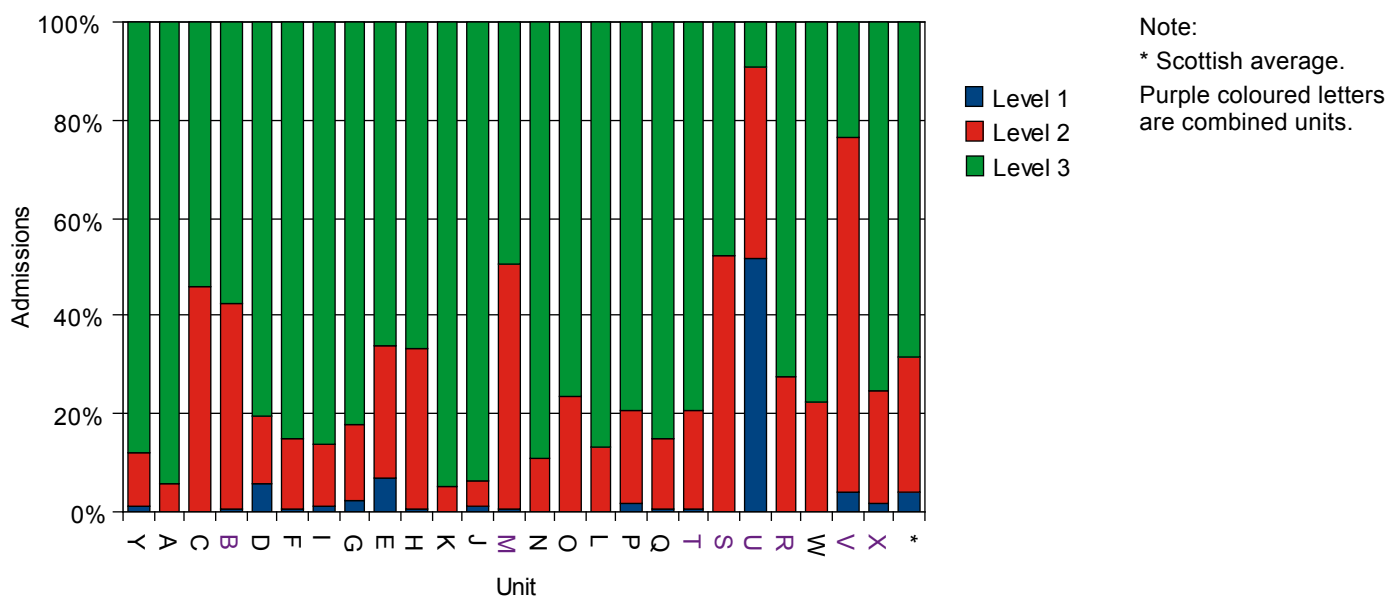
The proportion of patients who receive such support in HDU is low, perhaps reflecting the fact that such patients tend to be managed in ICUs.



## Levels of Care

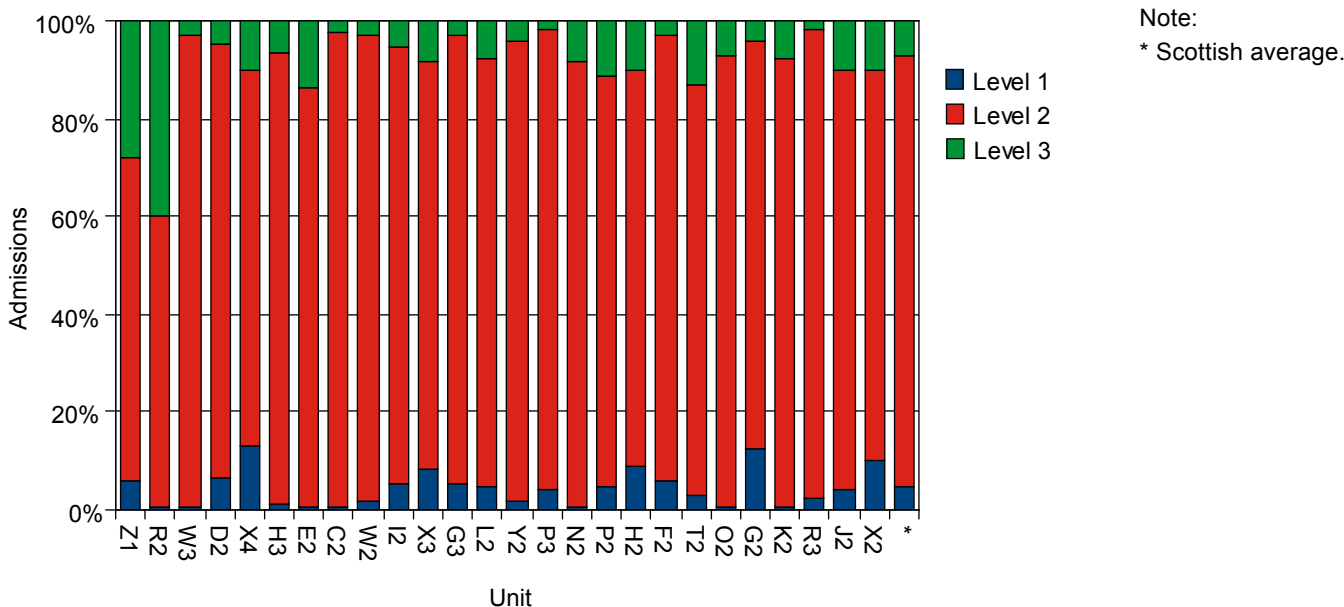
Combining the information described above with other intervention data enables us to calculate a patient's maximum dependency. The descriptions of the various levels of care have been used since the publication of Better Critical Care (Scottish Executive Health Dept 2000), and for the first time, we have been able to use the information from WardWatcher to calculate levels of care. Level 3 patients are classically equivalent to ICU patients requiring the highest level of input such as mechanical ventilation, Level 2 are HDU type patients and Level 1 patients usually only need more observation than is available in a general ward. The full definitions may be found in Appendix 1.

**Figure 24 Highest level of care in ICU and Combined Units (2007)**



Note:  
 \* Scottish average.  
 Purple coloured letters are combined units.

**Figure 25 Highest level of care in HDU (2007)**

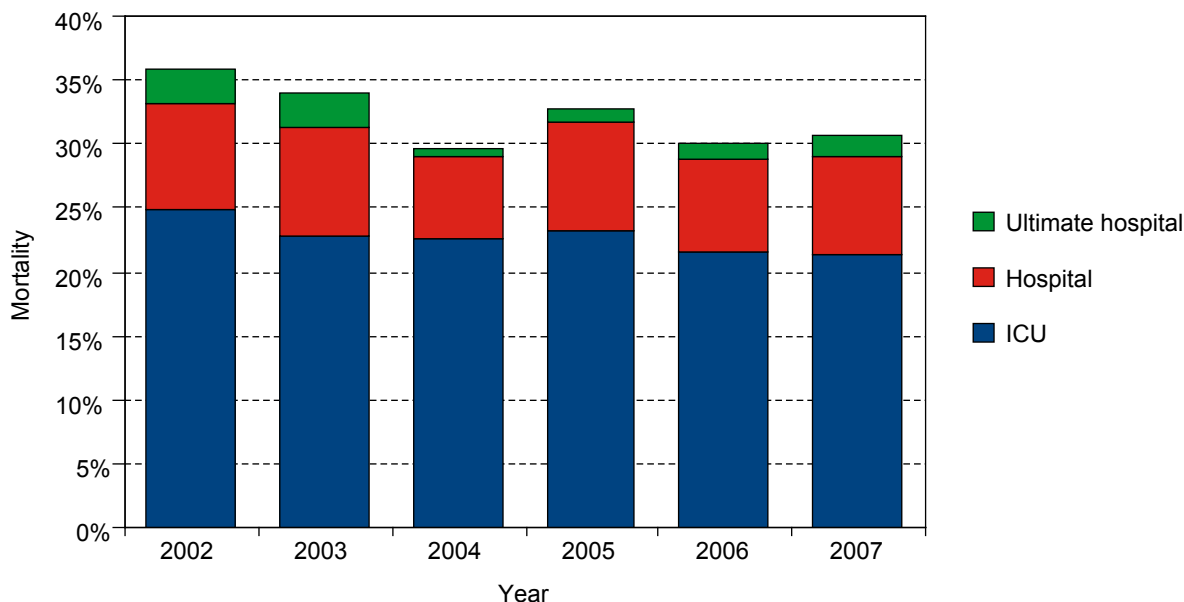


Note:  
 \* Scottish average.

These two graphs show that there is a clear distinction between HDUs and ICUs in the level of care they provide. Combined ICU / HDUs (Purple coloured letters) lie in between. Unit U also acts as a post-operative recovery unit which explains its high proportion of Level 1 patients. R2 has now amalgamated with ICU R. Unit Z1 is isolated with no ICU on-site so may have to provide level 3 care until a transfer is arranged.

## Section 3 Outcomes

**Figure 26 Crude mortality for patients with mortality predictions in ICU and Combined Units (2002-2007)**

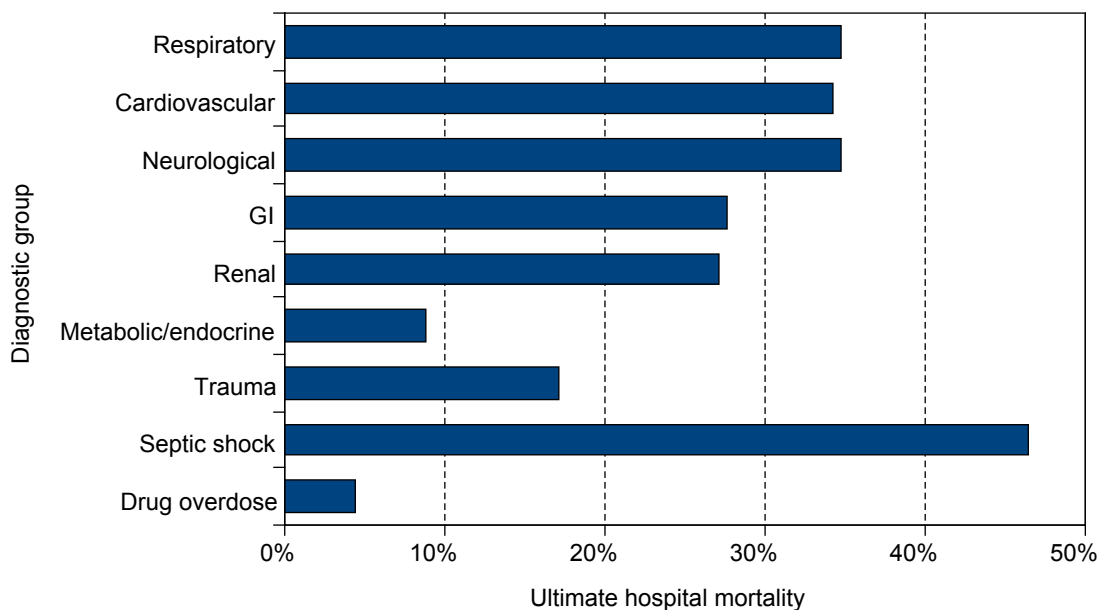


This chart shows a fluctuating but decreasing trend in crude mortality rates in Scotland between 2002 and 2007. The ICU mortality decreased from 25% to 22%. The ultimate hospital mortality relates to the status of final discharge from hospital. This is somewhat higher than the hospital mortality because of patients dying after being transferred to other hospitals. The ultimate hospital mortality decreased from 36% to 31%.

Crude ultimate hospital mortality for Scotland is 31% and varies between the units from 21% to 44%. The term 'crude mortality' means that these figures are not adjusted for differences in case-mix.



**Figure 27 Crude ultimate hospital mortality according to grouped APACHE II diagnosis in ICU and Combined Units (2007)**

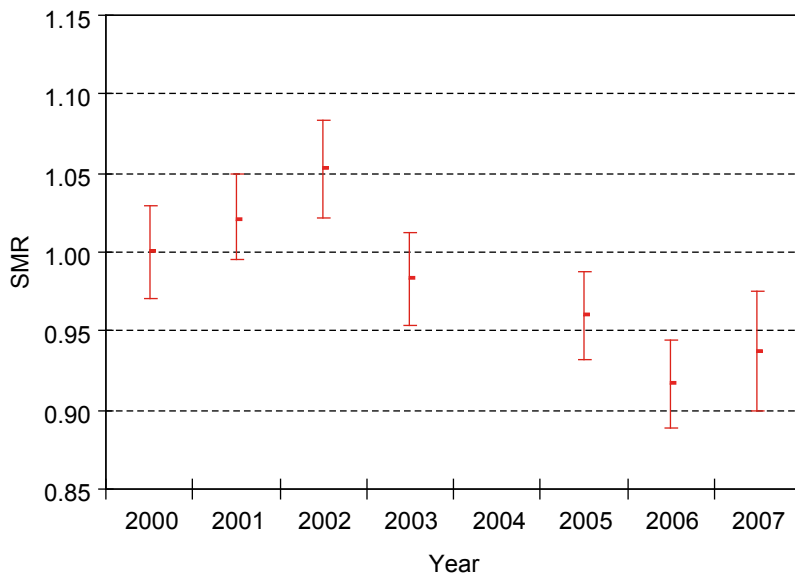


Note:  
Excludes admissions with no APACHEII mortality prediction.

Figure 27 illustrates the effect of a unit’s referral population or case-mix on mortality by sorting patients into diagnostic groups. It can be seen, for instance, that trauma diagnoses have a better outcome than patients with respiratory diagnoses. Septic shock has a high mortality in Scotland in 2007 and remains a significant challenge. Although high, this level of mortality is comparable to results from other international databases (Kumar *et al.* 2006).

Each individual unit treats a different population of patients. No scoring system adjusts for variations in this perfectly. The APACHE II scoring system has been used in this report to generate a Standardised Mortality Ratio (SMR). See Appendix 3 for methodology.

**Figure 28 Case-mix adjusted SMRs (APACHE II) in ICU and Combined Units (2000-2007)**



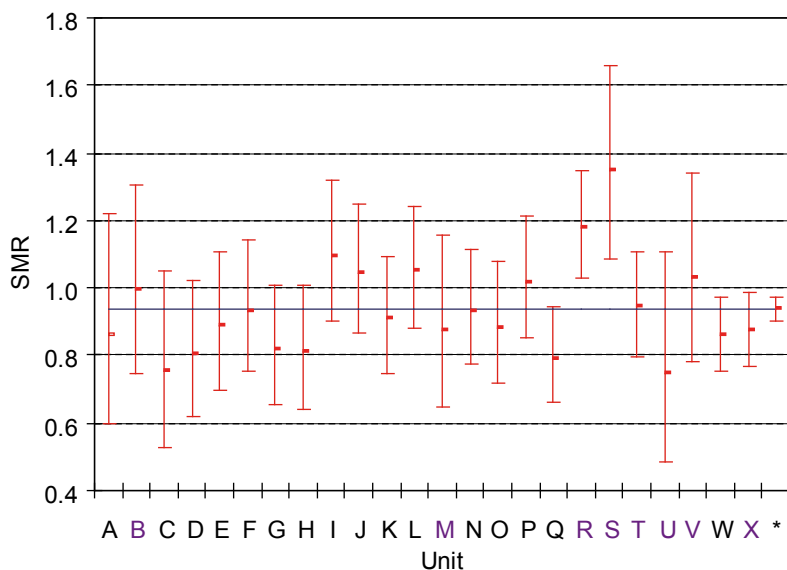
Note: Final outcome data was not collected in 2004.

Figure 28 shows the effect of adjusting crude mortality for case-mix and severity of illness for all Scottish units from 2000-2007 with the APACHE II system.

The Standardised Mortality Ratio (SMR) for patients admitted to ICU in Scotland has fallen over the last five years from 1.05 to 0.94 (incomplete data for 2004). The 2007 SMR is somewhat higher than 2006. However, the 95% confidence intervals of these two SMRs overlap, indicating that there is no statistically significant difference between 2006 and 2007 (figure 28).



**Figure 29 Case-mix adjusted SMRs (APACHE II) in ICU and Combined Units (2007)**



Note:  
 \* Scottish SMR.  
 No SMR for SGH Neuro ICU (only two months of data in 2007).

The pattern of SMRs across Scotland is remarkably uniform. There are many reasons which could explain significant statistical outliers, from mere chance, differences in data entry or diagnostic categories, to a real difference in standard of care. SICSAG uses 95% confidence intervals (2 standard deviations from the mean) to highlight units which might be different. In a UK context this is a strict definition which may be oversensitive. The Case-mix Programme of the Intensive Care National Audit and Research Centre, which fulfils a similar function to SICSAG in England and Wales, only highlights units who are 3 standard deviations from the mean.

Over the time that the audit has been running, various units have been statistical outliers one year and not the next. This strongly suggests that most variation is due to chance rather than true differences in care. The outcomes for individual units have been anonymised up to last year out of respect for the basis on which the audit was originally established: participation was voluntary and units were assured that they would not be identified. This was, and continues to be on the basis that Hospital and Health Board management are informed of their local unit's SMR and any significant variation is highlighted for explanation.

This policy now seems outdated, and the SICSAG Steering Group, with agreement from the Scottish Critical Care clinicians, decided to make units identifiable in this year's report.

Two units (R and S) have SMRs that are statistically significantly higher than the Scottish mean using the strict SICSAG definition. Unit R has an unusual case-mix in a hospital with a tertiary referral neurosciences centre and a regional oncology unit. It is well recognised that intensive care patients who have a neurological diagnosis are not well adjusted for by the APACHE II system (Livingston 2000). Severity of illness is underscored in this group as they are referred from other hospitals already sedated, and cannot then be assigned APACHE points for depressed levels of consciousness.

Unit S serves a population with a high level of deprivation and chronic ill health. The unit also had difficulties with data collection in 2007 and APACHE II scored only 37% of eligible patients (Scottish average 75%). SICSAG is helping with additional computer support in this unit.

On the basis of the limited variation in SMR between units, and the reduction in SMR across Scotland over time, the public and healthcare providers should be reassured by these results.

We recognise that quality of Critical Care is not just described by measuring mortality even if attempts are made to adjust this for case-mix. We have developed a range of performance measures, to include rates of Healthcare Associated Infections, and the use of evidence-based interventions to stand alongside this. In collaboration with the Scottish Critical Care community, Health Protection Scotland, and the Scottish Patient Safety Programme, we are helping individual units analyse data collected for these quality improvement measures.

## Conclusions

It is clear that ICU and HDU staff are involved in the care of an increasing proportion of patients admitted to hospital in Scotland. Patients admitted to Critical Care wards are often unstable and severely ill requiring the presence of highly trained professionals on a continuous 24-hour basis. These services, particularly HDU, are also vital for the safe delivery of elective surgical activity.

Doctors who are training to be consultants are an essential group of healthcare providers who possess the abilities, attitudes and skills to successfully deliver a safe, high quality Critical Care service, particularly 'out of hours'. We will face challenges in the next few years as we lose these doctors from a reduction in their numbers, the hours they are permitted to work, and consequent loss of experience.

Critical Care services in Scotland continue to evolve in response to changing standards of care, expectations, medical advances and reorganisation. HDU bed provision across Scotland requires a 'needs assessment', and the high quality care delivered by a 'closed' model (with dedicated Critical Care consultant time, as part of a multidisciplinary team) is what we should aim to provide. SICSAG will continue to audit service development in this area.

This report has been produced with the support of medical and nursing professionals in Critical Care across Scotland. They value the information presented for comparative benchmarking and quality assurance. This is not provided as a judgement of what is 'correct', but to inform quality improvement, highlight differences for explanation and give the Scottish public confidence that an effective audit exists of the care provided for the most seriously ill and injured patients in our hospitals. The consistent reduction in case-mix adjusted mortality in recent years, and the Critical Care community's continued commitment to improving the management of this group of patients demonstrates the level of service provided to the population of Scotland.



## Critical Care Capacity (funded beds) 2007

Hospital	ICU L3	Combined ICU/HDU L3/L 2	HDU L2 (L1)	Specialised Beds (using WW)	Additional Info
Ayr	4		4 HDU, MHDU (L1) SHDU (L1)		
Crosshouse	5.5		12 SHDU, 12 MHDU		HDU beds are funded for 6L2 and 6L1
BGH		4/2 +(2X L1)			
DGRI	4		4 SHDU, 8 MHDU+		+ Combined medical and CCU
QMH	7		8 SHDU, MHDU		
VHK			3/0		
SRI	9		SHDU, MHDU		HDUs joined audit Feb 08
ARI	14		8 SHDU, SHDU	4 NHDU	
Dr Grays, Elgin			HDU		To join audit 08
GRI	8		12 SHDU		
IRH	3		SHDU		HDU to join audit 08
RAH	7		12 SHDU+		+ predominantly surgical, admit medical HDU patients
Stobhill	5		4 SHDU		
SGH	5		6 SHDU	4 NHDU, 6 NICU	NICU joined audit 11/07
Vale of Leven			HDU		
VI	5		8 SHDU		
WIG/ GGH			7/2 10 HDU		
Belford, Fort William			HDU		
Caithness, Wick			HDU		
Lorn & Islands, Oban			HDU		
Raigmore	8		6SHDU, 4MHDU		
Hairmyres		5.25/3.1			HDU beds ↑ from 2-4 06/07
MDGH	5.3		8SHDU		
Wishaw		5.3/6.7	HDU (L1)		
RIE		13/5	10 HDU	6 + 2 Renal/SHDU 5 Transplant HDU	
SJH		3.2/1.6			
WGH		9/6.5	10 SHDU (L1)	4 NHDU	Level 2 beds (combined) ↑ from 6-7 07/07
GBH			1 HDU#		
Ninewells	7.5		10 SHDU, MHDU		MHDU to join audit 08
PRI	3		4 HDU		
W. Isles, Lewis			HDU#		
<b>Scottish TOTAL (units using ww only)</b>	<b>100.3</b>	<b>49.75/26.9 (+2XL1)</b>	<b>161</b>	<b>31</b>	

### Notes:

SHDU = Surgical, MHDU= Medical, HDU = combined Medical and Surgical HDU, NHDU/NICU = Neurological

# no additional funding for HDU beds within general wards

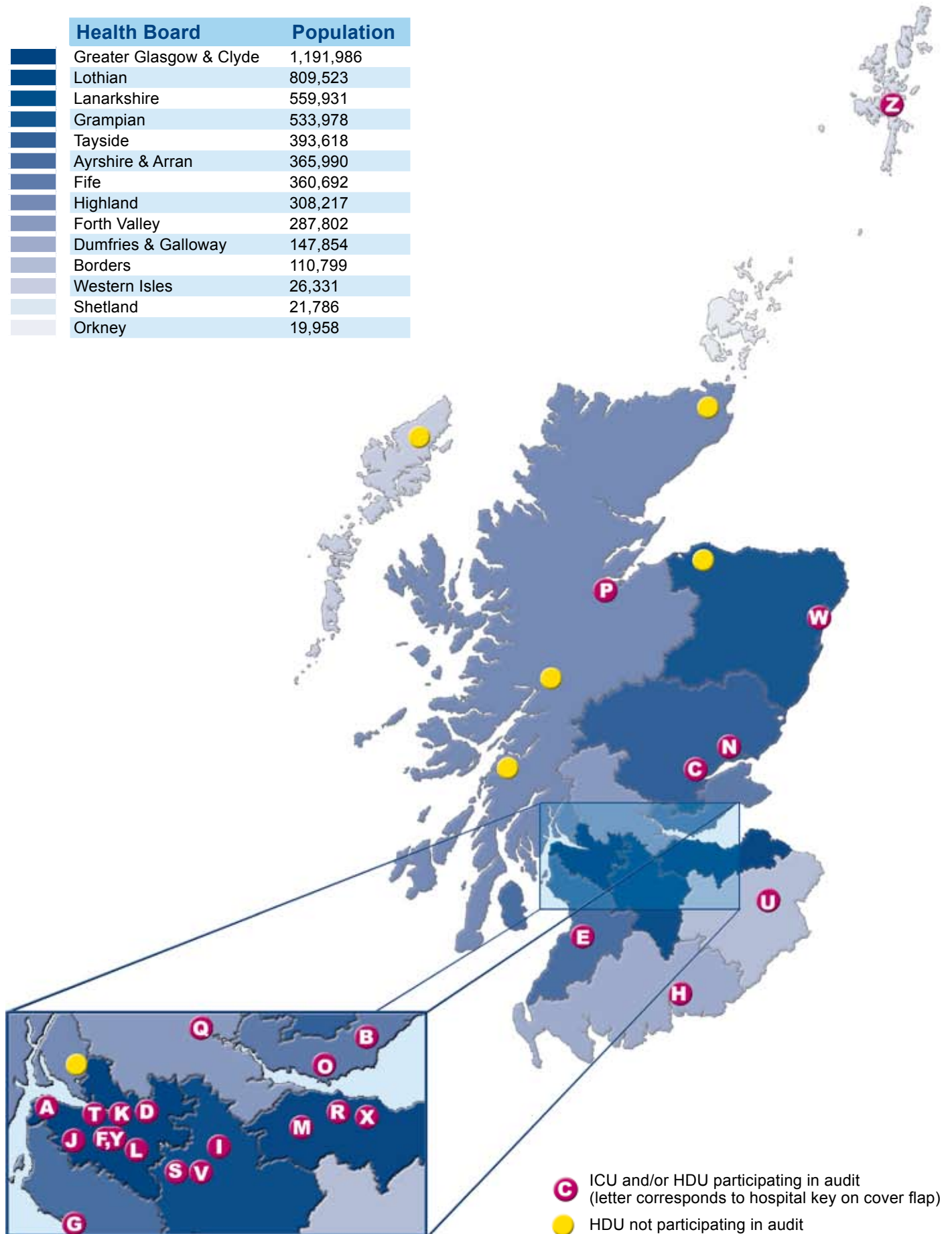
All General ICUs participate in the SICSAG Audit.

HDU L2 (L1) (3rd Column): This reflects a comprehensive view of all general (medical, surgical, combined medical/surgical) HDU beds throughout Scotland. The units coloured in blue do not currently participate in the audit.

In 2007, 60% of general HDUs participated in the audit. This will increase to over 74% in 2008 with a further five general HDUs joining SICSAG.

# ICUs and HDUs in Scotland

Health Board	Population
Greater Glasgow & Clyde	1,191,986
Lothian	809,523
Lanarkshire	559,931
Grampian	533,978
Tayside	393,618
Ayrshire & Arran	365,990
Fife	360,692
Highland	308,217
Forth Valley	287,802
Dumfries & Galloway	147,854
Borders	110,799
Western Isles	26,331
Shetland	21,786
Orkney	19,958





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Dumfries & Galloway Royal Infirmary	SHDU: Dr C Auld MHDU: Dr S Little
Gartnavel General Hospital	HDU: Dr A Binning
Gilbert Bain, Shetland	HDU: Dr B Poulton
Glasgow Royal Infirmary	SHDU: Mr E Dickson
Monklands Hospital, Airdrie	SHDU: Mr A MacDonald
Ninewells Hospital, Dundee	SHDU: Dr S Cole MHDU: Dr J Winter
Perth Royal Infirmary	HDU: Mr R Murdoch /Dr P Brown
Queen Margaret Hospital, Dunfermline	SHDU: Mr I Amin
Raigmore Hospital, Inverness	SHDU: Mr J Duncan MHDU: Dr G Franklin
Royal Alexandra Hospital, Paisley	SHDU: Mr R Alexander
Royal Infirmary of Edinburgh	HDU: Dr B Cook RHDU: Dr C Whitworth TRHDU: Mr J Forsythe
Southern General Hospital, Glasgow	SHDU: Dr D Wright NHDU: Dr L Stewart
Stirling Royal Infirmary	SHDU: Dr Chris Cairns
Stobhill Hospital	SHDU: Dr D Ure
Victoria Infirmary, Glasgow	SHDU: Dr H Dorrance
Western General Hospital, Edinburgh	NHDU: Dr T Russell

Notes:

SHDU = Surgical HDU

MHDU = Medical HDU

NHDU = Neurological HDU

RHDU = Renal HDU

TRHDU = Transplant HDU



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# Appendix 1

## Levels of Care

(as calculated by current version of WardWatcher)

Levels of care are calculated on a daily basis from the Augmented Care Period (ACP) section of WardWatcher. They are currently dependent on the assessed requirement for support of four different organ systems:

### Advanced respiratory support

- Connected to a ventilator via endotracheal tube (ETT) or tracheostomy

### Basic respiratory support

- Airway managed by ETT or tracheostomy
- Connected to a ventilator via mask or CPAP
- > 50% oxygen
- Potential need for ventilation via ETT or tracheostomy

### Cardiovascular support

- Receiving inotropes/vasopressors
- Circulatory instability due to hypovolaemia

### Renal support

- Intermittent or continuous haemofiltration/dialysis

### Neurological support

- Invasive neuro monitoring

## Calculation of Level of Care

### Level 3

- Advanced respiratory support or
- Two or more organ systems are being supported or
- One organ system is being supported and a different system is in chronic failure \*

### Level 2

- One organ system alone is supported or
- No organ is being supported but either there is a requirement for more observation or monitoring than could be provided safely on a general ward or there is a potential for deterioration.

### Level 1

- A patient is assessed as level one if not assessed as level two or three

\* chronic failure is collected from the PMH section of the history page.

The ACP page has been redesigned by the WardWatcher subgroup of SICSAG, taking into account the WardWatcher survey last year, removing or clarifying subjective or ambiguous questions and adding dermatological system to allow better comparison with the Critical Care minimal data set (CCMDS) used in England and Wales.



## New version of ACP page (2008 upgrade)

**WWatcher**  
File Edit Help

**ACP Details** ? **Hermione NEWSTYLE (4784)**

<b>Respiratory Support</b>	Invasive	Non-invasive			
Was this patient on a ventilator today? (Y/N) <input checked="" type="checkbox"/> Y	ETT	Trache	Mask/ Hood	Mask/ Cannulae	Nil
Connected to a ventilator	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>		
CPAP	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>		
O2 50% or more	<input type="radio"/>	<input type="radio"/>		<input type="radio"/>	
O2 less than 50%	<input type="radio"/>	<input type="radio"/>		<input type="radio"/>	
Nil					<input checked="" type="radio"/>
Intubation/reintubation considered at some point today (Y/N) <input type="checkbox"/>					
<b>Cardiovascular Support</b>					
Multiple IV vasoactive drugs and/or IV antiarrhythmics (Y/N)	<input type="checkbox"/>				
Single IV vasoactive drug or IV antiarrhythmic (Y/N)	<input type="checkbox"/>				
Cardiac output monitoring (Y/N)	<input type="checkbox"/>				
Type of cardiac output monitoring	▼				
Circulatory instability due to hypovolaemia (Y/N)	<input type="checkbox"/>				
Central venous catheter (including dialysis catheter) (Y/N)	<input type="checkbox"/>				
Arterial line (Y/N)	<input type="checkbox"/>				
<b>Renal Support</b>					
Acute renal replacement therapy (haemofiltration/dialysis) (Y/N)	<input type="checkbox"/>				
<b>Neurological Support</b>					
Invasive neuro monitoring (eg ICP, jugular bulb) (Y/N)	<input type="checkbox"/>				
Requiring 1:1 nursing due to severe agitation or epilepsy (Y/N)	<input type="checkbox"/>				
CNS depression sufficient to prejudice airway (NOT due to sedation) (Y/N)	<input type="checkbox"/>				
<b>Gastrointestinal Support</b>					
Parenteral nutrition (Y/N) <input type="checkbox"/>	Enteral nutrition (Y/N) <input type="checkbox"/>				

**Dermatological Support**

Major skin rashes/exfoliation or burns (Y/N)

Use of multiple trauma dressings (Y/N)

Complex dressing (eg open abdomen, large skin areas) (Y/N)

**Other Support**

Epidural infusion (Y/N)

**Other Monitoring**

Needs more monitoring than available on a general ward (Y/N)

**Locally defined ACP (Y/N)**

<No questions>

Date:

Data collected by:

Day:

## Levels of Care (2008 upgrade)

The updated version will score levels of care based on support of five different organ systems: respiratory, cardiovascular, renal, neurological and dermatological. GI section (enteral or parenteral feeding) will not count towards level of care.

## Calculation of levels of care (2008 upgrade)

### Level 3

- Unchanged from current method

### Level 2

- one organ supported (five systems above)

### Level 1

- epidural only or
- general observations requiring more monitoring than can be provided on a general ward.

# Appendix 2

## Methodology

### Data collection

Data were collected prospectively from all general adult ICUs and the majority of HDUs using the WardWatcher system developed for this purpose. In the first half of 2008, the National Audit Team and IT support team from ISD worked closely with staff in units to facilitate the electronic uploading of encrypted data to secure ISD servers. These data were received by April 2008 and then merged into a number of large datasets. Validation queries relating to discharges and final treatment outcomes, ages and missing treatment information were then issued and fed back to individual units for checking by Local and Regional Audit Co-ordinators.

Along with the measures taken to ensure data validity, the comprehensiveness of the data and size of the merged datasets (incorporating data on all admissions to participating units during 2007) ensures that the findings included in this report have a high degree of reliability at a national, health board and individual unit level.

### Presentation of the data

Data presented in this report are for patients receiving care in a participating ICU or HDU between 1st January 2007 and 31st December 2007.

The analysis of the data and the presentation of the findings were broadly based on that adopted in previous annual reports. However, a few significant differences should be noted.

1. Additional analyses address the most prevalent diagnoses within Critical Care units
2. Levels of care.

Furthermore, data from HDUs are included for the second time in this annual report, so some trends may begin to become apparent. We have also chosen to curtail the level of graphical detail provided in respect of some subject areas (e.g. pulmonary artery flotation catheters), addressing these instead in the commentary. Figures not available in this report (along with more detailed information about subject areas that are included) are available on the SICSAG website ([www.sicsag.scot.nhs.uk](http://www.sicsag.scot.nhs.uk)).



## Funnel Plots

To show the differences between units, many figures are shown in funnel plots.

In a funnel plot, a performance indicator is shown on the y-axis, while the number of admissions is shown on the x-axis. There is a data point for every unit in the funnel plot.

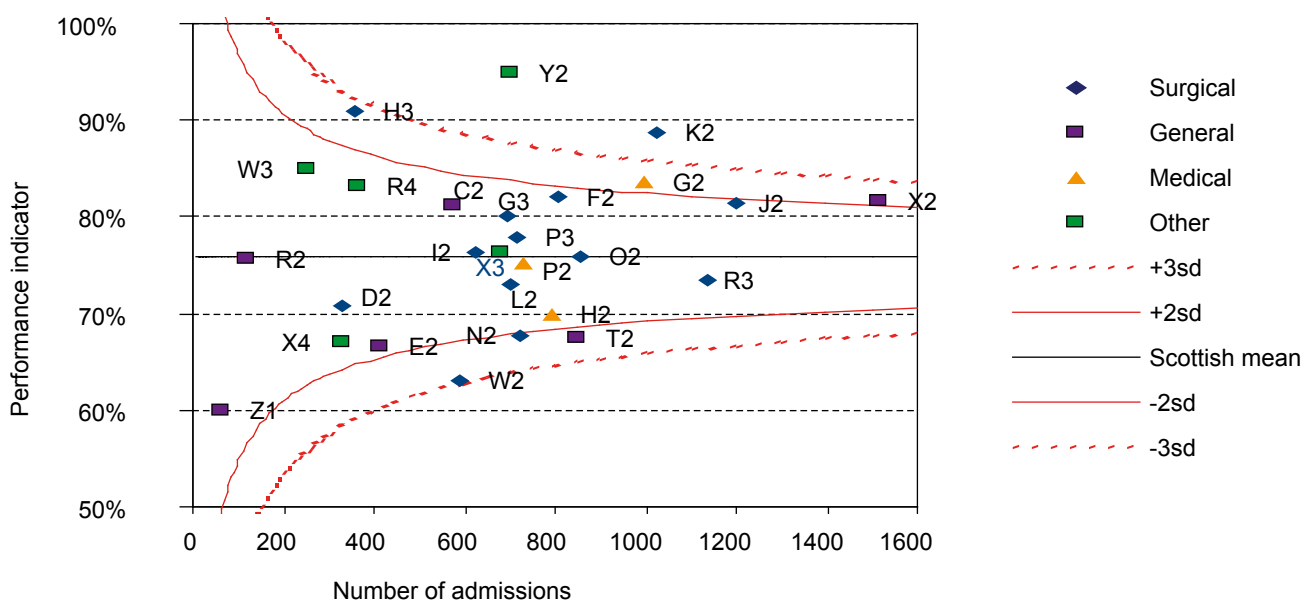
Furthermore, the plot shows the Scottish mean as a horizontal line across the number of admissions. The funnel plot also shows confidence intervals for the performance indicator across the number of admissions. Because the confidence intervals get smaller as the numbers of admissions get larger, the shape of a funnel appears.

When a unit's performance indicator falls outside the confidence intervals, that unit might be different from the rest. In our funnel plots we present two confidence intervals. The inner curves correspond with 2 standard deviations from the Scottish mean, while the outer curves correspond with 3 standard deviations from the Scottish mean.

Units whose performance indicator is outside the outer confidence interval are considered to be different from the majority of other units. Differences may arise from many sources: differences in data accuracy, case-mix, service provision or practice. Sometimes a difference is just a random difference ('caused' by chance alone).

For some performance indicators, more than a few units are outside the outer confidence intervals. This typically arises when the units are heterogeneous, for instance ICU versus Combined units, or surgical versus medical HDUs. Then small institutional factors contribute to more variability than would be expected by chance alone. These differences may not be particularly important nor point to real differences in the performance indicators. Although the positions of the units differ in statistical sense, they might not be of any clinical significance. To account for excess variability the confidence intervals can be adjusted in several ways. In this report they are calculated with a procedure derived from Spiegelhalter (2005).

**Figure A2-1 Example Funnel Plot for HDU**



## Appendix 3

### APACHE II

The outcome measure used by SICSAG is the patient's survival status (alive or dead) when they finally leave hospital (even if this is not the original hospital to which the patient was admitted). Patients admitted to Intensive Care Units are at significant, but varied, risk of death. Simply comparing the proportion of patients who die in each unit can give a misleading impression because the severities of their illnesses are different. To overcome this, we use the APACHE II system to adjust for case-mix (Knaus *et al.* 1985). This is a validated scoring system (Livingston *et al.* 2000), which takes account of both the patient's acute condition and their chronic health.

Certain groups of patients are excluded:

- less than 16 years of age
- stay less than 8 hours
- readmitted to the same ICU during the same hospital admission
- have a primary diagnosis for which the system was not developed: burns, coronary artery bypass graft, liver transplant.

WardWatcher provides similar codes as reasons for excluding unit admissions from APACHE II scoring. These were re-coded to reflect the hierarchy of decision-making within units. Automatic exclusions such as 'diagnosis', 'patient under 16' and 'patient stayed for less than eight hours' were excluded first and existing codes changed to reflect this prioritisation. Readmissions were excluded next, followed by 'other' cases where no rationale for automatic exclusion was provided. The remaining exclusions were optional - where it was possible to generate a score but this was not done (e.g. HDU patients).

If unit admissions are scored, case-mix adjusted mortality estimates may only be calculated in cases where an appropriate diagnosis is available. All exclusions and cases with missing or inappropriate diagnoses (e.g. liver transplant) are shown schematically in the decision tree on page 36.

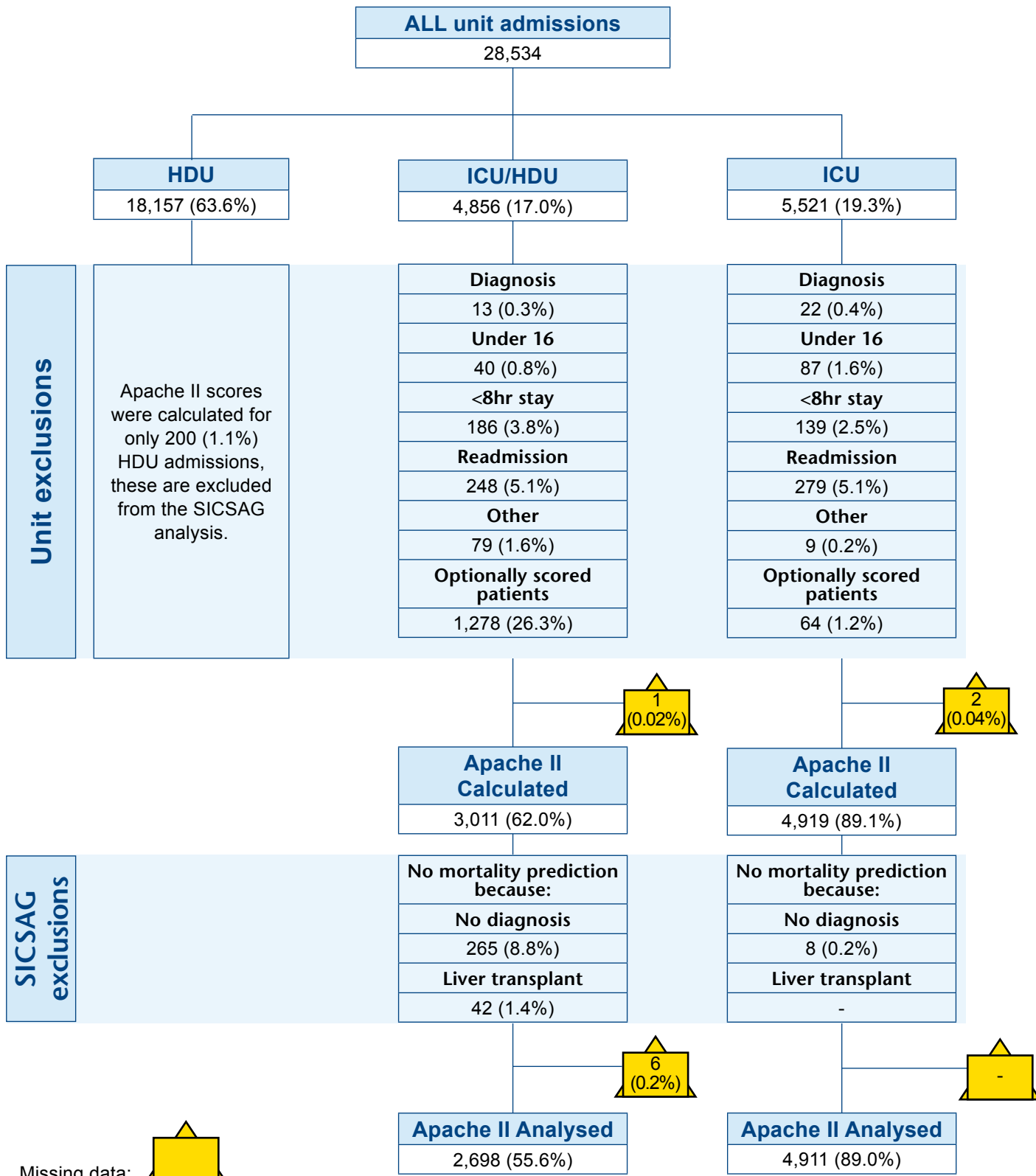
APACHE II produces an expected mortality rate for a unit which can be compared to the actual observed mortality rate to give a standardised mortality ratio (SMR). An SMR significantly greater than 1 suggests that mortality is higher than expected, and a value of less than 1 that it is lower than expected. It is important to interpret SMRs with caution. It should be appreciated that whilst the system adjusts for case-mix, it does not do so perfectly, as has been highlighted in previous reports, and also is now nearly 30 years old. Many units admit a relatively small number of patients each year and the confidence intervals around the SMR are therefore wide. Exact confidence intervals for standardised mortality ratios are calculated by the method described by Ulm (1990).

### Patient Linkage

A further important element in achieving accurate estimates of patient mortality was an exercise to link multiple unit admissions in relation to individual patients. Many patients move between ICU and HDU (in both directions) or to Critical Care units in other hospitals and in the absence of CHI numbers for all cases, it is important not to double count them. Data on around 28,600 unit admissions in 2007 were examined for similarities in patient's identifying characteristics. Cases were then selectively matched on the basis of these criteria to create approximately 22,400 individual patient identifiers. Different unit admissions relating to each patient were then examined for continuity and separate treatment episodes identified. These treatment episodes were subsequently used to generate further validations in cases involving multiple unit admissions and to enable the accurate matching of final outcome (i.e. mortality) data.



# Eligibility for APACHE II scores and selection for analysis



## References

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## Hospital Identification List

Hospital	Abbreviation	Unit	Letter
Inverclyde Royal Hospital	IRH	ICU	A
Victoria Hospital, Kirkcaldy	VHK	ICU/HDU	B
Perth Royal Infirmary	PRI	ICU	C
		HDU	C2
Stobhill Hospital	Stobhill	ICU	D
		Surgical HDU	D2
Ayr Hospital	AYR	ICU	E
		HDU	E2
Southern General Hospital	SGH	ICU	F
		Surgical HDU	F2
Crosshouse Hospital	Crosshouse	ICU	G
		Medical HDU	G2
		Surgical HDU	G3
Dumfries & Galloway Royal Infirmary	DGRI	ICU	H
		Medical HDU	H2
		Surgical HDU	H3
Monklands District General Hospital	MDGH	ICU	I
		Surgical HDU	I2
Royal Alexandra Hospital	RAH	ICU	J
		Surgical HDU	J2
Glasgow Royal Infirmary	GRI	ICU	K
		Surgical HDU	K2
Victoria Infirmary Glasgow	VI	ICU	L
		Surgical HDU	L2
St John's Hospital	SJH	ICU/HDU	M
Ninewells Hospital	Ninewells	ICU	N
		Surgical HDU	N2
Queen Margaret Hospital	QMH	ICU	O
		Surgical HDU	O2
Raigmore Hospital	Raigmore	ICU	P
		Medical HDU	P2
		Surgical HDU	P3
Stirling Royal Infirmary	SRI	ICU	Q
Western General Hospital	WGH	ICU/HDU	R
		HDU	R2
		Surgical HDU (Level1)	R3
		Neuro HDU	R4
Hairmyres Hospital	Hairmyres	ICU/HDU	S
Western Infirmary Glasgow	WIG	ICU/HDU	T
Gartnavel General Hospital	GGH	HDU	T2
Borders General Hospital	BGH	ICU/HDU	U
Wishaw General Hospital	Wishaw	ICU/HDU	V
Aberdeen Royal Infirmary	ARI	ICU	W
		Surgical HDU	W2
		Neuro HDU	W3
Royal Infirmary of Edinburgh	RIE	ICU/HDU	X
		HDU	X2
		Renal HDU	X3
		Transplant HDU	X4
Southern General Hospital		Neuro ICU	Y
		Neuro HDU	Y2
Gilbert Bain Hospital	GBH	HDU	Z1

[www.sicsag.scot.nhs.uk](http://www.sicsag.scot.nhs.uk)  
[www.scottishintensivecare.org.uk](http://www.scottishintensivecare.org.uk)