



**Audit of Critical
Care in Scotland.**

SICS
scottish intensive care society

2016 report – reporting on 2015.

© NHS National Services Scotland/Crown Copyright 2016

First published October 2009

ISBN: 978-1-84134-014-2

Brief extracts from this publication may be reproduced provided the source is fully acknowledged. Proposals for reproduction of large extracts should be addressed to:

ISD Scotland Publications
Information Services Division
NHS National Services Scotland
Gyle Square
1 South Gyle Crescent
Edinburgh EH12 9EB
Tel: +44 (0)131-275-6233
Email: nss.phigraphics@nhs.net

Designed and typeset by:
ISD Scotland Publications

Translation Service

If you would like this leaflet in a different language, large print or Braille (English only), or would like information on how it can be translated into your community language, please phone 0131 275 6665.

Foreword

The Scottish Intensive Care Society Audit Group (SICSAG) is a national critical care audit, funded through Information Services Division (ISD). This annual report describes the activities and outcomes for Scottish Intensive Care Units (ICU) and High Dependency Units (HDU) in 2015. It is a continuation of the original critical care outcomes audit and has covered an ever expanding national dataset since 1995.

The overall aim of SICSAG is to improve the quality of care that is delivered to critical care patients across Scotland by continuous monitoring and comparison of activities and outcomes. SICSAG's aims are closely aligned with the Scottish Government's strategic vision for Healthcare Quality in Scotland¹ and the 2020 Vision².

This national audit continually seeks to evolve and improve which is reflected in the introduction of new metrics and a refreshed presentation of complex data. The continued expansion of the audit together with the increasing number of units now participating means that for 2015 we report on over 46,000 of our hospitals' sickest patients.

The report provides transparent quality assurance regarding the outcomes and quality of care for this group of critically ill patients, informing the public, government and other healthcare professionals. To the best of our knowledge this audit remains the only one in the world which reports outcomes against named and identified ICUs to this level of public scrutiny and detail. In addition, we continue our close collaboration with Health Protection Scotland (HPS) to collect, analyse and report on Healthcare Associated Infection (HAI) Surveillance across Scottish ICUs.

A key finding from the 2015 data is that the overall Scottish ICU Standardised Mortality Ratio (SMR) demonstrated a slight increase compared to previous years. This year on year increase has been observed in the past when there have been individual units who have been outliers. As in previous years, there are outlying units, with the overall spread of SMR's being less tightly grouped than the preceding year's report.

Measures of success this year include, the reporting of professionally agreed Minimum Standards and Quality Indicators across critical care in Scotland³. We continue to report in a detailed and transparent way on individual unit adherence to SICSAG process and outcome measures. These standards have been extensively updated in 2016 allowing greater alignment with those published in Guidelines for the provision of Intensive Care Services (GPICS) for England and Wales⁴. We will report on new and improvement standards in 2017⁵.

I note that some units are struggling with the provision of time to collect data and would once again urge health boards to continue to provide the necessary infrastructure and support required to ensure that units are able to fully participate in the provision of accurate and timely data for this internationally respected quality assurance program. We continue to support units through the publication of this data in order to improve both patient care and patient experience in critical care Units across Scotland.

The continued success of the audit would not be possible without the ongoing commitment, enthusiasm and support of the entire Scottish critical care clinical community. I would strongly encourage clinicians and management to take the time to read this report with particular reference to their local board level data. This data, when compared with national data, can be a powerful tool to drive ongoing improvement and to make local changes.

Particular thanks go to the SICSAG steering group, Paul Smith (National Clinical Coordinator), Lorraine Smyth (Senior Information Analyst), Clare McGeoch (Quality Assurance Manager), Roselind Hall (Regional Coordinator), and the network of Local Audit Leads and Team Coordinators.

Dr Stephen Cole

Chairman

Contents

Foreword	i
Key findings	1
Introduction	2
Section 1 Outcomes	4
Section 2 Quality Indicators	7
2.1 Current status and changes in practice	7
2.2 Focus on ICUs and combined units	8
2.3 Focus on HDUs	11
Section 3 Activity	14
3.1 Number of admissions	14
3.2 Bed occupancy	19
3.3 Length of stay	20
3.4 APACHE III diagnosis	21
3.5 Night time admissions	22
3.6 Focus on delayed discharges	23
3.7 Organ donation	27
Section 4 Interventions	28
4.1 Level of care	28
4.2 Respiratory support	30
4.3 Cardiovascular support	31
4.4 Renal support	32
4.5 Nutrition	33
Section 5 Surveillance of HAIs in ICUs	34
5.1 Data collection and patient population	34
5.2 The epidemiology of HAI in ICU	35
Conclusion	41
Appendix 1 ICU profiles 2015	42
Appendix 2 HDU profiles 2015	43
Appendix 3 Eligibility for APACHE II scores and selection for analysis (2015)	45
Appendix 4 Level of care	46
Appendix 5 HAI Reader's Notes	47
Appendix 6 List of abbreviations	48
List of References	49

Key findings

- This year the SMR for one unit, Unit W (ARI ICU), is an outlier to 2SD and hence using the strict SICSAG definition, may be statistically significantly different from the rest of Scotland. We would refer readers to the comments following figure 3 for caveats and explanation.
- Unit K (GRI ICU) was shown to have statistically fewer deaths than expected using the APACHE mortality prediction scoring system, please see figure 3.
- There were over 46 000 admissions to critical care in 2015, this is higher than numbers reported in previous years and reflects an increase in the number of participating units.
- Compliance with the **Quality Indicators for critical care in Scotland 2012³** are published for the fourth time.
 - Each patient should be seen daily by an appropriately trained consultant and have a written management plan. In 2015 79% of ICUs and 82% of HDUs were complying with this indicator, both an improvement from 2014.
 - A small number of discharges are classified as ‘**Early**’ – before the patient is clinically ready. There is considerable variation in the percentage of early discharges between units.
 - 96% of ICUs and 86% of HDUs have a Healthcare Associated Infection (HAI) surveillance system in place.
 - 92% of ICUs and 71% of HDUs have **Morbidity and Mortality** meetings where all significant critical care incidents are discussed in an open forum for staff.
- In 2015, the bed occupancy rate for Scotland remained stable with ICU and combined units at 73% and HDUs at 77%. There was considerable variation in occupancy between the HDUs.
- **Delayed discharges** continue to be a problem for critical care. The main reason recorded for the delays were bed shortages in other areas of the hospital downstream.
- The intensity of treatment remains high with 68% of patients treated in ICU and combined units receiving level 3 care and 65% of patients treated in High Dependency Units receiving level 2 or higher care. Level of care definitions are based on the Intensive Care Society Standards 2009⁶ (Appendix 4).

HAI Key points

- Infection rates remain unchanged from 2014 and in total 2.8% of patients included in surveillance developed an HAI. Of the patients included, 1.3% developed pneumonia and 1.5% had a bloodstream infection.
- The data indicate that there was a temporal association with central venous catheter use for the majority of bloodstream infections reported.
- Units should continue to collect high quality surveillance data. With the growing threat of antimicrobial resistance, units should focus on the complete collection of antimicrobial resistance data for all infections.
- Surveillance of HAI in ICUs is a mandatory requirement for all NHS boards⁷.

Introduction

SICSAG continues to work within the Scottish critical care community and other NHS bodies to promote person-centred care with the focus on safety and improved quality of care and outcomes as set out in the Healthcare Quality Strategy for NHS Scotland 2010¹ and 2020 Vision².

SICSAG is recognised as an audit that uses data intelligently to enable improvements to care for critical care patients. The 2014-15 annual report of the Chief Medical Officer of Scotland, Dr Catherine Calderwood, recognises that data are powerful and important influencers for improving patient care. In particular SICSAG is commended for its work in quality improvement where Dr Calderwood states,

“...[SICSAG is] a system that is now being used to inform and design ways that routine data like these can be used to design routine quality monitoring and improvement systems across the country.”

Dr Catherine Calderwood,
Chief Medical Officer of Scotland,
Annual Report 2014-15, Page 27⁸

This is the second year that the SICSAG annual report is published in collaboration with critical care HAI data from Health Protection Scotland (HPS). This significant collaborative working relationship towards person-centred quality care for critical care patients in Scotland will continue and expand in the future.

This year we are reporting on the management of 14,529 patients admitted to ICU and combined units (units with a combination of ICU and HDU beds) and 31,490 patients admitted to HDU during 2015.

This report summarises data that have been collected via a bespoke electronic database (WardWatcher), within critical care Units in Scotland. From 2016 we are embarking on an ambitious project to build a new data collection platform that will enable the audit to continue to fulfil its core objectives and improve data collection.

The format of the report starts with units' compliance with outcomes aligned to SICSAG Minimum Standards & Quality Indicators. It then follows the patient's journey through to activity, levels of care and interventions.

The information presented is for comparative benchmarking to highlight differences and inform quality improvement and is not intended as a judgement of what is 'correct'. We recommend units who are outliers to examine the reason for this. Careful judgement should be taken when interpreting the control charts used in this report and reference can be made to the appendix and web site for explanations on methodology and interpretation of these charts that can suggest some reasons why units may be different.

The codes used in the charts to identify each unit can be found in the front and back flaps of paper copies or on the last page of the electronic copy and are consistent with previous years.

SICSAG developments

Quality Indicators

We are reporting for the fourth year Quality Indicators (QIs) for critical care in Scotland³, which were developed and published by The Scottish Intensive Care Society Quality Improvement Group. All QIs are now under the SICSAG Steering Group's governance procedures.

Since the initial indicators were published there have been some new developments particularly with the recent publication by the Intensive Care Society (ICS) and the Faculty of Intensive Care Medicine (FICM) of Guidelines for the Provision of Intensive Care Services (GPICS)⁴. These also have a number of core standards embedded within them and so it seems reasonable at this time of detailed review, to try to align the English and Welsh standards with the Scottish standards wherever appropriate. From August to October 2015 a wide ranging review by the SICS Quality Improvement Group took place, which consulted clinicians across the critical care community in Scotland.

These revised Minimum Standards and Quality Indicators⁵ are defined as being person centred, safe, effective, evidence based, equitable and timely and are in line with the Route Map to the 2020 Vision for Health and Social Care by NHSScotland¹ and should all be measurable, realistic and achievable. For many, they will be stretching and we recognise fully that these are aspirational in many cases. Our aim continues to be quantifying, documenting and where possible, improving the quality and standards of critical care provided throughout Scotland. For the first time in this report we have developed Quality Indicators and Standards based on the needs of other members of the multidisciplinary team such as Allied Health Professionals and Nursing staff within the critical care community.

Clinical Outcomes and Measures for Quality Improvement working group (COMQI)

SICSAG remains part of the Scottish Healthcare Audits (SHA) which maintains and supports a spectrum of clinical audits across Scotland, involving a wide range of clinical, government and voluntary sector stakeholders.

The work of the SHA is accountable to the Clinical Outcomes and Measures for Quality Improvement working group (COMQI), joint chaired by Dr Aileen Keel and Professor Jason Leitch.

New Units

Aberdeen Medical HDU joined the audit in July 2015.

Obstetric HDUs

The Princess Royal Maternity Obstetric HDU in Glasgow joined SICSAG during 2015. Whilst we have been unable to add other obstetric HDUs in 2015 we are hopeful to have 3 join the audit during 2016. These potential units are at Royal Infirmary Edinburgh, Aberdeen Royal Infirmary and at the Queen Elizabeth University Hospital.

Non-NHS critical care

SICSAG recognises that every patient in Scotland regardless of provider should expect the best possible care. This position was endorsed by the audit Steering Group in 2015 after initial inquiries from a non-NHS critical care in Scotland seeking to join the audit.

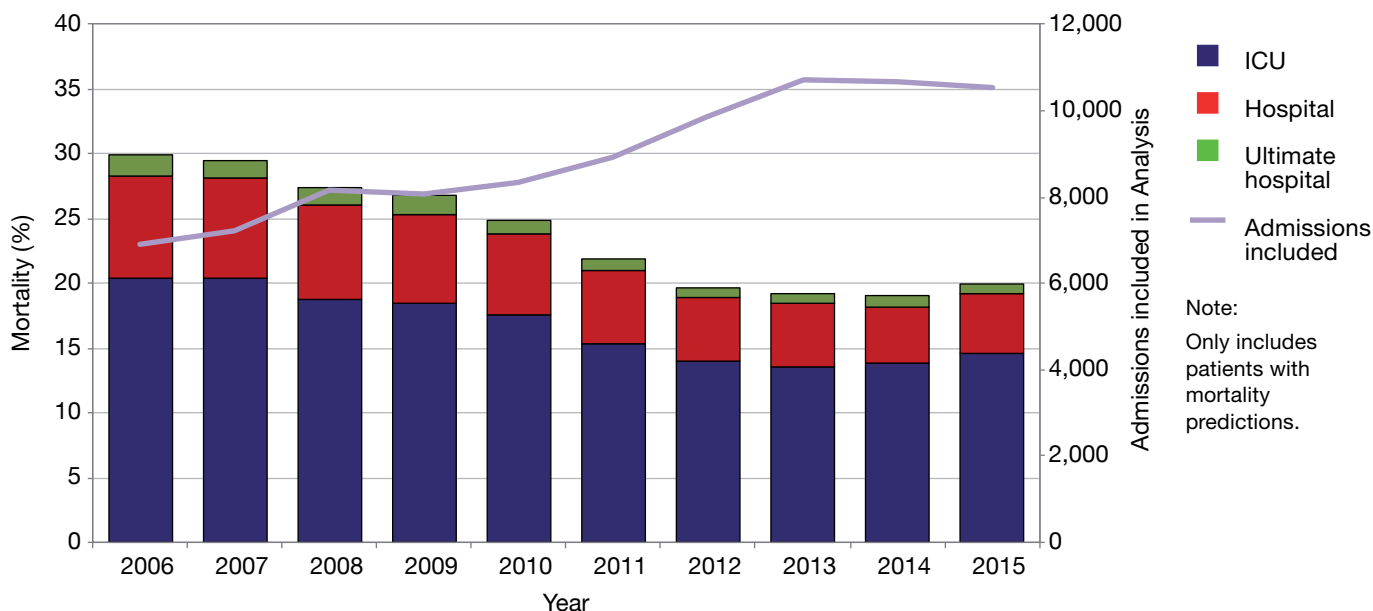
Whilst SICSAG welcomes this inquiry, the process of resource allocation needs to be appropriate for any unit's inclusion. We will continue to seek ways to include this non-NHS unit into the audit during 2015-16.

Paul Smith

National Clinical Coordinator

Section 1 Outcomes

Figure 1 Scottish crude mortality of patients in ICU and combined units (2006-2015)



Crude mortality in patients admitted to ICUs and combined units is at similar levels to previous years. In 2015 20% of patients died before their ultimate discharge from hospital. It should be remembered that the above chart is not adjusted for illness severity or case-mix, which can change over time.

Figure 2 Scottish Standardised Mortality Ratios in ICU and combined units, using the Standard APACHE II model (2006-2015) and Recalibrated APACHE II model (2009-2015)

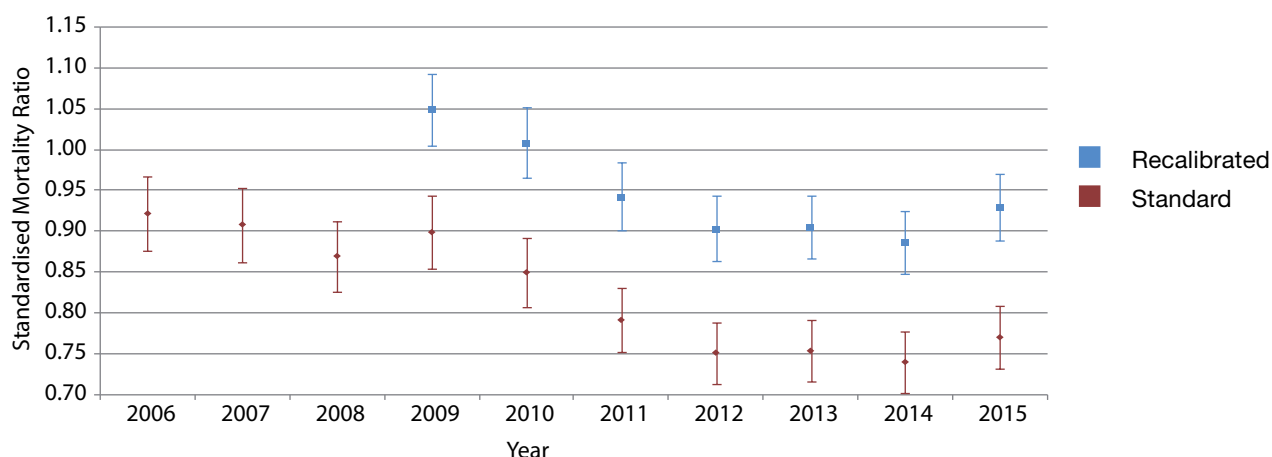


Figure 2 shows the Standardised Mortality Ratio (SMR) where the actual mortality is compared with expected mortality, using Acute Physiology and Chronic Health Evaluation (APACHE) II methodology (see SICSAG website). This allows a better comparison of mortality over time as illness severity and case-mix are adjusted for. The APACHE II scoring system was recalibrated to better reflect a Scottish population. The standard APACHE however is included in figure 2 for international comparison.

Both models follow a similar pattern over time, and in 2015 the SMR for both had increased slightly compared to last year, although this is not a significant difference. The standard SMR was 0.77 and the recalibrated model was 0.93.

Figure 3 Standardised Mortality Ratios using recalibrated APACHE II model in ICU and combined units (2015)

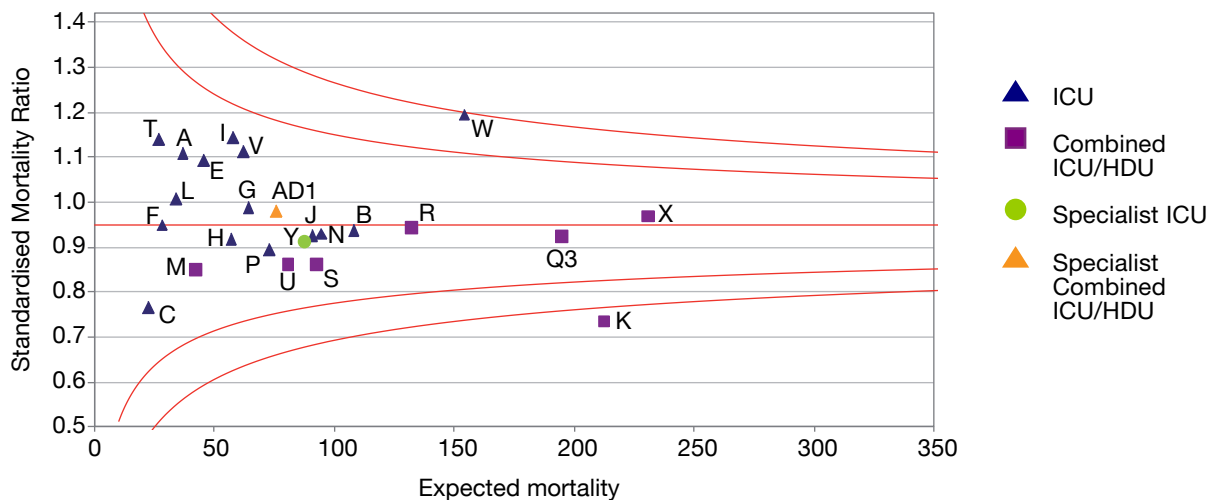


Figure 3 shows the SMR for ICU and combined units and is calculated using the recalibrated model.

This year the SMR Unit W (ARI ICU) is an outlier to 2SD and hence, using the strict SICSAG definition, may be statistically different from the rest of Scotland. Experience in this and other audits suggests that, with the number of units in the audit, it is possible that one or two units may appear to be different at this level of significance simply due to chance. 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.

While this could be due to chance, we do not take this finding of possible differences lightly and as such Unit W became subject to the SICSAG governance process. This process includes informing the unit (unit clinicians and senior hospital managers) before publication of this report, and Unit W completing a comprehensive review of their practice and data collection methodology⁹. The governance process also recommends commissioning an external review of this result which is ongoing for Unit W at the time of publication.

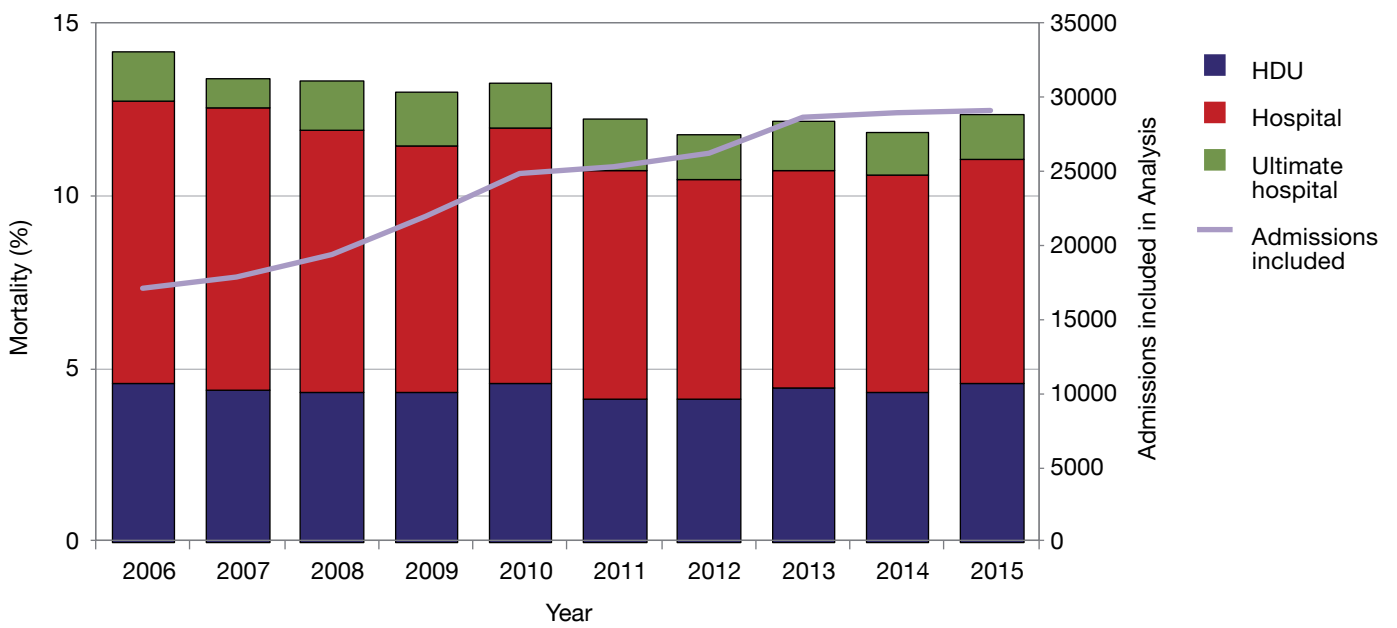
Unit W is a tertiary referral centre, and as such severity of illness can be underscored in this group as they are referred from other hospitals already sedated, and then cannot be assigned APACHE points for depressed levels of consciousness¹⁰.

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, however the Scottish public should be reassured by these findings and the action we have taken to ensure that patient safety is our first priority.

The decision was taken not to include Queen Elizabeth University Hospital in the SMR chart until a full year data was collected, this was to give time for the new unit to embed into the audit and the routine of data collection

Unit K (GRI ICU) was shown to have statistically fewer deaths than expected using the APACHE mortality prediction scoring system.

Figure 4 Scottish crude mortality of patients in High Dependency Units (2006-2015)



Crude mortality in patients admitted to HDUs is at similar levels to previous years. In 2015 12% of patients died before their ultimate discharge from hospital.

Section 2 Quality Indicators

2.1 Current status and changes in practice

Figure 5 Percentage of units complying with the Quality Indicator (2015)

Units improved from last year to fully achieve an indicator

Units no longer achieving an indicator

Units continuing not to meet an indicator

Key	Hospital Name and department
AYR ICU	Ayr Hospital ICU
WIH HDU	Western Isles Hospital HDU
Ninewells OHDU	Ninewells Obstetric HDU
DGRI MHDU	Dumfries & Galloway Royal Infirmary Medical HDU
DRGI SHDU	Dumfries & Galloway Royal Infirmary Surgical HDU
ARI NHDU	Aberdeen Neurological HDU
IRH SHDU	Inverclyde Royal Hospital Surgical HDU
Balfour HDU	Balfour HDU
ARI SHDU (Ward 503)	Aberdeen Royal Hospital Surgical HDU (Ward 503)
ARI CHDU	Aberdeen Royal Hospital Cardiothoracic HDU

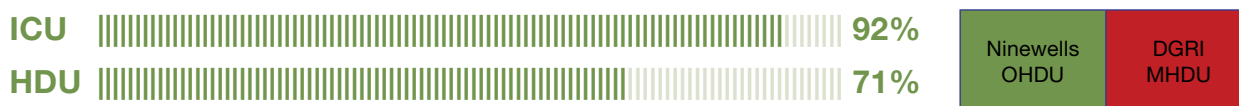
Daily written management plan



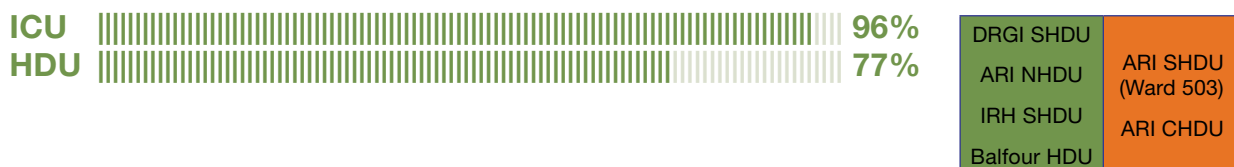
HAI surveillance system



Morbidity & Mortality Meetings



Patient/Family Survey



2.2 Focus on ICUs and combined units

Early discharge is defined as a transfer that is not in the best interest of a patient but necessary due to pressure on beds or staffing. Unit X (RIE ICU) had the highest percentage of early discharges at almost 10%. No units were significantly different from the figure reported last year (Figure 6a).

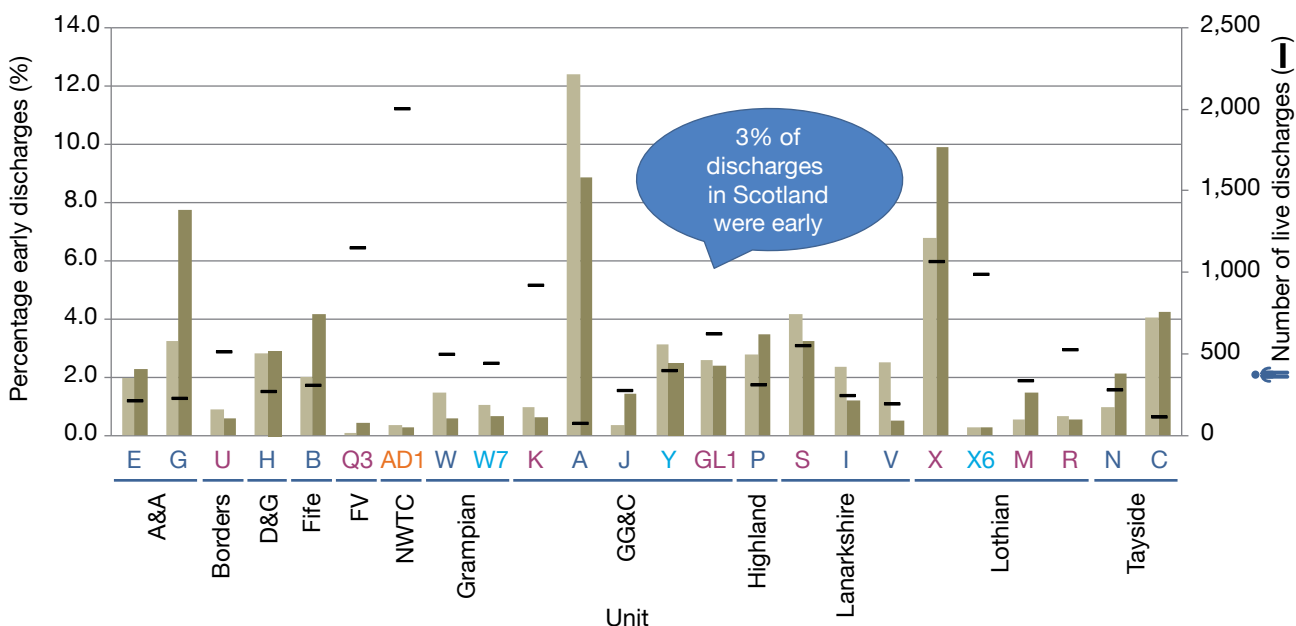
The mean re-admission rate in ICUs and Combined Units in Scotland was 2% - this is a similar figure to those reported in previous years. Unit U (Borders ICU/HDU) have shown a significant improvement in their re-admission rate since 2014 (Figure 6b).

There was no significant change in night time discharges from 2014 to 2015 in any ICUs (Figure 6c).

Key for charts 6a to 6c

2014 results	2015 results: statistically significant improvement since 2014
2015 results: no statistically significant change since 2014	2015 results: statistically significant decrease in performance since 2014

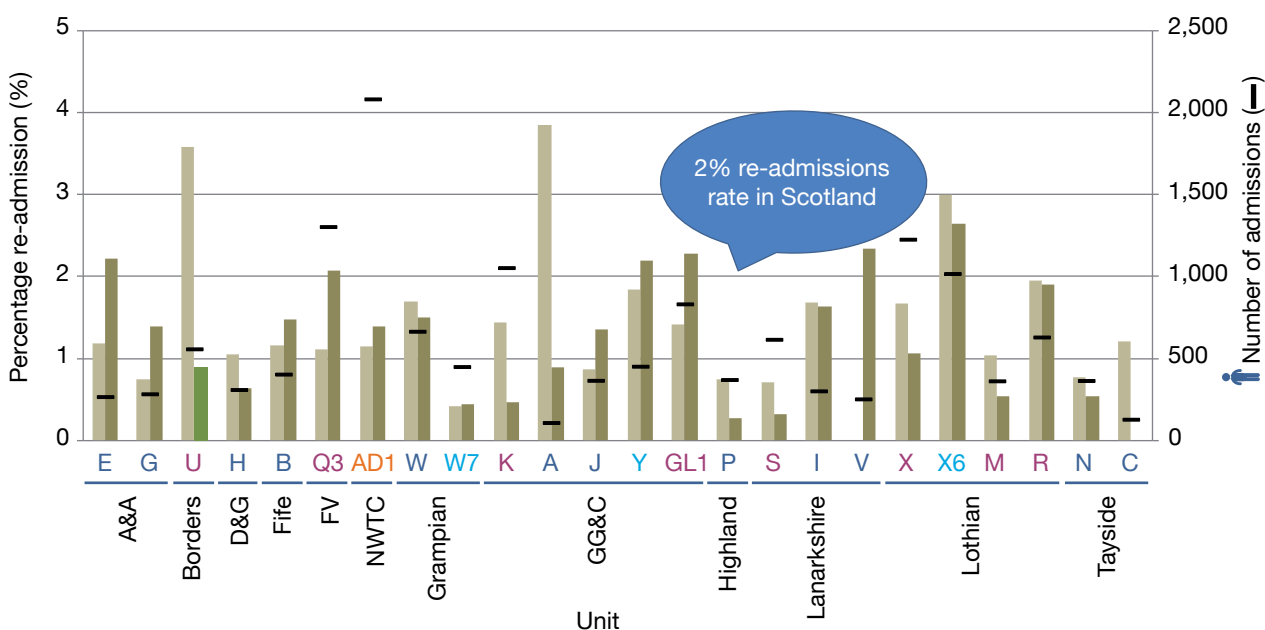
Figure 6a Early discharges from ICU and combined units (2014-2015)



Unit Key: ICU Combined ICU/HDU Specialist ICU Specialist Combined ICU/HDU

Note: Early discharge is defined as a transfer that is not in the best interest of a patient but necessary due to pressure on beds or staffing.

Figure 6b Re-admissions within 48 hours of discharge in ICU and combined units (2014-2015)

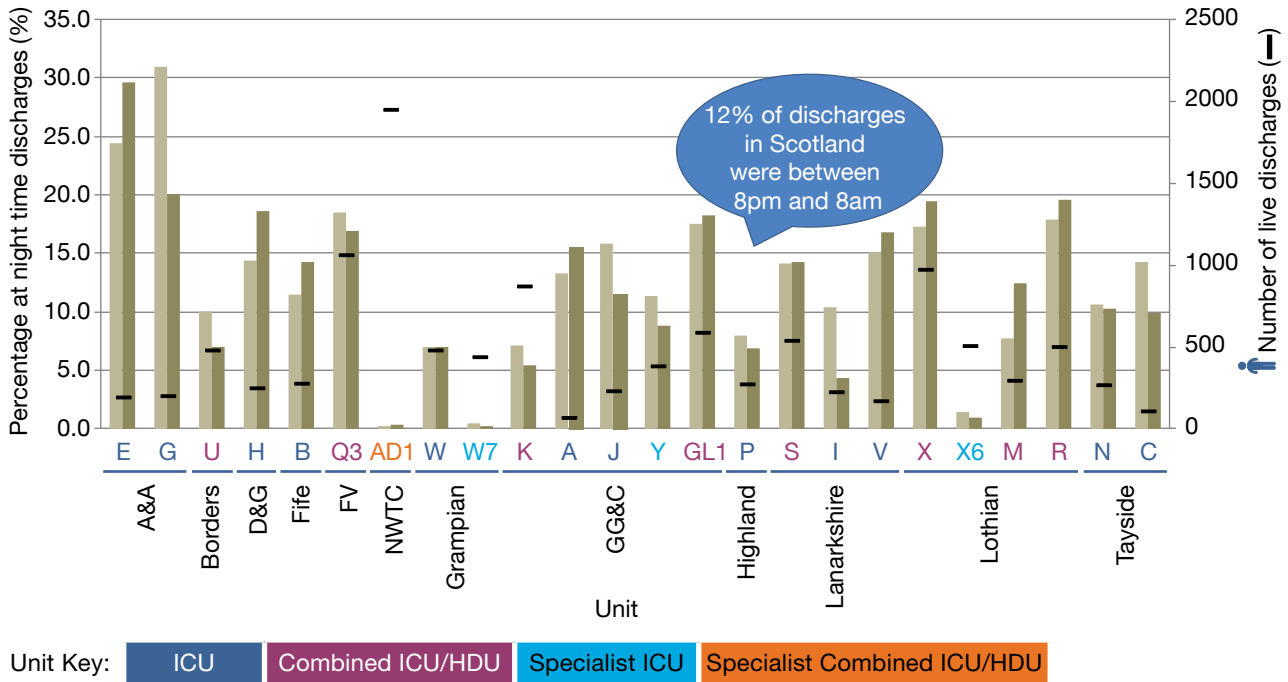


Unit Key: ICU Combined ICU/HDU Specialist ICU Specialist Combined ICU/HDU

-Key for charts 6a to 6c

2014 results	2015 results: statistically significant improvement since 2014
2015 results: no statistically significant change since 2014	2015 results: statistically significant decrease in performance since 2014

Figure 6c Night time discharges from ICU and combined units (2014-2015)



Note: Night time discharges are defined as discharges between 8pm and 8am.

2.3 Focus on HDUs

Unit P2 (Raigmore MHDU) had the highest percentage early discharges at just over 6%, although this is a reduction from the 8% reported for this unit in 2014. Unit H2 (DGRI MHDU) has reported significantly less early discharges than in 2014. No unit reported significantly more than the 2014 figure (Figure 7a).

The mean re-admission rate in HDUs in Scotland was 2% (Figure 7b) - this is a similar figure to those reported in previous years.

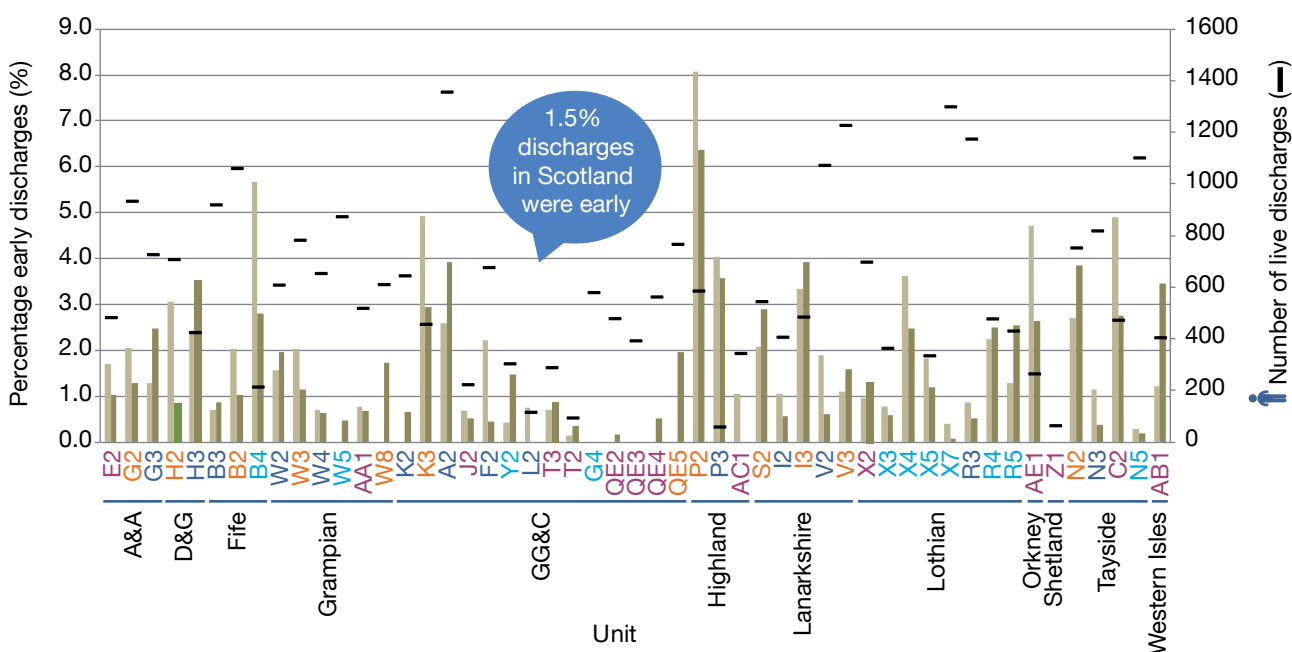
Unit X4 (RIE Transplant HDU) was identified as having increased out of hours discharges in 2014, this year the discharges at night have significantly decreased for this unit.

Overall night time discharges in HDUs have stayed at the same level as last year (Figure 7c). Three units however, were identified as having significantly more discharges at night compared to last year. The pattern of discharge shows that most of the night time discharges occur between 8pm and 10pm (Figure 7d), this could be due to hospital bed planning and freeing up of beds at this time. The definition of a 'night time discharge' is changing from next year to be from 10pm to 7am which will account for bed planning and staff changes allowing the focus to be on a time when patients are being moved for other non-clinical reasons.

Key for charts 7a to 7c

2014 results	2015 results: statistically significant improvement since 2014
2015 results: no statistically significant change since 2014	2015 results: statistically significant decrease in performance since 2014

Figure 7a Early discharges from HDU (2014-2015)



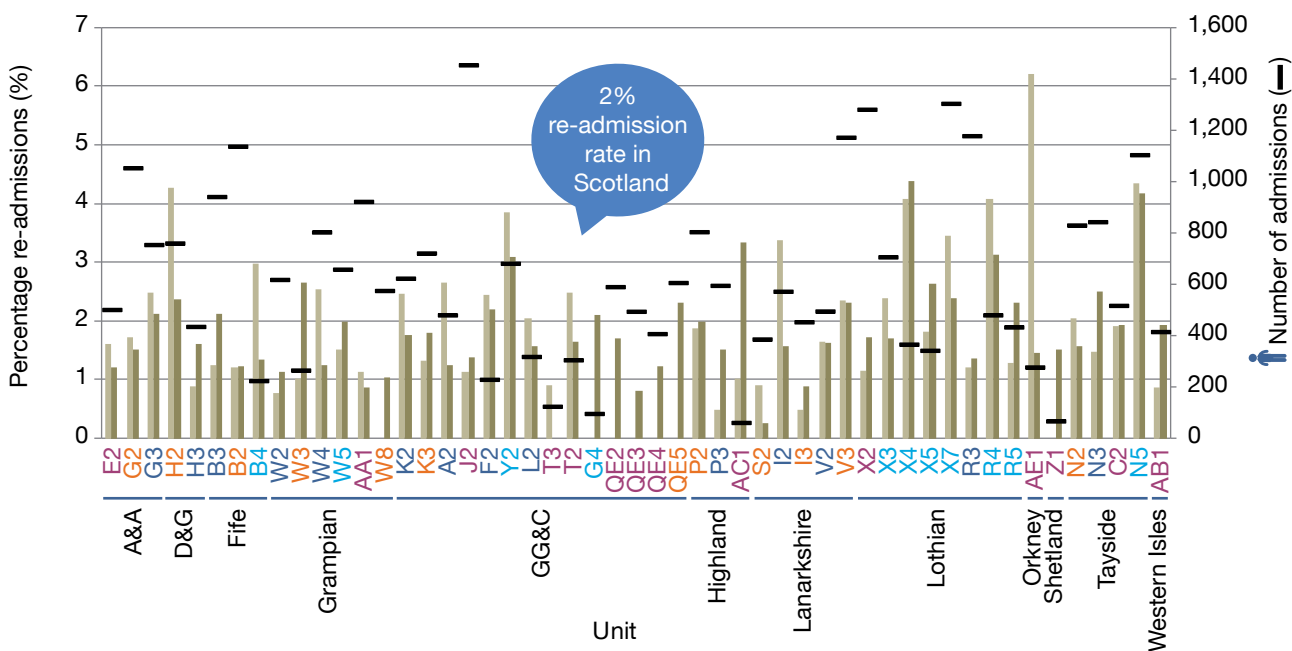
Unit Key: Surgical General Medical Specialist

Note: Early discharge is defined as a transfer that is not in the best interest of a patient but necessary due to pressure on beds or staffing.

Key for charts 7a to 7c

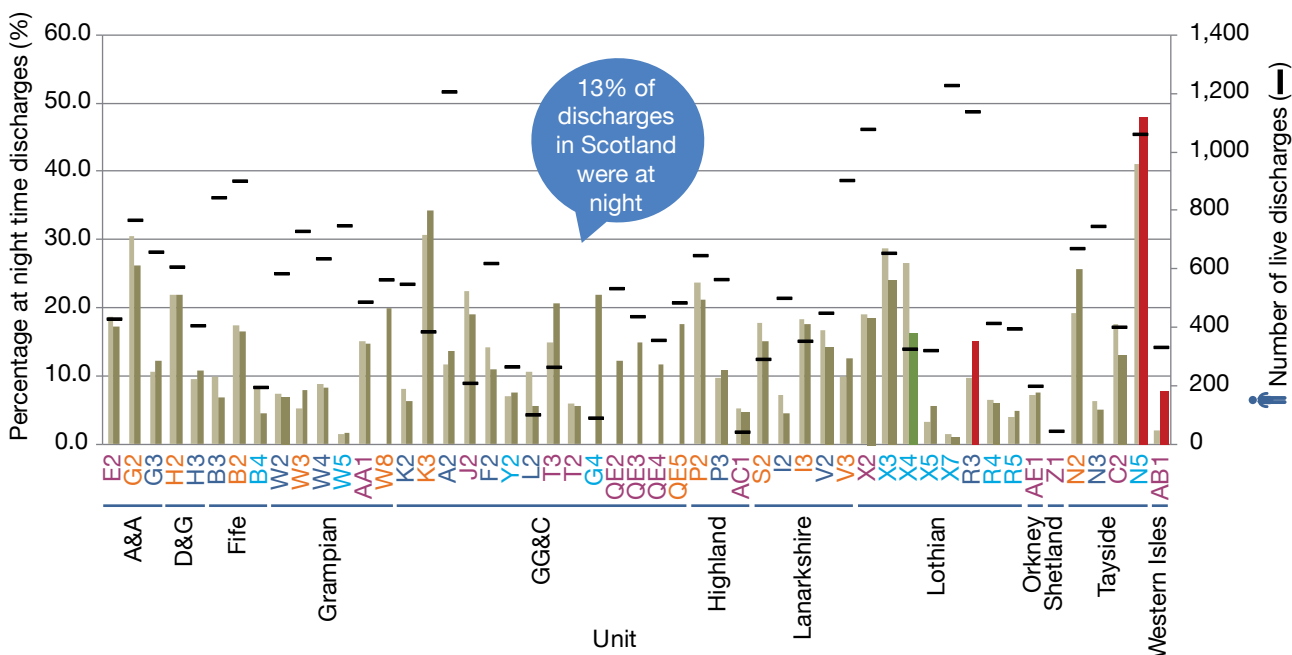
2014 results	2015 results: statistically significant improvement since 2014
2015 results: no statistically significant change since 2014	2015 results: statistically significant decrease in performance since 2014

Figure 7b Re-admissions within 48 hours in HDU (2015)



Unit Key: Surgical General Medical Specialist

Figure 7c Night time discharges from HDU (2014-2015)



Unit Key: Surgical General Medical Specialist

Figure 7d Night time discharges in HDUs by time of discharge (2015)

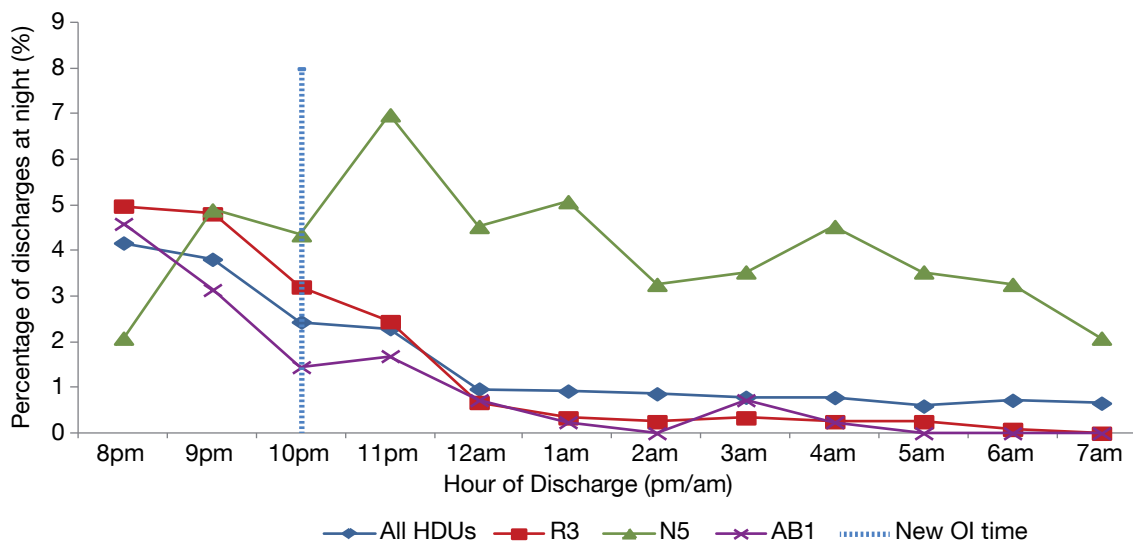


Figure 7d shows a breakdown of discharges by time for the units identified as having significantly more ‘night time discharges’ than last year. For units R3 (WGH SHDU) and AB1 (WIH HDU) we recognise that the majority of their ‘night time discharges’ have occurred between 8pm and 10pm, which from next year will no longer be classed as ‘night time’.

Units are often at a peak of activity during the time of 7pm and 9pm with medical and nursing staff changeover. This can cause multiple handover events of patients between units and staff that may have a negative impact on the patient experience or outcome. This was recognised during the review of the Minimum Standards and Quality Indicators⁵ and as such the ‘night time’ limit changed from 8pm to 10pm.

In future this indicator will focus on the units that are moving patients during the night that are the unplanned discharges and not in the patients’ best interest.

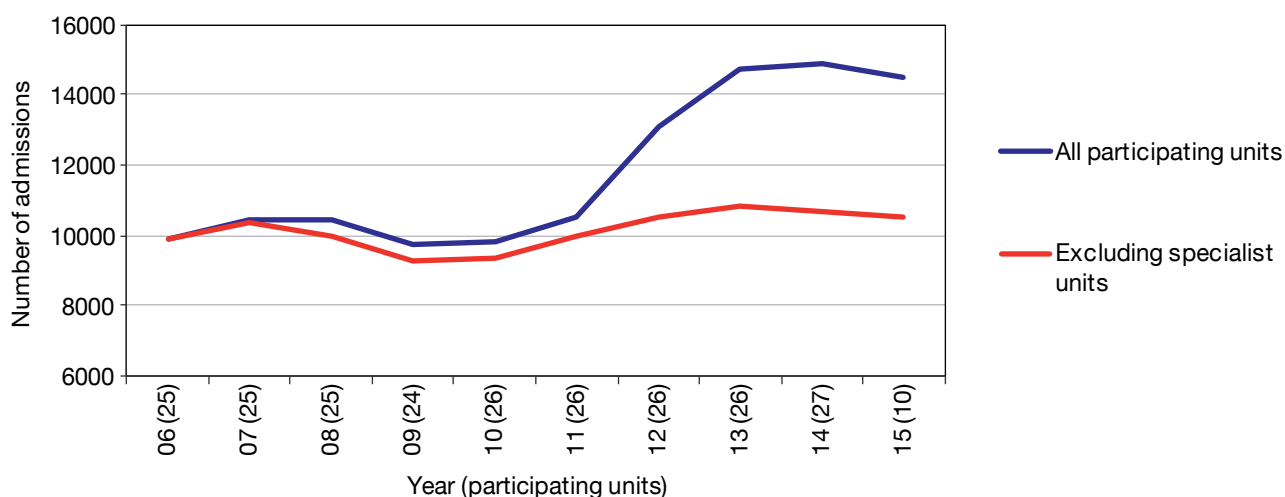
Section 3 Activity

Data regarding critical care activity is presented in this section. These data are presented in a variety of formats; information on funnel plots is given in the methodology section of the SICSAG website at; <http://www.sicsag.scot.nhs.uk/>

When interpreting the unit-level charts it is very important to remember that each unit is unique in terms of case load, patient case-mix and geographical factors, these may all account for any differences seen.

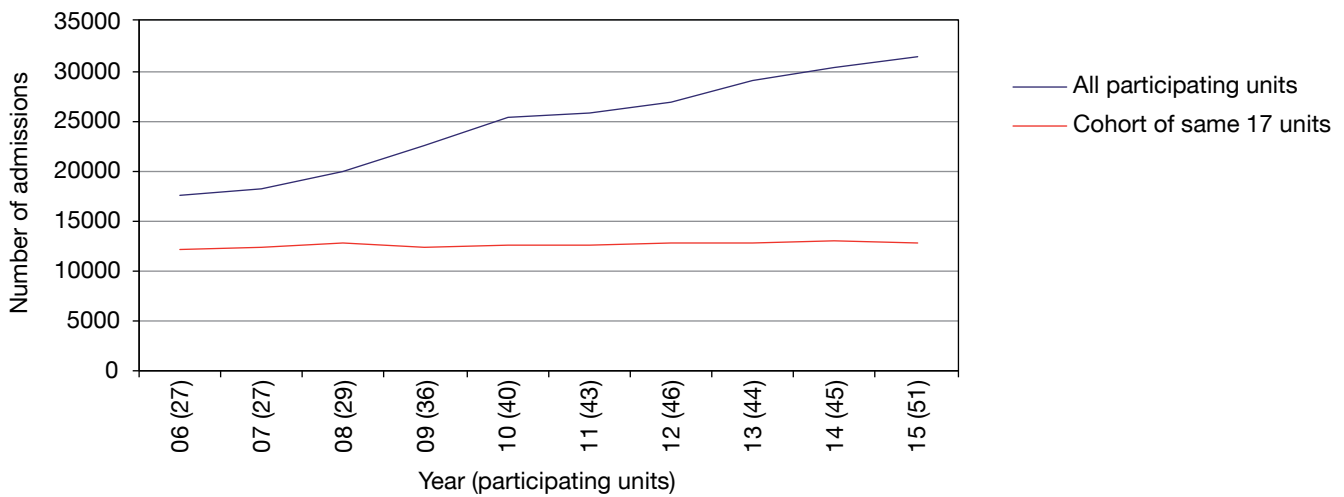
3.1 Number of admissions

Figure 8 Annual admissions to ICU and combined units (2006-2015)



In 2015 there was a slight decrease in admissions to ICUs and combined units compared to 2014, this equates to 2% less admissions. The red line shows ICUs and combined units excluding specialist units.

Figure 9 Annual admissions to HDU (2015)



The number of admissions to HDUs increased by 4% from 2014 to 2015, the cohort line refers to units that have participated in the audit for the past ten years. The number of admissions to the same 17 units has decreased very slightly.

Table 3 Number of annual admissions to ICU and combined units (2006-2015)

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
NHS Ayrshire and Arran										
Ayr ICU	266	307	330	330	292	252	268	243	255	270
Crosshouse ICU	285	302	304	294	305	319	302	276	269	287
NHS Borders										
BGH ICU/HDU	709	691	406	397	429	506	600	579	586	561
NHS Dumfries and Galloway										
DGRI ICU	304	324	316	285	298	293	314	323	286	313
NHS Fife										
QMH ICU	377	373	382	437	439	449	22			
VHK ICU							394	453	429	407
VHK ICU/HDU	145	179	124	38						
NHS Forth Valley										
FVRH ICU/HDU						577	1189	1159	1260	1308
SRI ICU	480	471	443	378	411	214				
NHS Grampian										
ARI ICU	781	778	762	717	748	665	676	821	765	669
ARI CICU								279	483	453
NHS Greater Glasgow and Clyde										
GRI ICU / HDU	321	348	395	426	461	793	952	1060	973	1056
IRH ICU	122	104	104	82	120	150	138	137	130	112
RAH ICU	318	367	359	360	433	402	374	359	346	369
SGH ICU ¹	279	296	299	289	278	282	264	232	279	103
SGH NICU		76	454	461	451	395	347	377	437	456
Stobhill ICU	220	201	233	202	155	40				
VI ICU ¹	340	391	284	317	298	280	284	289	246	99
WIG ICU ¹	532	512	554	495	485	475	393	421	391	136
QEU ICU ¹										497
NHS Highland										
Raigmore ICU	389	436	391	429	433	384	423	433	404	374
NHS Lanarkshire										
Hairmyres ICU/HDU	531	522	505	560	562	583	558	615	565	619
MDGH ICU	307	301	278	252	225	273	267	307	298	308
Wishaw ICU	756	829	619	222	229	237	212	235	257	259
NHS Lothian										
RIE ICU/HDU	1059	1041	1092	968	1110	1177	1230	1236	1267	1262
RIE CICU						188	926	1011	1038	1023
SJH ICU/HDU	352	367	443	465	424	444	452	458	387	371
WGH ICU/HDU	504	714	772	831	735	705	647	676	721	633
NHS National Waiting Times Centre										
Golden Jubilee National Hospital ICU/HDU ²							1318	2223	2255	2084
NHS Tayside										
Ninewells ICU	352	370	404	386	357	349	417	378	391	368
PRI ICU	163	151	156	136	122	119	140	124	166	132
Total	9892	10451	10409	9757	9800	10551	13107	14704	14884	14529
Total (excluding specialist units)	9892	10375	9955	9296	9349	9968	10516	10814	10671	10513

Notes:

- Queen Elizabeth University Hospital opened in summer 2015 and is an amalgamation of VIG, WIG, GGH, and SGH. Figure for the ICUs in these units are combined across the year in the rest of the publication.
- Golden Jubilee have two ICUs and two HDUs but for the purpose of this audit are reported as one combined ICU/HDU.

NHS Boards

Shaded areas refer to periods with incomplete data collection

Combined Unit

Key:

 NICU – Neurological ICU
 CICU – Cardiothoracic ICU

Table 4 Number of annual admissions to HDU (2006-2015)										
	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
NHS Ayrshire and Arran										
Ayr HDU		413	542	527	498	487	469	474	498	500
Crosshouse MHDU	966	992	997	974	1033	1103	1193	1201	1102	1053
Crosshouse SHDU	657	696	728	711	644	641	644	669	723	754
NHS Borders										
BGH Surgical (Level 1)			310	339	254					
NHS Dumfries and Galloway										
DGRI MHDU	783	793	823	804	854	731	788	824	868	759
DGRI SHDU	336	360	393	392	431	418	437	431	456	434
NHS Fife										
QMH SHDU	821	853	849	840	816	813	34			
QMH MHDU					525	724	37			
QMH RHDU						155				
Victoria Hospital SHDU							817	903	883	941
Victoria Hospital MHDU					429	444	937	1088	1084	1136
Victoria Hospital RHDU							159	210	202	224
NHS Forth Valley										
Stirling HDU			1089	963	992	558				
NHS Grampian										
ARI SHDU (Ward 503)	654	587	582	623	714	630	575	609	654	619
ARI NHDU	170	251	237	235	241	240	202	86	99	264
ARI SHDU (Ward 506)				780	814	868	892	856	871	802
ARI CHDU							42	703	728	659
ARI MHDU ¹										575
Dr Gray's HDU				797	1083	1169	1069	1068	986	950
NHS Greater Glasgow and Clyde										
GRI Princess OHDU ¹										95
QEU HDU1 ¹										590
QEU HDU2 ¹										494
QEU HDU6 ¹										406
QEU MHDU ¹										607
GRI SHDU	693	1028	1051	1053	1026	765	629	621	650	624
GRI MHDU							533	671	679	720
IRH SHDU				266	432	469	439	485	526	479
RAH HDU	1188	1201	1291	1289	1339	1459	1497	1418	1414	1453
SGH SHDU ²	796	809	861	870	807	693	711	692	696	228
SGH NHDU	642	703	675	660	647	621	594	637	706	681
Stobhill SHDU	317	327	327	337	287	58				
VI SHDU ²	605	702	692	636	700	812	847	873	835	317
GGH HDU ²	771	849	885	882	904	755	755	761	806	304
WIG HDU ²					75	413	438	427	443	123
NHS Highland										
Raigmore MHDU	651	732	718	730	811	803	743	774	804	806
Raigmore SHDU	672	714	620	677	669	669	653	657	629	595
Belford HDU						74	78	114	100	63

Table 4 Number of annual admissions to HDU (2006-2015)

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
NHS Lanarkshire										
Hairmyres Thoracic HDU	340									
Hairmyres MHDU						274	375	254	223	385
MDGH SHDU	632	628	601	593	569	565	588	618	592	574
MDGH MHDU				56	278	283	377	438	406	452
Wishaw SHDU			154	602	532	546	571	526	488	498
Wishaw MHDU							265	1245	1188	1172
NHS Lothian										
RIE HDU	1530	1517	1541	1390	1369	1366	1377	1329	1300	1282
RIE RHDU	607	683	667	632	674	675	634	650	682	715
RIE Transplant HDU	269	330	338	306	345	296	325	375	392	368
RIE Vascular (Level 1)				112	452	378	372	330	331	341
RIE CHDU						214	1118	1223	1249	1303
WGH HDU	502	117								
WGH SHDU	1229	1139	1192	1126	1119	1136	1112	1115	1160	1184
WGH NHDU	450	362	230	285	404	476	431	481	493	480
WGH Neurological (Level 1)					52	418	364	475	469	432
NHS Orkney										
Balfour HDU							78	138	258	277
NHS Shetland										
GBH HDU	72	64	63	49	58	74	65	77	69	66
NHS Tayside										
Ninewells SHDU	652	723	832	742	754	794	784	816	812	842
Ninewells MHDU				558	641	673	743	709	782	829
Ninewells OHDU									1057	1103
Perth HDU	536	569	623	644	618	625	659	612	576	516
NHS Western Isles										
WIH HDU				145	414	448	417	301	344	414
Total	17541	18142	19911	22625	25304	25813	26867	28964	30313	31488
Total (17 units)	12076	12431	12684	12342	12648	12606	12668	12812	12939	12701

Notes:

1. Unit joined during 2015.
2. Unit closed during 2015.

NHS Boards

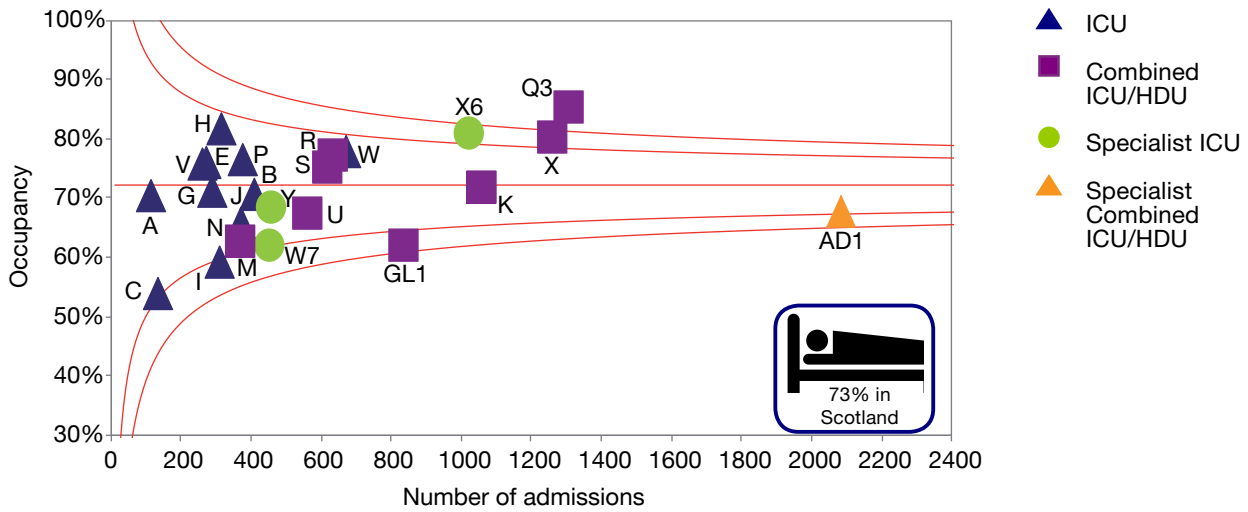
Shaded areas refer to periods with incomplete data collection

Key:

SHDU – Surgical HDU
 MHDU – Medical HDU
 NHDU – Neurological HDU
 CHDU – Cardiothoracic HDU
 RHDU – Renal HDU
 OHDU – Obstetrics HDU

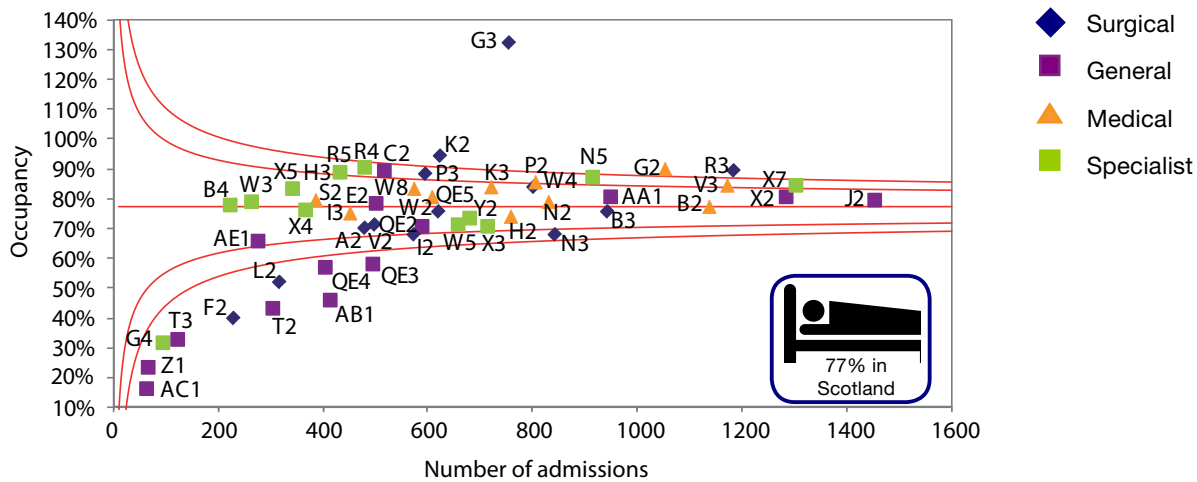
3.2 Bed occupancy

Figure 10 Bed occupancy rates for ICU and combined units (2015)



Unit Q3 (Forth Valley ICU/HDU) has a significantly higher bed occupancy rate compared to the Scottish mean.

Figure 11 Bed occupancy rates for HDU (2015)

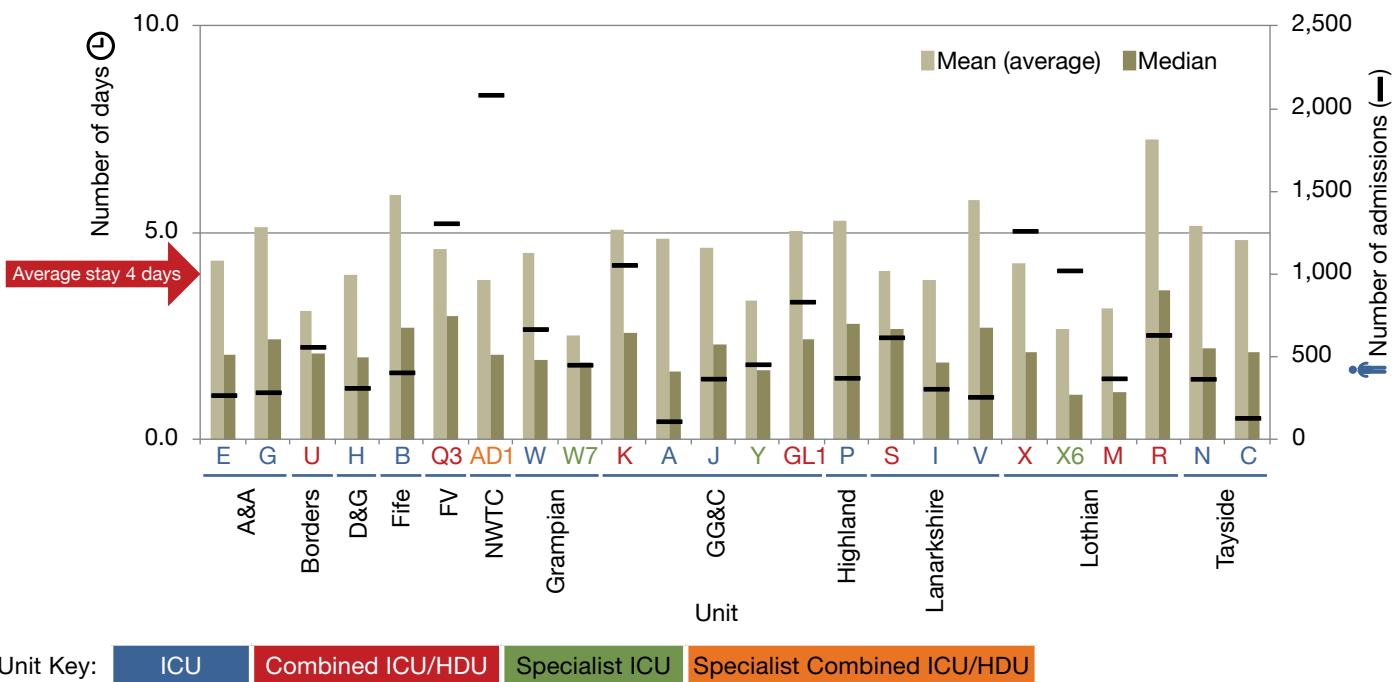


Some of the units with low occupancy are in smaller remote hospitals and staff work within general wards until there is a need to open HDU beds.

Unit G3 (Crosshouse SHDU) is over occupied, there are 12 physical beds in the unit, however they are only funded for 8 beds.

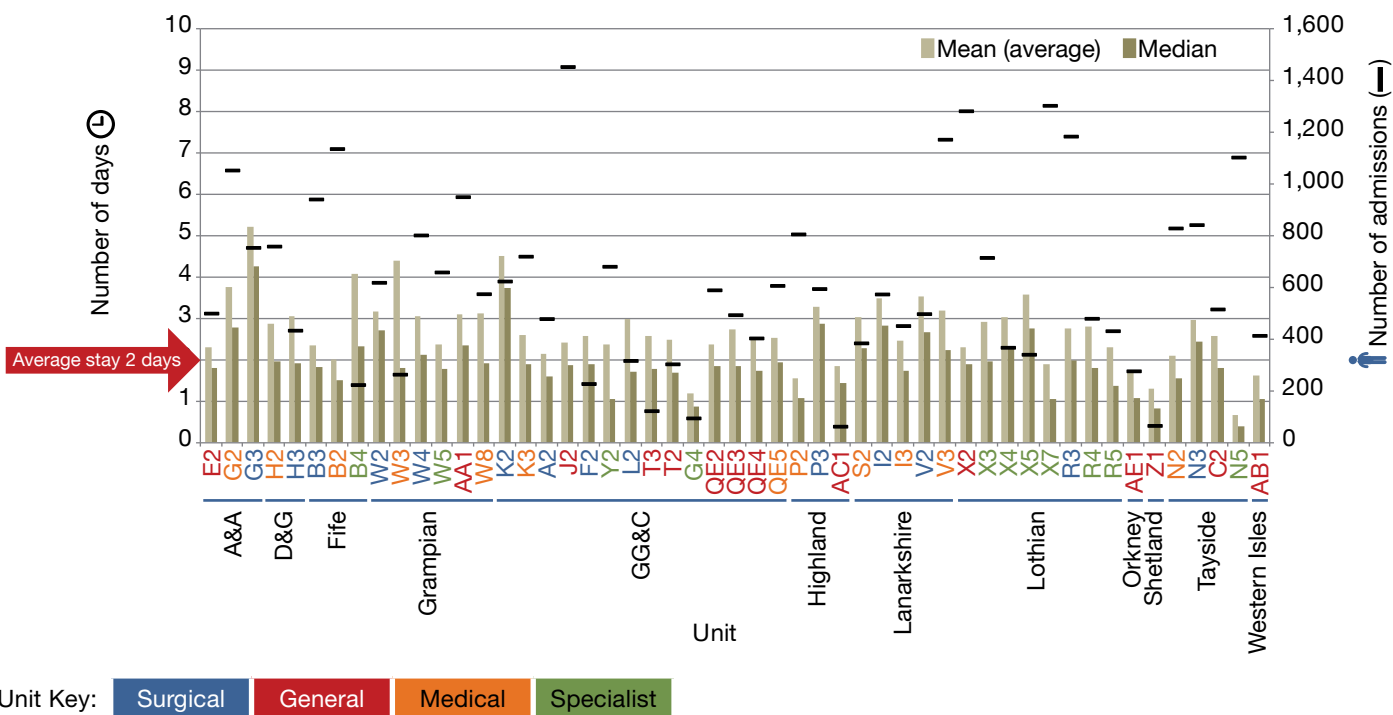
3.3 Length of stay

Figure 12 Length of stay for ICU and combined units (2015)



The mean length of stay for ICUs and combined units in 2015 was 4 days; which is similar to the last few years. Unit R (WGH ICU) has the longest length of stay at 7 days.

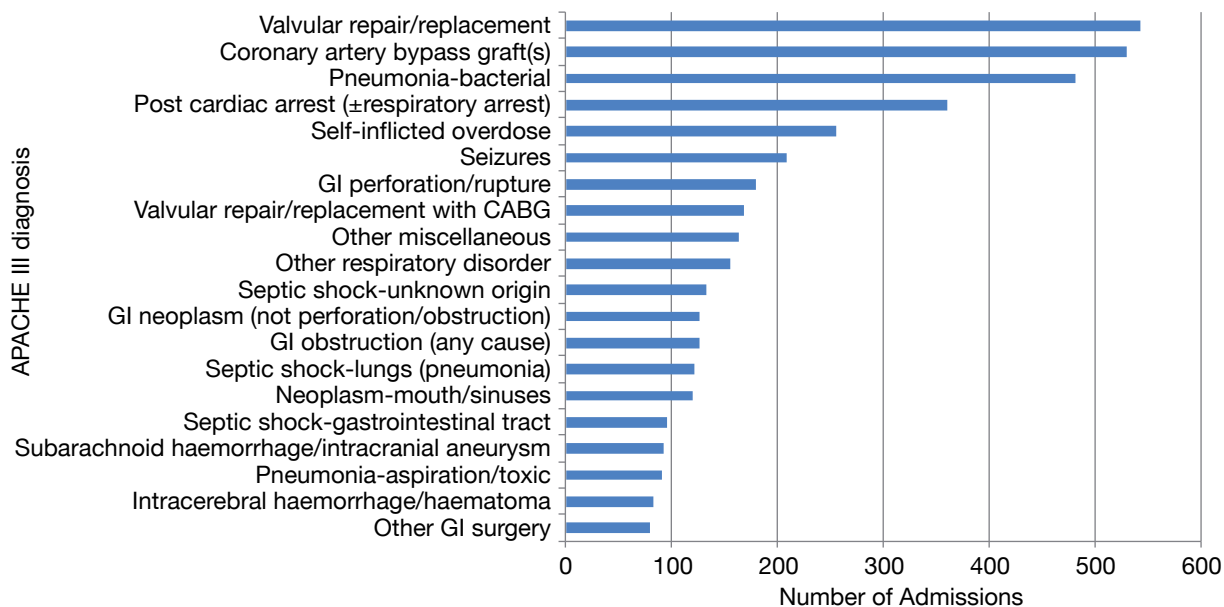
Figure 13 Length of stay for HDU (2015)



The mean length of stay was less than previous years at 2 days. Unit G3 (Crosshouse SHDU) had the longest average length of stay.

3.4 APACHE III diagnosis

Figure 14 Top 20 Apache III diagnoses in ICU and combined units (2015)



The top two ICU Apache diagnoses in 2015 were both cardiac (valvular repair and CABG).

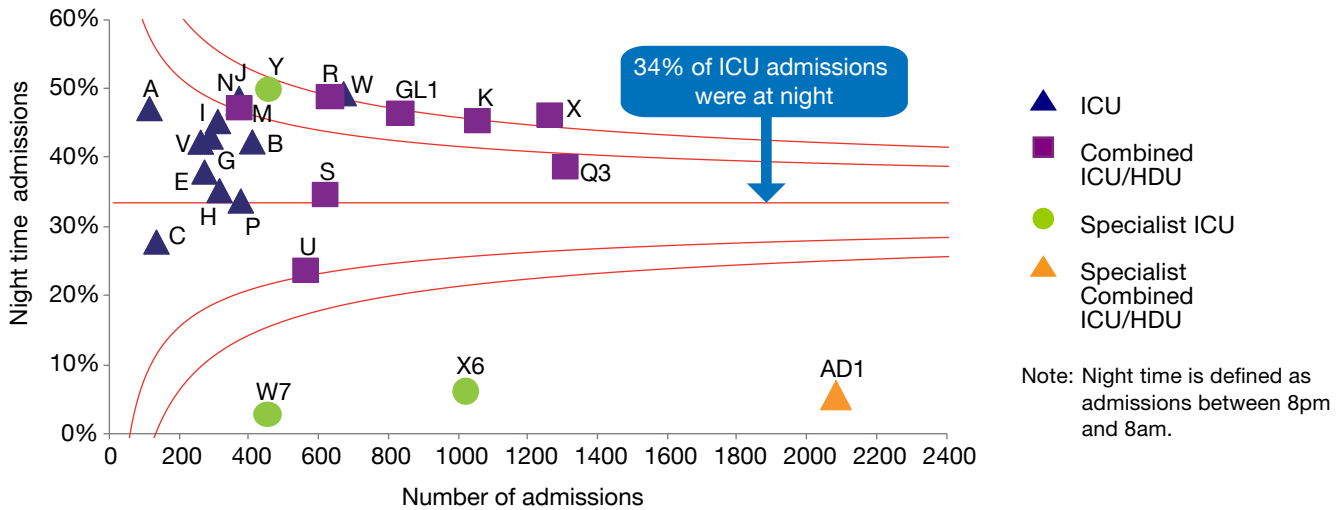
This is a reflection of the 2 large cardiothoracic ICU’s being an integral part of the unit.

Below this the more common general ICU diagnoses of bacterial pneumonia, cardiac arrest and self inflicted overdose show a pattern that is relatively unchanged in recent years.

3.5 Night time admissions

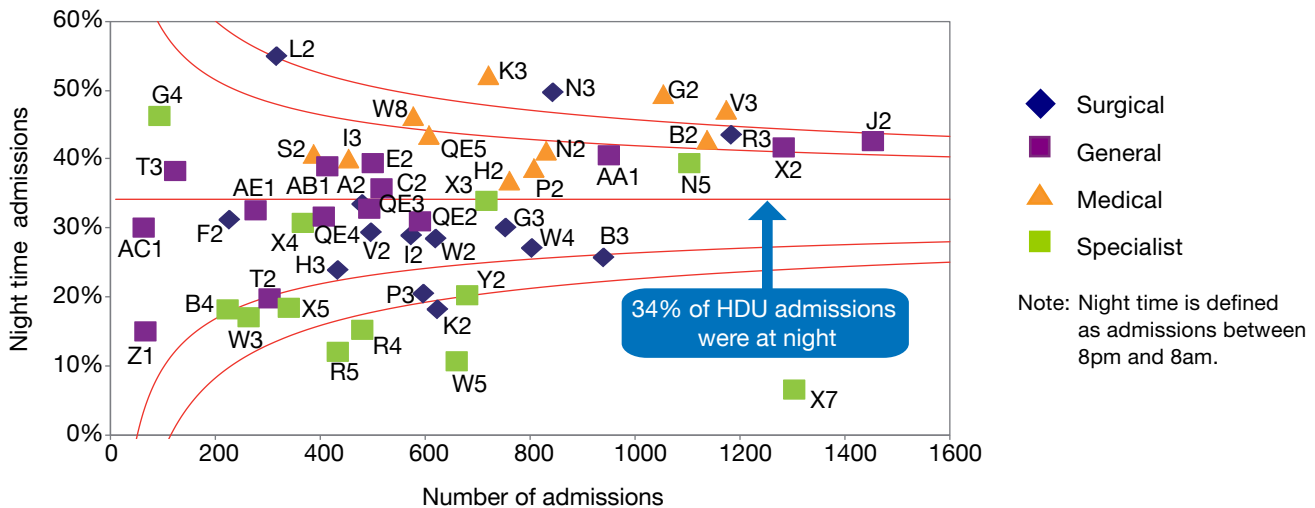
The high percentage of night time admissions highlights the pressure on units to deliver unplanned care at all hours.

Figure 15 Night time admissions to ICU and combined units (2015)



Units K (GRI ICU/HDU), X (RIE ICU/HDU) and R (WGH ICU/HDU) had significantly more night time admissions than the Scottish mean. All units with a significantly lower night time admission compared to the Scottish mean were cardiothoracic units; W7 (ARI CICU), X6 (RIE CICU), AD1 (GJH CICU).

Figure 16 Night time admissions to HDU (2015)



Four units admitted significantly more patient at night time compared to the Scottish mean. These were; K3 (GRI MHDU), N3 (Ninewells SHDU), G2 (Crosshouse MHDU) and V3 (Wishaw MHDU).

Five units had significantly fewer patients admitted at night time compared to the Scottish mean, these were R5 (WGH NHDU level 1), R4 (WGH NHDU), K2 (GRI SHDU), W5 (ARI CHDU) and W7(ARI CICU).

Please see Figures 6c and 7c for data on night time discharges.

3.6 Focus on delayed discharges

Delayed discharges are instances where patients are deemed clinically ready for discharge, but there is a delay or “gap” before actual discharge. Where staff feel this gap is “abnormal” they have various options to record as reasons for this. The most common reason for delayed discharge is a shortage of available downstream ward or HDU beds. This in turn can be due to delayed discharge of patients from acute hospital beds often caused by lack of social care in the community. In times of peak demand, this effect can back up into critical care areas.

Delayed discharge in Intensive Care Units and Combined Units

In 2015 the average delay for patients in Scotland was 11 hours however this varies considerably across the units (Figure 17a). The median delay is much shorter than the mean, indicating that there are a smaller number of cases with prolonged delay.

The cumulative delay (Figure 17b) is the total time lost in 2015 for each unit due to a delayed discharge. This figure is higher for some units than others.

Overall in 2015 the main reason for a delay was a mix of ward bed shortages or HDU bed shortages, with the main reason identified differing across units (Figure 17c).

Units should examine locally why these blockages occurred in the system.

Figure 17a Average delayed discharges in ICUs and combined units (2015)

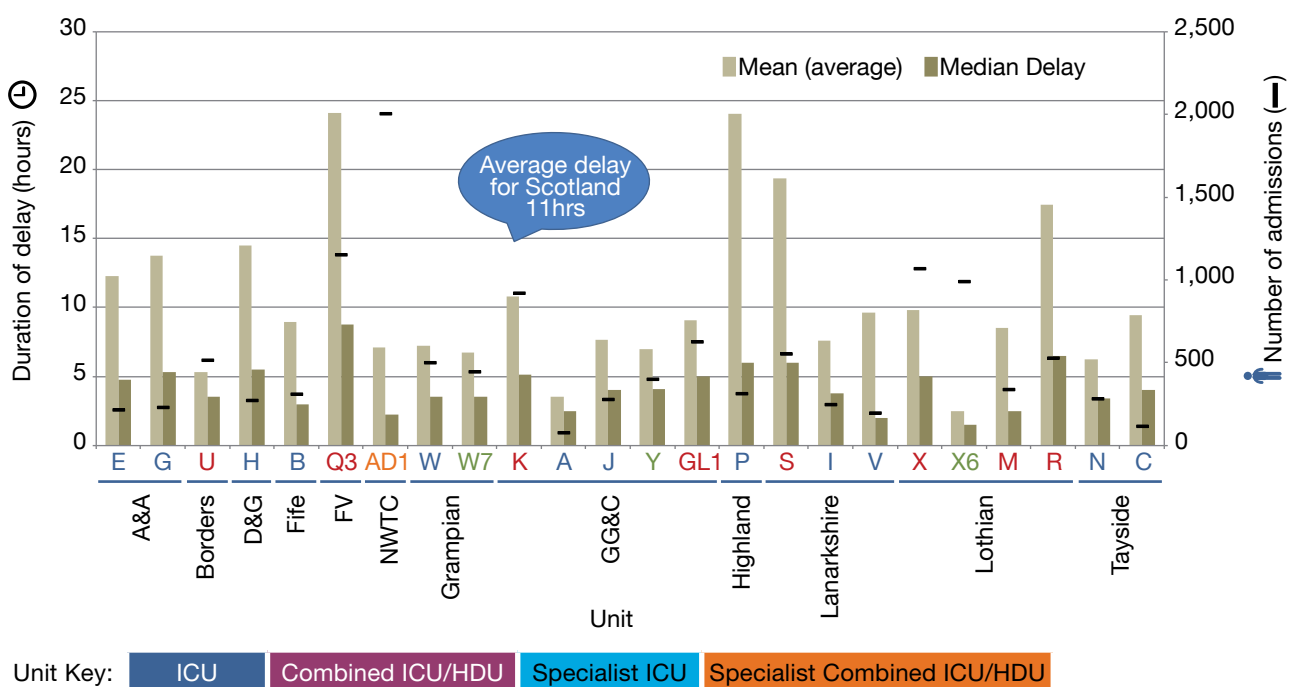


Figure 17b Total delays in ICUs and combined units in 2015

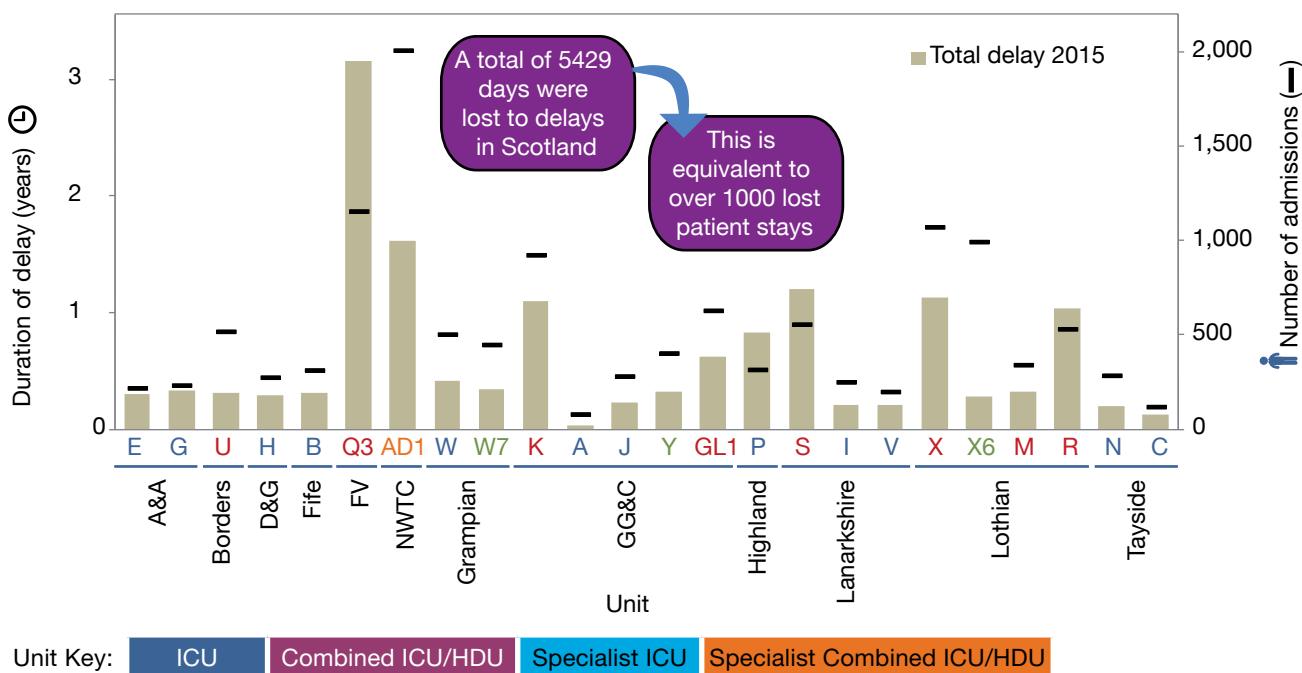
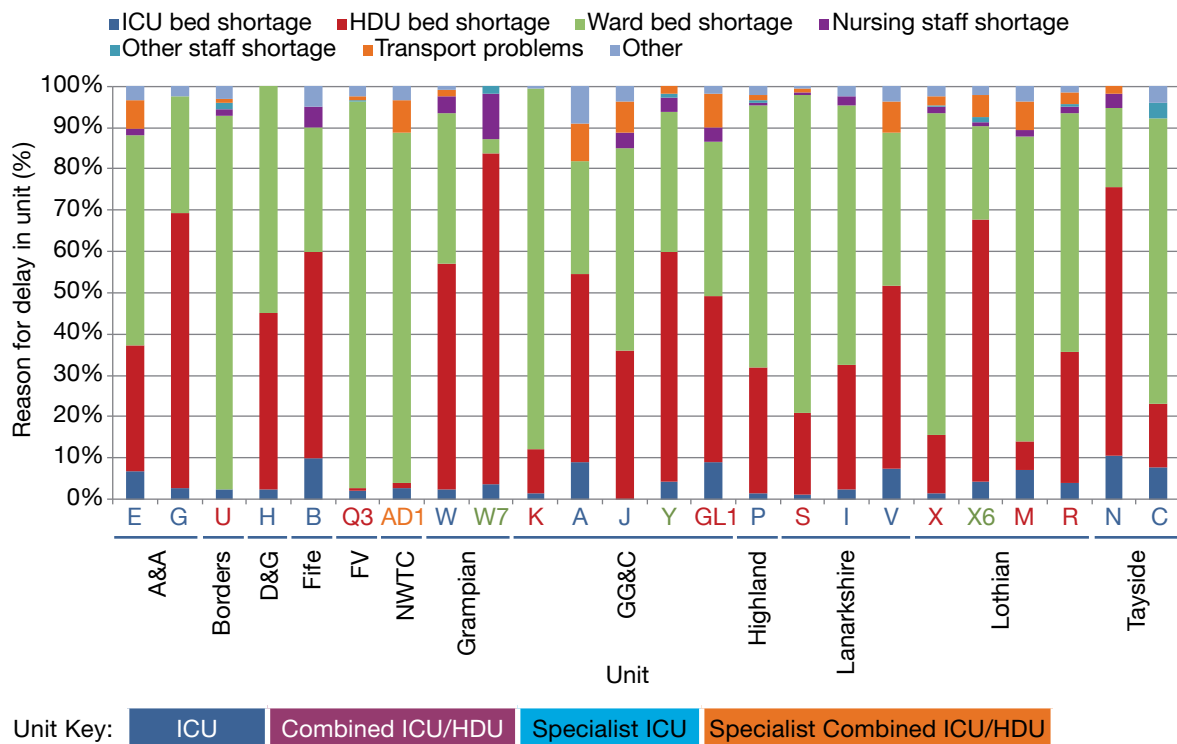


Figure 17c Reason for delay in ICUs and combined units (2015)



High Dependency Units

In 2015 the average delay for patients in Scotland was 10 hours (Figure 18a). The cumulative chart shows a variation in time lost to delays in the units with a few units standing out with much higher figures (Figure 18b). Units can examine reasons given for the delay, with bed shortages as the most common reason (Figure 18c).

Figure 18a Delayed discharges in HDUs (2015)

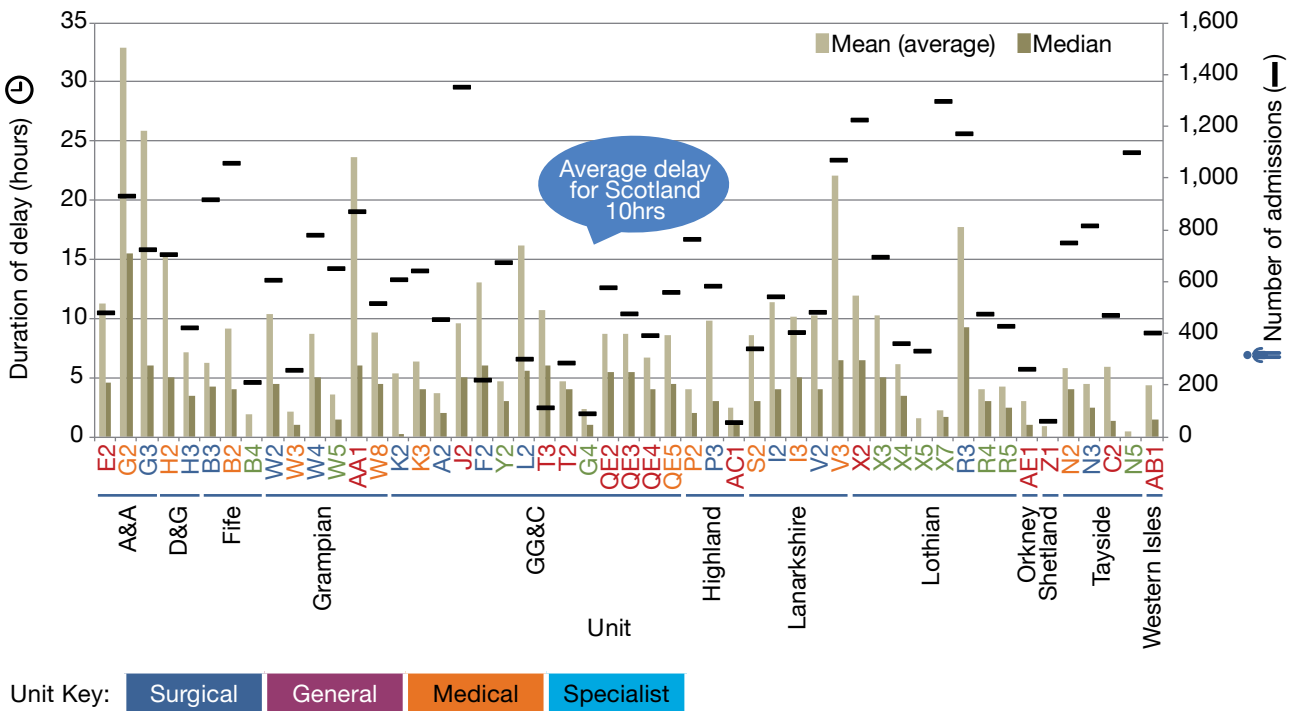


Figure 18b Total delay in HDUs (2015)

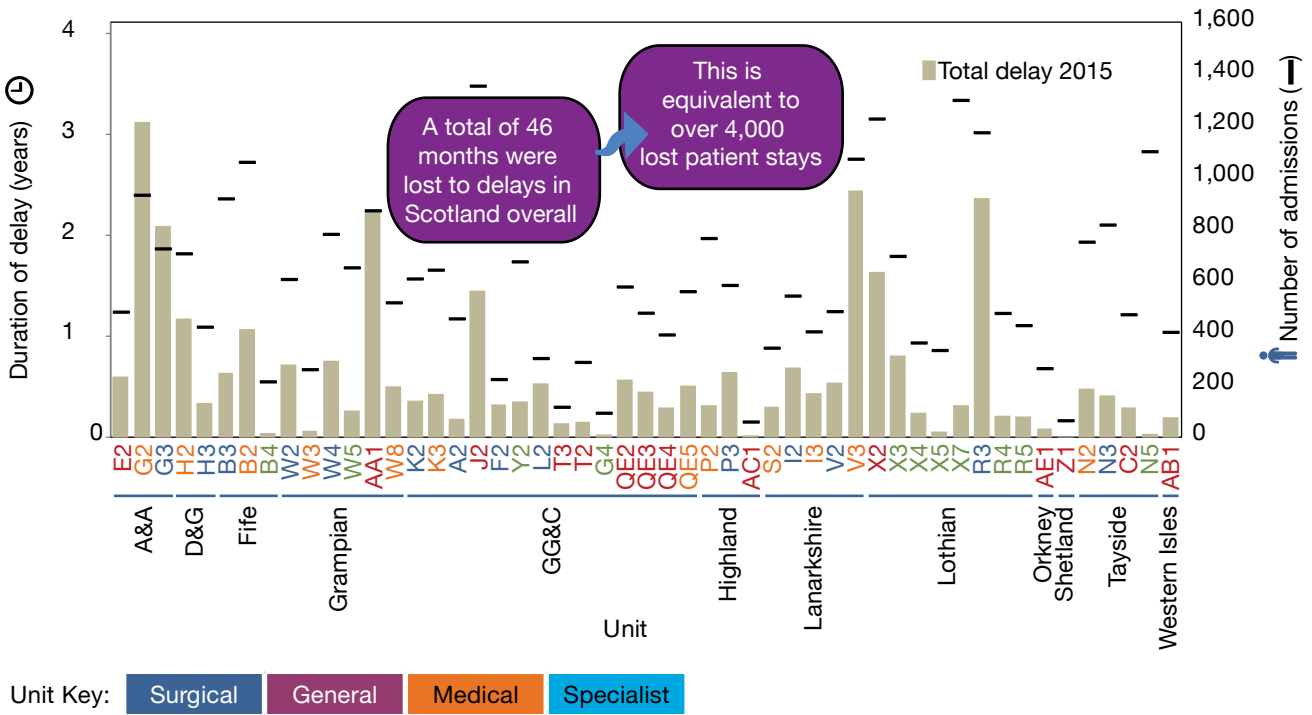
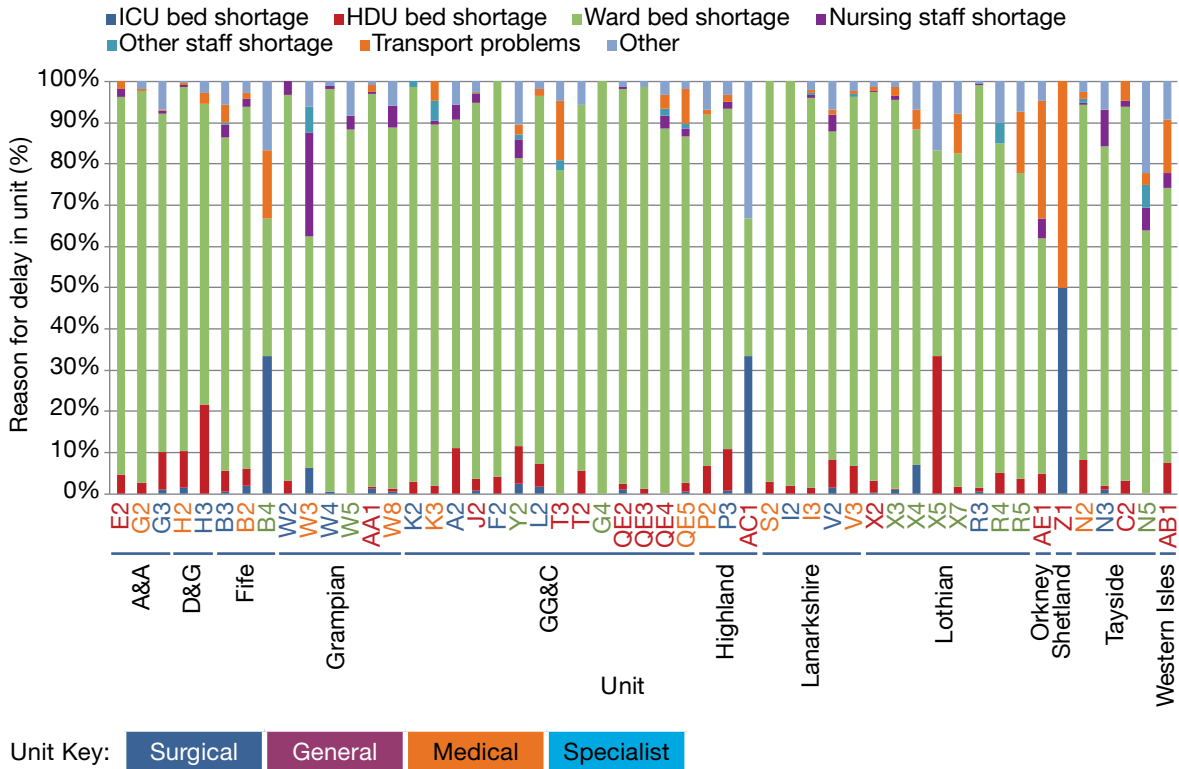
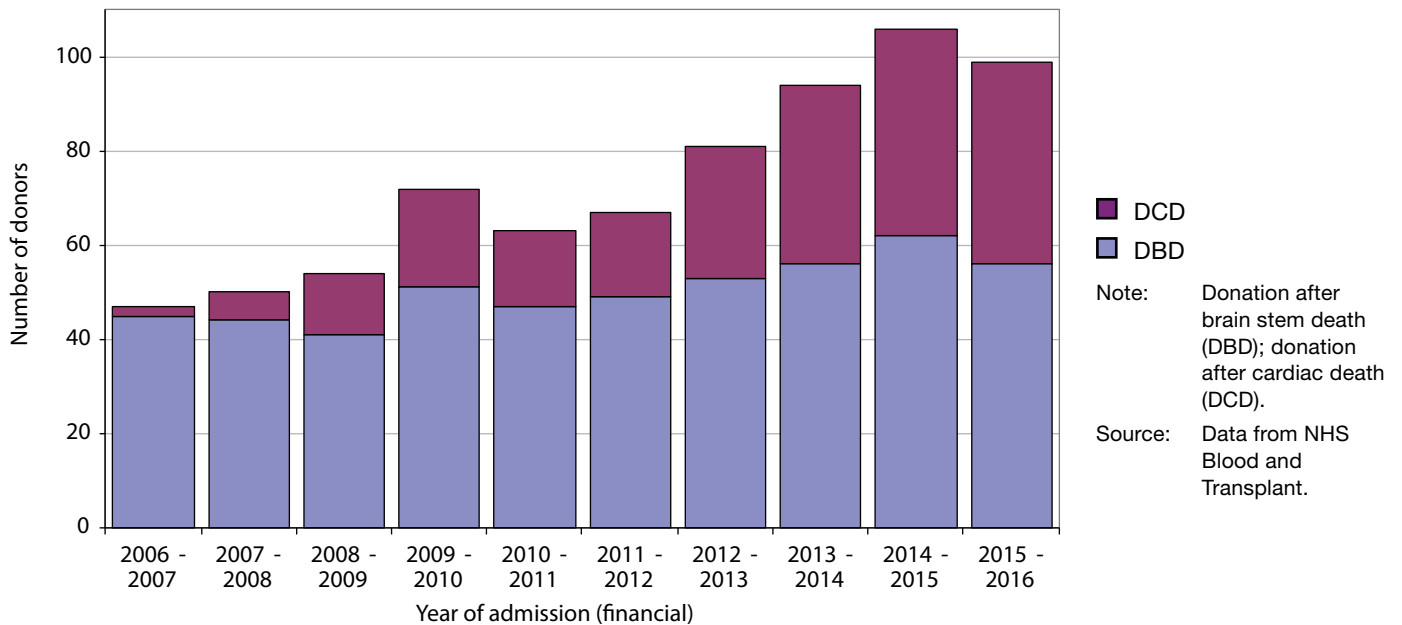


Figure 18c Reason for delay in HDU (2015)



3.7 Organ donation

Figure 19 Scottish deceased organ donors (2006-2016)



The figures for organ donation in Scotland show a decrease in overall numbers (from 106 in 2014/15 to 99 in 2015/16). Organ donation is a complex and changing field and the numbers will vary from year to year. The long term trend shows a rise in organ donation.

The role of Intensive Care in deceased organ donation is pivotal. NHS Blood and Transplant are working with clinical leads for organ donation in the ICUs in Scotland to ensure continuous improvement.

The current objectives are set out in the four outcomes of the “Taking Organ Transplantation to 2020¹¹ strategy. Outcome 2 is relevant to ICU’s and states that “Action by NHS hospitals and staff will mean that the NHS routinely provides excellent care in support of organ donation and every effort is made to ensure that each donor can give as many organs as possible.”

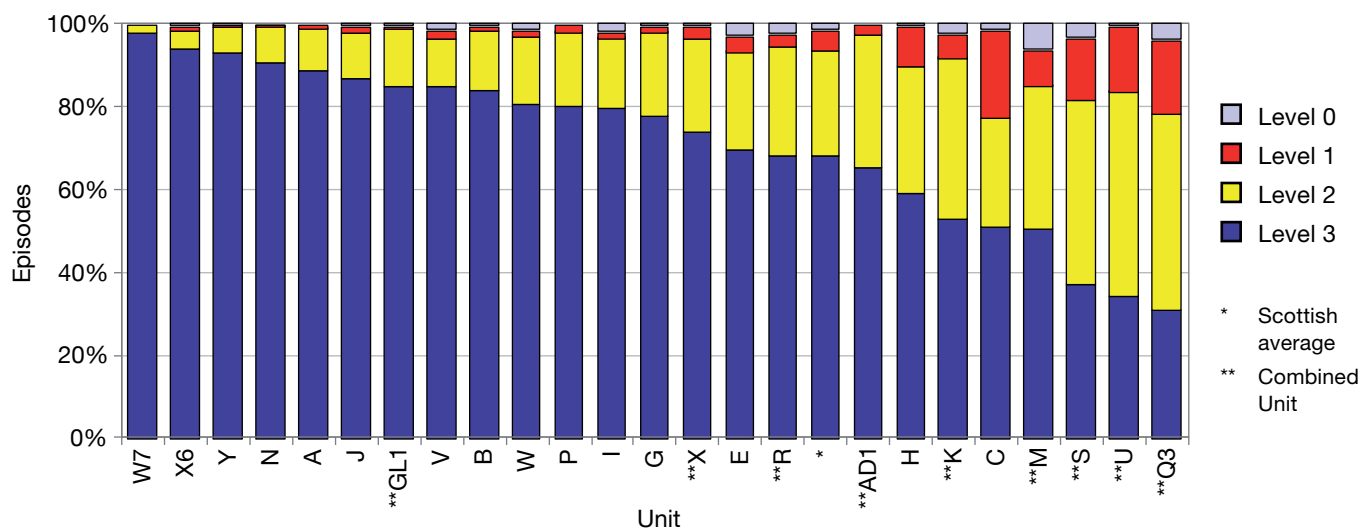
Section 4 Interventions

4.1 Level of care

Level of care data are collected from the WardWatcher Augmented Care Period (ACP) page. It allows direct comparisons of interventions and levels of care to be made between critical care units. Level of care is defined in the methodology section of the SICSAG website.

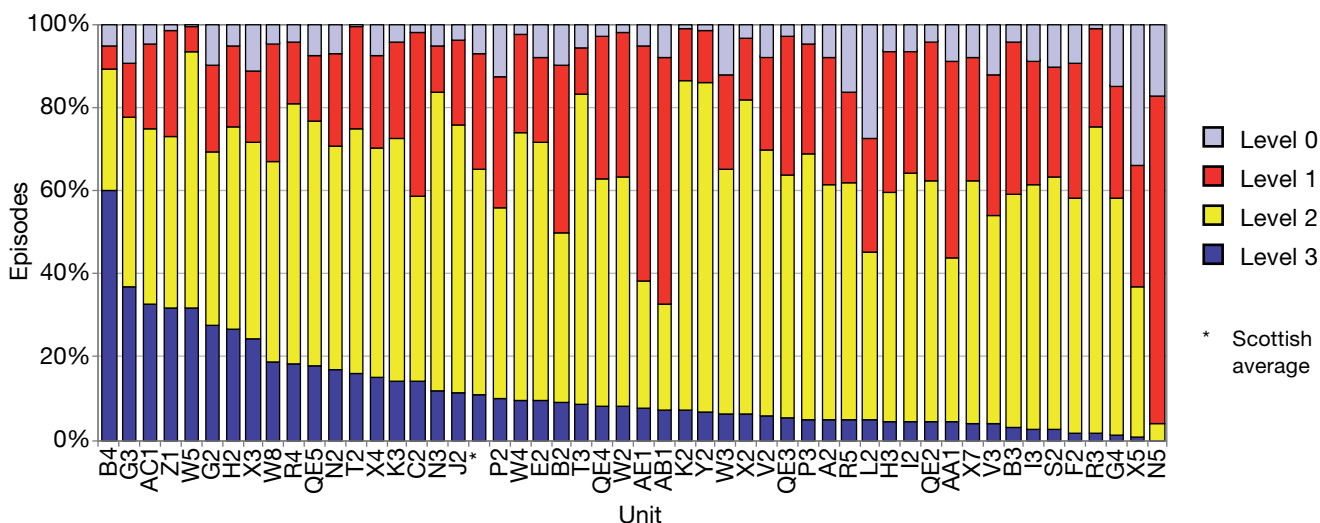
It is important to realise that units are not identical, as they admit patients with a different range of problems, reflecting the differing specialty mix between hospitals.

Figure 20 Highest level of care in ICU and combined units (2015)



As in last year’s report, the data are presented in order of descending proportion of level 3 care. In 2015 the highest level of care, level 3, was required in 68% of patient episodes in ICU and combined units, and indicates the significant resource and skill-mix implications required by each unit in Scotland. Specialist ICUs – cardiothoracic or neurological W7 (ARI CICU), X6 (RIE CICU) and Y (SGH NICU) have the highest percentage of patient episodes requiring level 3 care.

Figure 21 Highest level of care in HDU (2015)



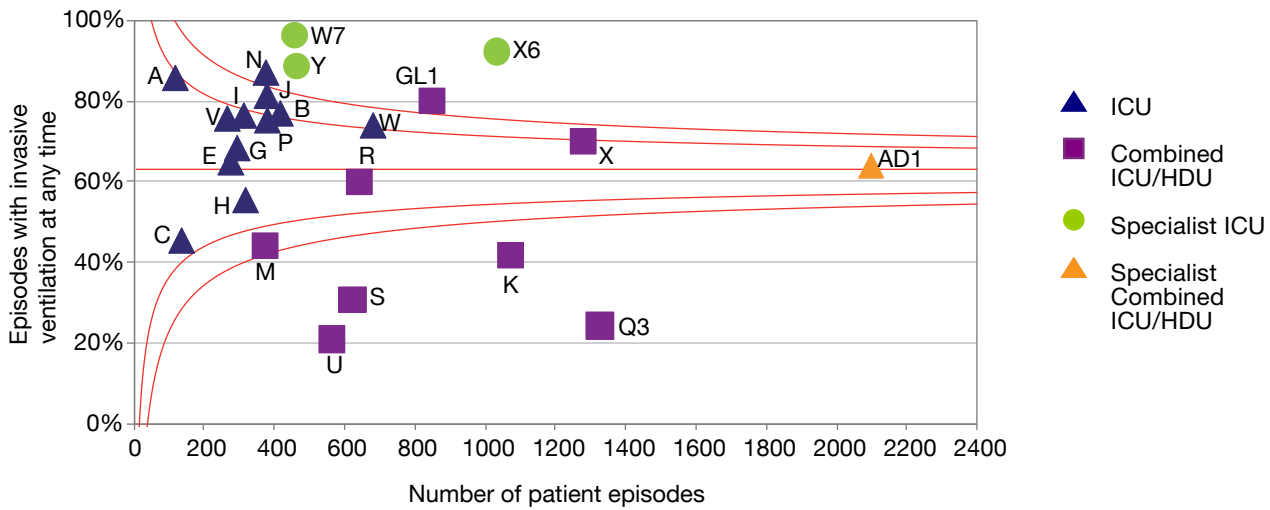
It is reassuring that this graph shows that the highest level of care required for the majority of HDU episodes is at the appropriate level (level 2), with 65% of patients at level 2 or higher. There is variation in the pattern of the highest level of care demonstrating the heterogeneous nature of HDUs.

B4 (VHK Renal HDU) has 60% of its patients at level 3 – it is a specialist HDU and may well have staffing implications for safe care. Unit N5 (Ninewells OHDU) and G4 (PRM OHDU) are specialist obstetric units.

The proportion of HDU episodes requiring only level 0 (ward level) care has stayed static since 2012 at 7% and likely represents downstream bed availability which remains an issue in critical care. Recorded reasons for delay are shown on figure 18c.

4.2 Respiratory support

Figure 22 Invasive ventilation in ICU and combined units (2015)

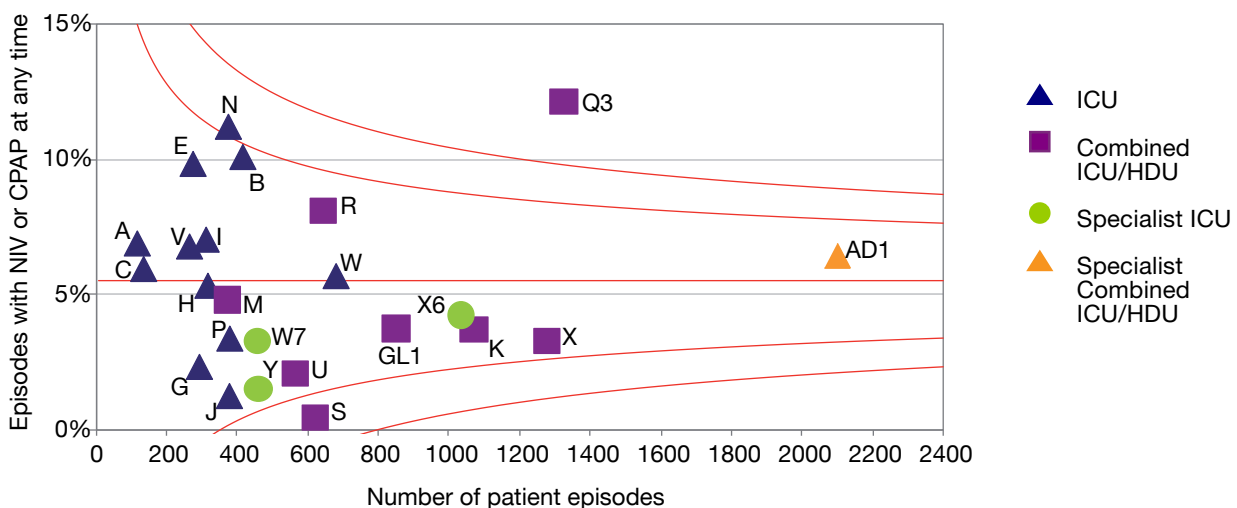


The Scottish percentage average of patients requiring invasive ventilation was 63% in 2015.

The specialist units are again invasively ventilating a statistically significantly higher number of patients but this is entirely appropriate. Units N (Ninewells ICU), W7 (ARI CICU), Y (RIE NICU), GL1 (QEU ICU), X6 (RIE CICU) are ventilating statistically significantly higher numbers compared to other units in Scotland.

The lower area of the graph is dominated by the combined units.

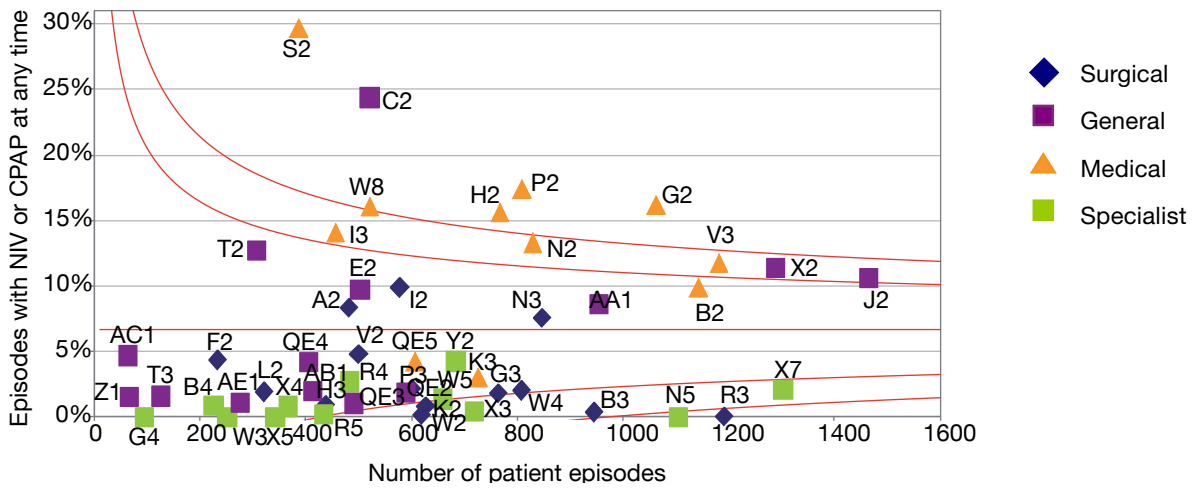
Figure 23 NIV and CPAP rates in ICU and combined units (2015)



The incidence of this method of respiratory support remains low in ICU and combined units, at 6% in 2015.

Unit Q3 (FVRH (ICU/HDU) has a significantly higher percentage of patient episodes receiving this method of respiratory support.

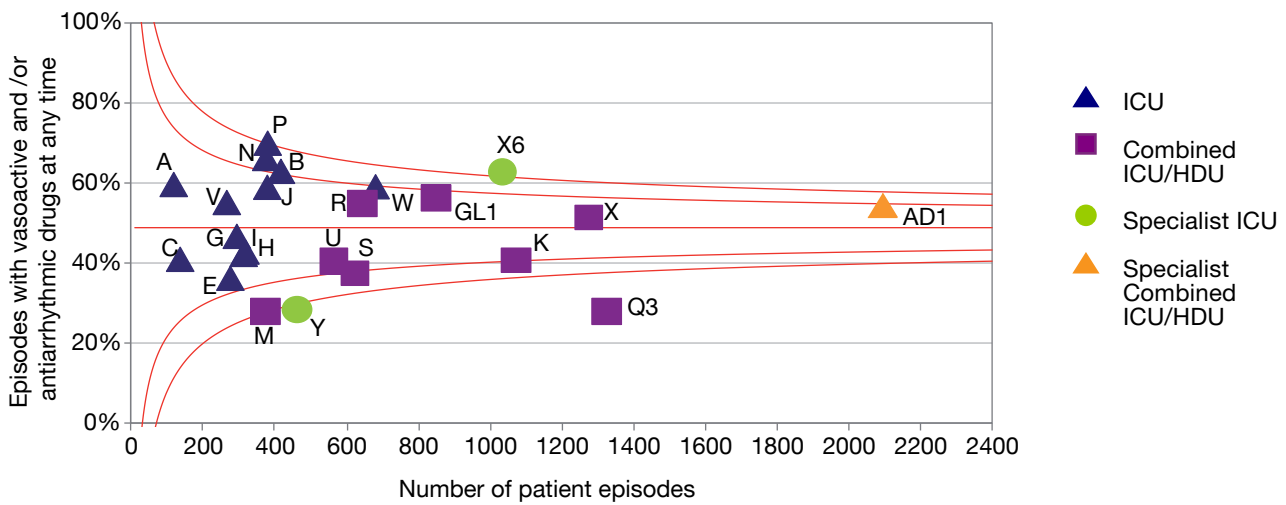
Figure 24 NIV and CPAP rates in HDU (2015)



The proportion of admissions to HDU who received NIV and/or CPAP has remained the same since 2012 at 7%. The top of the chart is dominated by medical HDUs as would be expected.

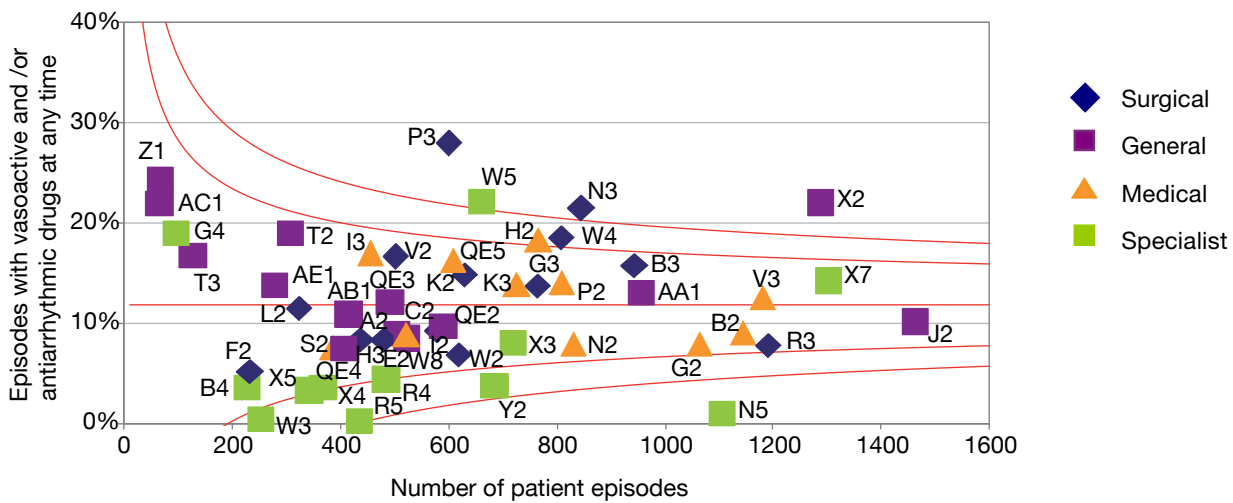
4.3 Cardiovascular support

Figure 25 Use of vasoactive and/or antiarrhythmic drugs in ICU and combined units (2015)



The proportion of patient episodes with vasoactive and/or antiarrhythmic drugs in ICU and combined units in 2015 is 49%, similar to the percentage reported in previous years.

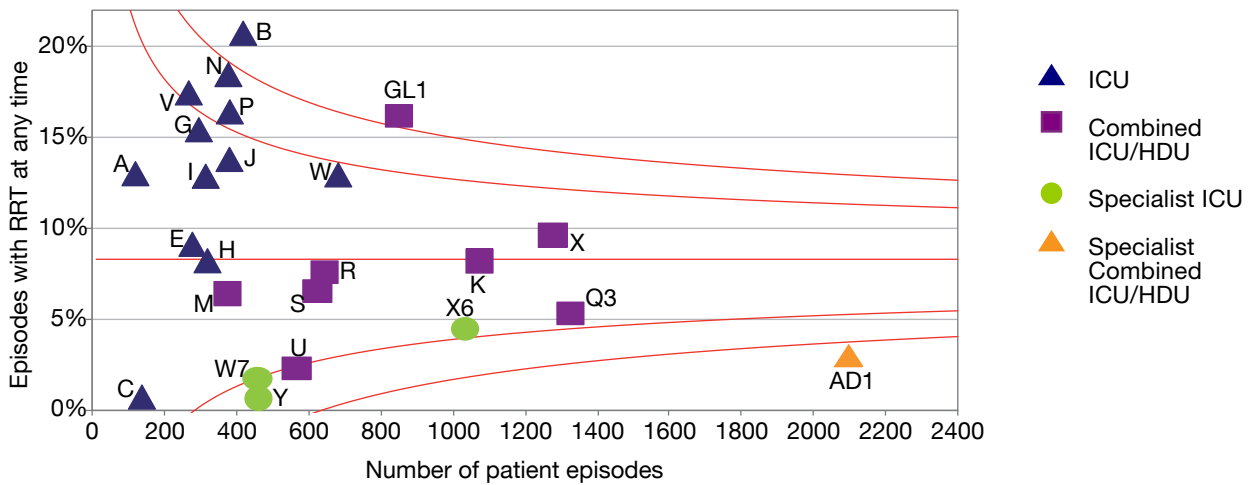
Figure 26 Use of vasoactive and/or antiarrhythmic drugs in HDU (2015)



Use of vasoactive and/or antiarrhythmic drugs in HDU has remained at a similar level to last year at 12%.

4.4 Renal support

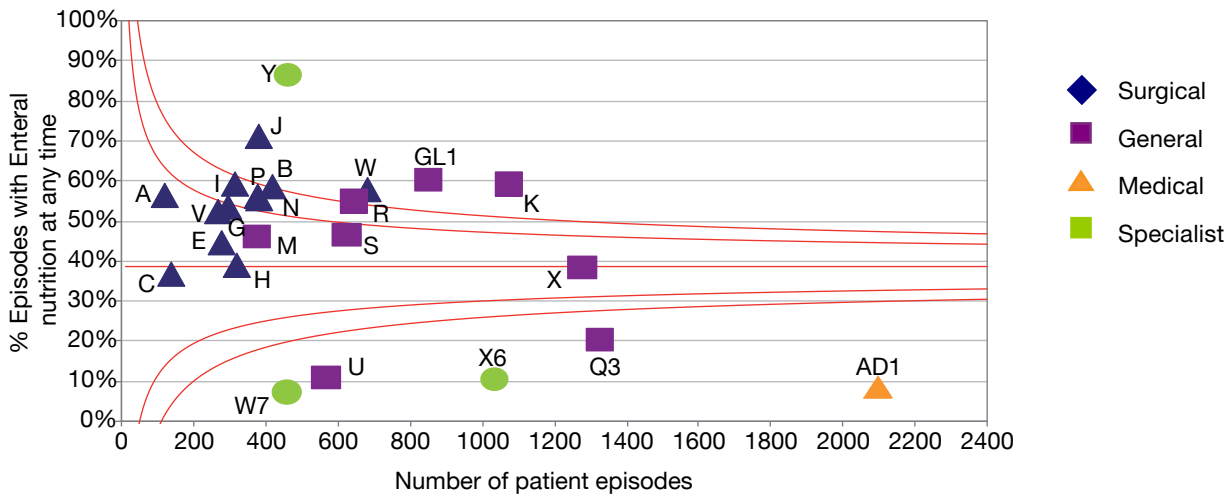
Figure 27 Renal Replacement Therapy in ICU and combined units (2015)



The provision of Renal Replacement Therapy (RRT) across Scotland decreased in the last few years from 12% in 2011 to 8% in 2015.

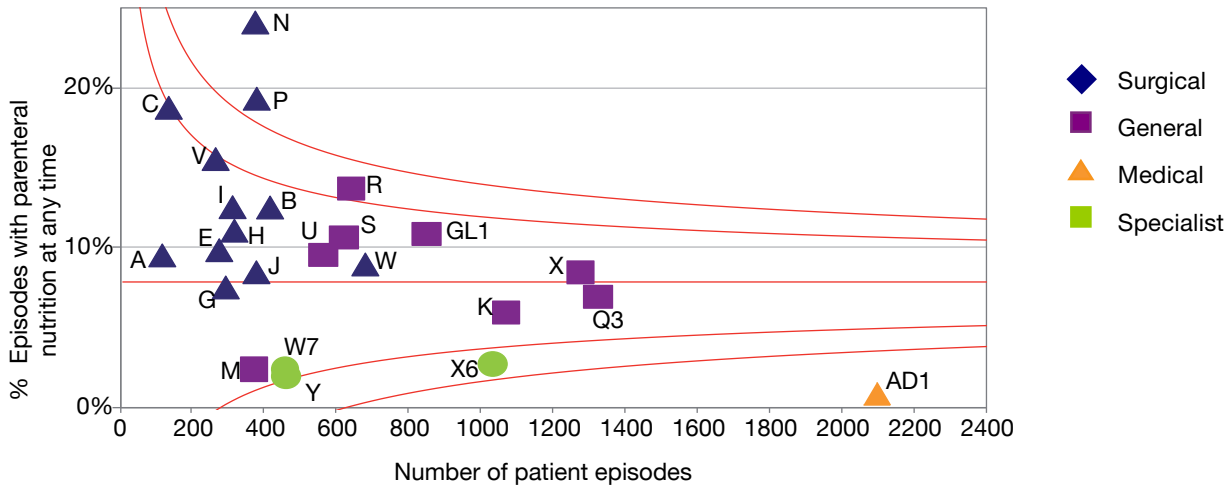
4.5 Nutrition

Figure 28 Enteral nutrition in ICU and combined units (2015)



The provision of enteral invasive nutrition in Scotland ICUs was 39% in 2015.

Figure 29 Parenteral nutrition in ICU and combined units (2015)



The provision of parenteral nutrition in Scotland ICUs was 8% in 2015.

Units P (Raigmore ICU), N (Ninewells ICU) and AD1 (Golden Jubilee ICU/HDU) are statistically different to the rest of Scotland.

Section 5 Surveillance of HAIs in ICUs

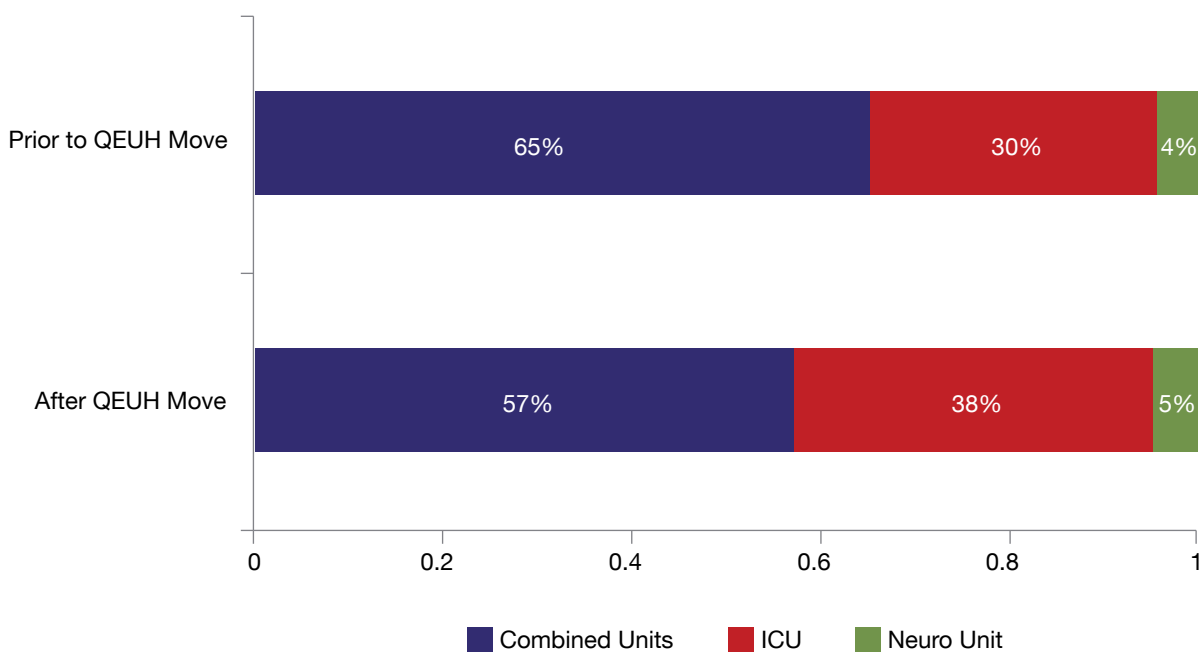
5.1 Data collection and patient population

Data collected for the national HAI surveillance programme are presented in this section. Surveillance data were collected from adult patients (16 years or over) admitted to participating ICUs between 01/01/2015 and 31/12/2015, with a stay of more than two days in ICU. It is noted that this represents a different patient population than that presented in the other sections of this report. All infections reported were identified in accordance with the European surveillance methodology^{12,13}. For the purpose of this report all units including the combined intensive care/high dependency units will be referred to as ICUs.

It is noted that there have been changes to units participating in the national surveillance programme during 2015. Three units in Glasgow closed and the Queen Elizabeth University Hospital (QEUE) unit opened in April 2015. The transition of these three units to QEUE units took place during April and May 2015. Prior to the changes in Glasgow, the total number of units participating was 23 units and following the change, 21 units participated. The proportion of ICU types before and after the changes in Glasgow are summarised in Figure 30.

It is noted that three Glasgow ICUs moved to the QEUE ICU, this may have altered the case-mix of patients included in surveillance. The way in which surveillance data are collected is also likely to have changed, which may influence the data contributed by this patient population, but has not been quantified.

Figure 30 Proportion of ICU types contributing to national HAI surveillance data



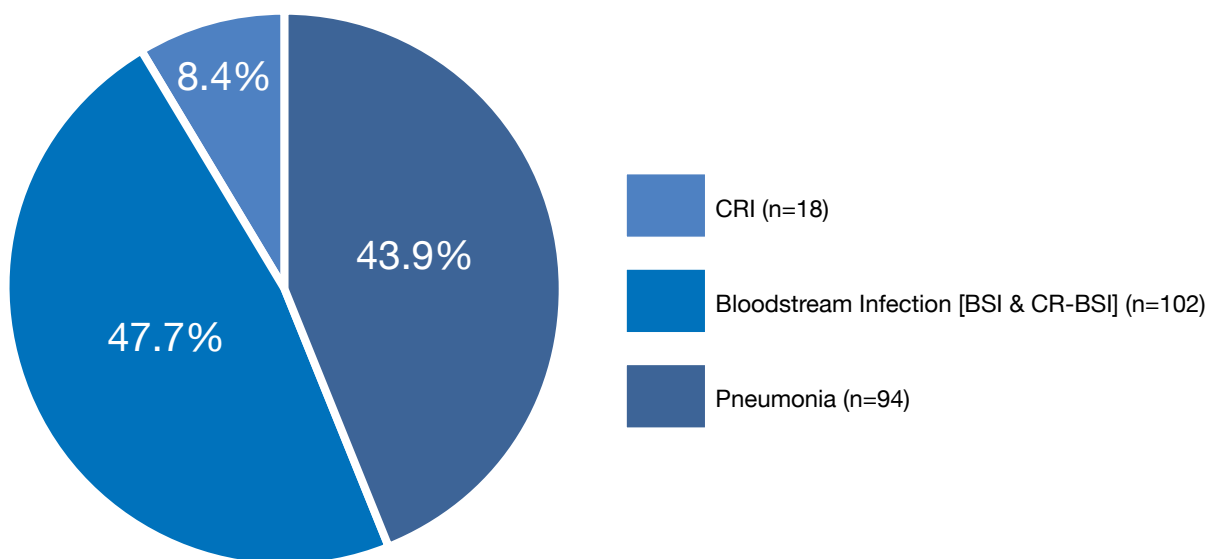
5.2 The epidemiology of HAI in ICU

Healthcare Associated Infections

BSI	Bloodstream Infection
CLABSI	Central Line Associated Bloodstream Infection Patient had a BSI and central line <i>in situ</i> on the day of onset or in the 48 hours prior to the day of onset and where there was no infection with the same organism at another site.
CRI	Catheter-Related Infection Local infection at the insertion site or clinical symptoms that improve on removal of central line
CR-BSI	Catheter-Related Bloodstream Infection Microbiologically confirmed central line related BSI
VAP	Ventilator Associated Pneumonia Pneumonia where an invasive respiratory device was present preceding infection
PN	Pneumonia

Data were collected from 6,916 patients and in total 214 HAIs (PN, CRI and BSI) were reported from 197 (2.8%, 95% CI: 2.5-3.3) of patients. Broken down by infection type, these were; 94 (43.9%) PN, 102 (47.7%) BSI (including CR-BSI) and 18 (8.4%) CRI.

Figure 31 Percentage of each HAI type reported (n=214)



Pneumonia

A total of 94 pneumonia were reported from 92 (1.3%, 95% C.I: 1.1-1.6) patients, of these 86 (91.5%) were considered to be VAP[§]. Seven (7.4%) of the remaining pneumonia were not considered to be VAP and one was unable to be classified due to missing device data. The incidence rates for pneumonia are summarised in Table 5.

Table 5 Incidence of pneumonia

Invasive respiratory device present¶	Number of pneumonia	Incidence (95% Confidence Intervals)
Yes (VAP)§	86	2.7 per 1000 invasive device days¶ (2.1-3.3)
No (non-VAP)	7	0.1 per 1000 patient days (0.1-0.3)
Not classified	1	-
All	94	1.7 per 1000 patient days (1.4-2.1)

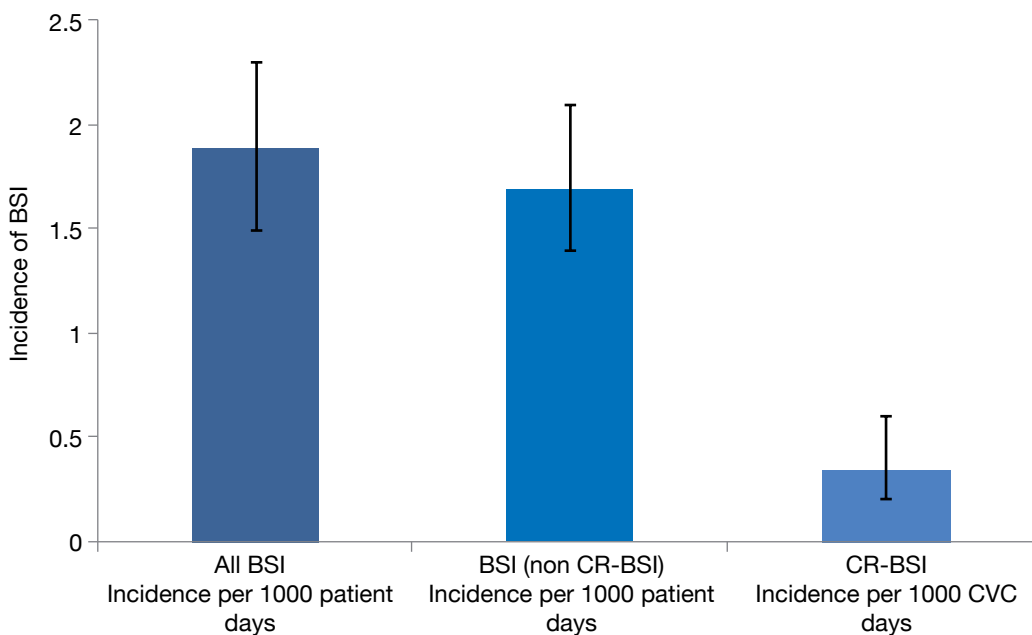
§ Infections were considered to be VAP if the patient had an invasive respiratory device present in the 48 hours preceding the onset of infection.

¶ Invasive respiratory device present in the 48 hours preceding the onset of infection.

Bloodstream Infections

A total of 102 BSI were reported from 101 patients, (1.5%, 95% C.I: 1.2–1.8) and the incidence of all BSI was 1.9 per 1000 patient days. Of the BSI reported, 11 (10.8%) were CR-BSI, the incidence of CR-BSI was 0.3 per 1000 central venous catheter (CVC) days. The incidence of BSI (not including CR-BSI) was 1.7 per 1000 patient days. These data are shown in Figure 32.

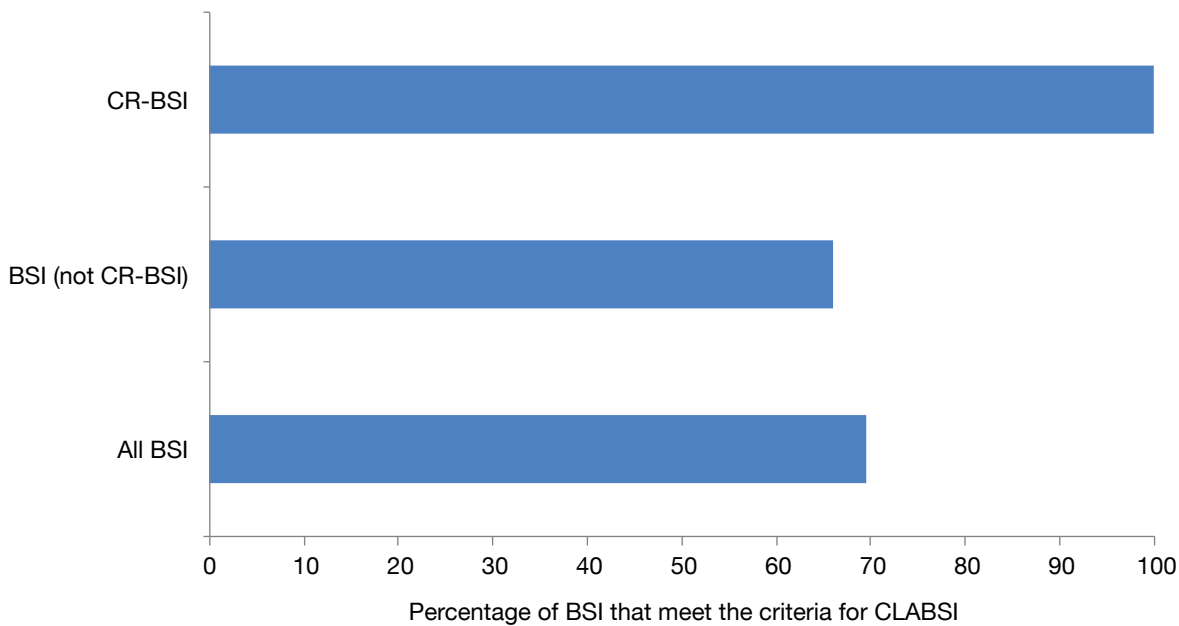
Figure 32 Incidence of BSI



Central Line Associated BSI (CLABSI)

Of the 91 BSI (not including CR-BSI) reported, 60 had a CVC present around the time of infection and therefore met the criteria for CLABSI. The incidence of CLABSI (n=60) + CR-BSI (n=11) was 2.2 per 1000 CVC days (95% CI: 1.7-2.8). The percentage of BSI that met the criteria for CLABSI are shown in Figure 33.

Figure 33 The percentage of BSI that meet the criteria for CLABSI



CVC related infection (not including CR-BSI)

In total, 18 Local and General CRI were reported, the incidence density of CRI was 0.6 per 1000 CVC days, (95% CI: 0.3-0.9).

Year on year comparison of micro-organisms isolated from HAI

The distribution of the top ten organisms isolated from pneumonia and BSI in 2014 and 2015 are shown in Figure 34 and 35. The number of organisms is small and therefore any variation should be interpreted with caution.

Figure 34 The distribution of the top ten micro-organisms isolated from pneumonia in 2015 and the corresponding distribution of these organisms on 2014.

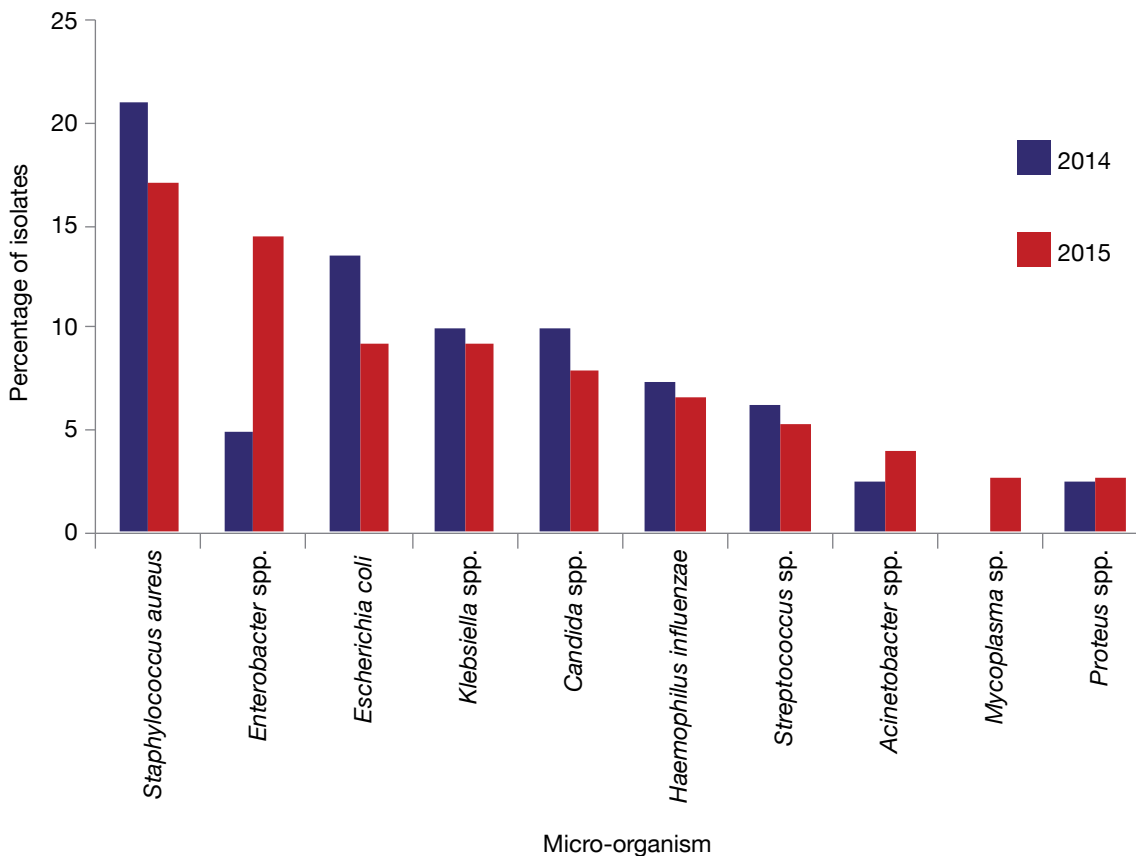
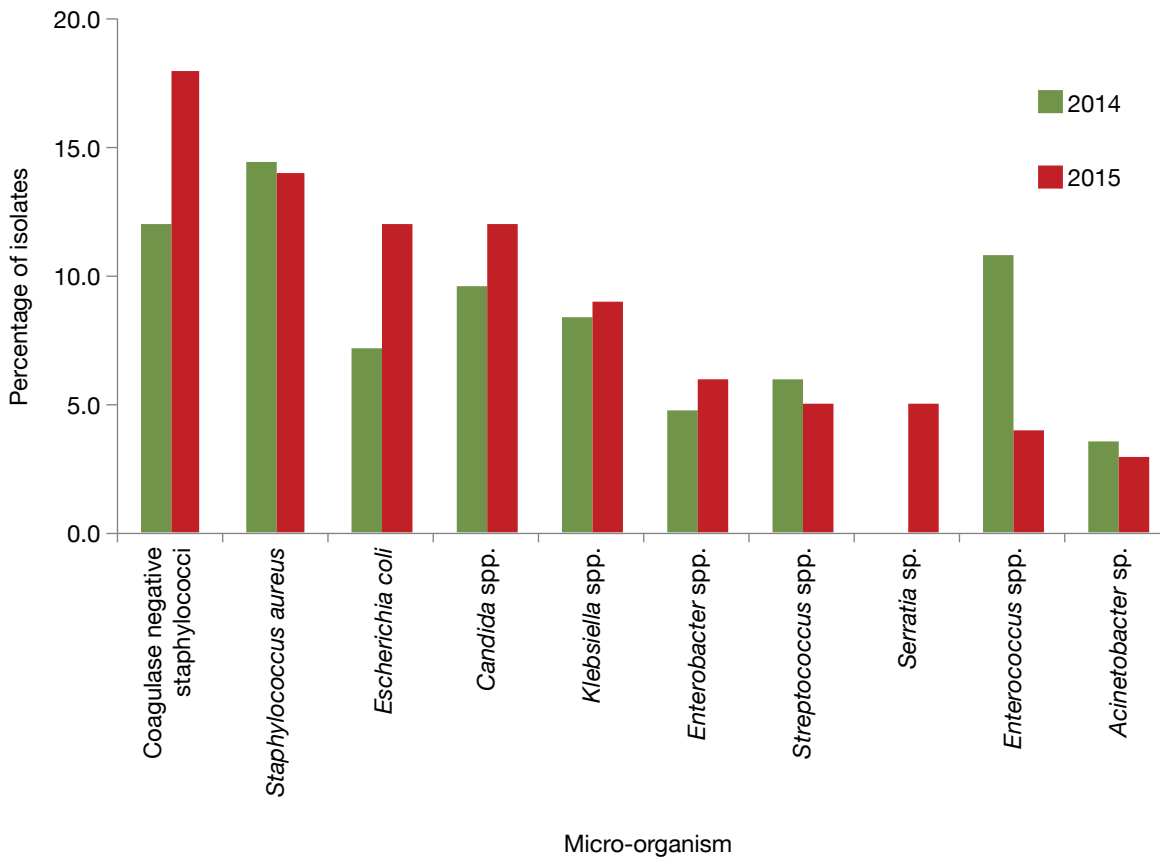


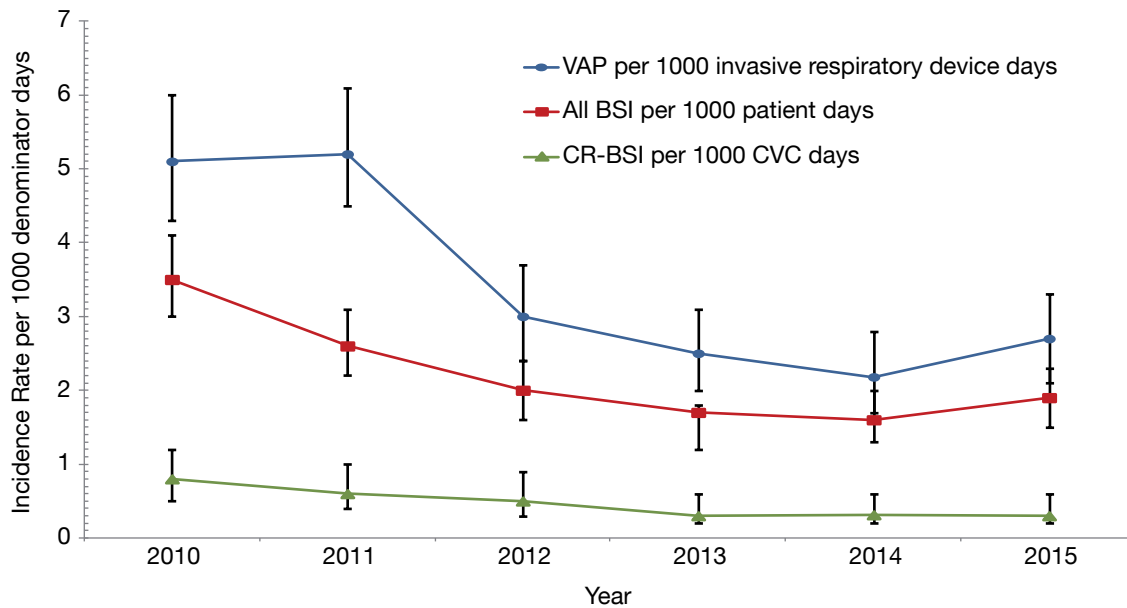
Figure 35 The distribution of the top ten micro-organisms isolated from BSI in 2015 and the corresponding distribution of these organisms in 2014



Year on year Comparison of Incidence Rates

The HAI data collected during 2015 show that there has been no change in the incidence of HAI from the previous year. In 2015, 2.8% of patients admitted to ICU with a stay of more than two days developed one or more HAI, this compares with 2.5% of patients in 2014 (Test of Proportions, $p=0.15$). Incidence rates of VAP, BSI and CR-BSI for 2010 to 2015 are shown in Figure 36.

Figure 36 Incidence rates of BSI, VAP and CR-BSI, 2010-2015



Benchmarking of incidence rates in Scotland and Europe for 2010 to 2012

Aggregated data from 14 European countries for pneumonia and BSI are shown in Table 6 and are compared to equivalent data from Scotland for the same time period. There is no published European data available beyond 2012 for comparison.

Table 6 Incidence Rates and percentage of patients with pneumonia and BSI for Scotland and Europe, 2010 to 2012

	Europe 2010 ¹⁴	Scotland 2010 ¹⁵	Europe 2011 ¹⁶	Scotland 2011 ¹⁷	Europe 2012 ¹⁸	Scotland 2012 ¹⁹
Percentage of patients who developed a pneumonia	5.9	3.1	5.6	2.8	5.3	2.0
All pneumonia per 1000 patient days	6.9	4.3	6.5	3.9	6.4	2.4
Ventilator associated pneumonia per 1000 intubation days	10.8	5.1	9.9	5.2	10.1	3.0
Percentage of patients who developed a BSI	3.1	2.6	3.0	2.0	3.0	1.5
Incidence rate of all BSI per 1000 patient days	3.5	3.5	3.5	2.6	3.3	2.0

Conclusion

The SICSAG audit remains a comprehensive report of the activity, interventions and outcome of critical care in Scotland. The addition of professionally agreed minimum standards of care and indicators of quality provides further depth and context indicative of a multidisciplinary service which is continually striving to improve. The established HAI surveillance program provides further evidence of collaborative working between critical care, Information Services Division and Health Protection Scotland.

Detailed individual unit-level information is presented for scrutiny and to inform the public, health care professionals and managers about the high quality of Scottish critical care. This report provides reassurance that the quality of critical care available within Scotland is of a uniformly high standard. There are ongoing challenges, particularly around discharge from critical care taking place out of hours. There is also evidence that some areas of the country lack adequate critical care capacity.

The number of units participating in the audit continues to grow as critical care expands to encompass more patients and many of the small number of non-participating units are in the process of doing so. Managers and Health Boards should seek to question why any critical care unit within their remit has not joined SICSAG and provide resource to ensure accurate and timely data collection.

The original SICSAG audit has developed into a dynamic and highly co-ordinated quality improvement programme which provides data, analysis and feedback. The expressed aims are to constantly raise standards and drive continued improvement in outcomes.

It is evident in this report that there is widespread engagement and enthusiasm for the audit among the clinical staff who care for the critically ill in Scotland.

Appendix 1 ICU profiles 2015

Capacity and Multi-disciplinary Team Information							
Hospital	Actual beds	Funded beds (Level 3/2)	Trained Nurse WTE*	ICU pharmacist	Microbiologist	Physiotherapy	Dietetic review available
ARI General	16	10	7	everyday	everyday	everyday	weekdays
ARI Cardio	6	5	5	weekdays	On call as needed	everyday	weekdays
AYR	5	4	6.2	weekdays	On call as needed	everyday	weekdays
Crosshouse	6	5.5	6.2	weekdays	everyday	everyday	weekdays
BGH	9	7	6.0	weekdays	weekdays	everyday	weekdays
DGRI	6	4	8.3	weekdays	Phone service at weekends	everyday	weekdays
VHK	10	9	6.3	weekdays	Phone service at weekends	everyday	Available 5 days a week
FVRH	19	7/12	5.5	weekdays	everyday	everyday	weekdays
QEU	20	18	7.3	weekdays	everyday	everyday	weekdays
GRI	20	12/8	6.1	weekdays	everyday	everyday	weekdays
IRH	3	See note below ¹	4.5	weekdays	other	everyday	weekdays
RAH	8	7	6.1	weekdays	weekdays	everyday	weekdays
SGH Neuro	9	6	7.3	everyday	everyday	everyday	weekdays
Raigmore	7	7	5.82	weekdays	other	everyday	weekdays
Hairmyres	10	7.25 ²	7	weekdays	everyday	everyday	weekdays
MDGH	6	5.3 ²	5.2	weekdays	weekdays	everyday	weekdays
Wishaw	5.3	5.3 ²	5.2	weekdays	everyday	everyday	weekdays
RIE General	18	16/2	6.2	weekdays	everyday	everyday	weekdays
RIE Cardio	12	9	6.6	weekdays	weekdays	everyday	weekdays
SJH	7	3/2	6.4	weekdays	weekdays	everyday	other
WGH	16	10/6	6.86	weekdays	everyday	everyday	weekdays
Ninewells	9	8	5.5	weekdays	everyday	everyday	weekdays
PRI	4	3	6.16	everyday	everyday	everyday	weekdays
GJNH Critcare	22 ICU	20/12 ³	6.2 for ITU beds only	weekdays	everyday	everyday	weekdays

Notes

- 1 Currently under review (ICU 2 beds, HDU 4 beds and CCU 11 beds has a total funded establishment of 43.79wte with current staffing at 48.74wte).
 - 2 Funded beds increase in winter months.
 - 3 Available beds vary daily from Friday to Tuesday.
- * Whole Time Equivalent per level 3 bed.

Appendix 2 HDU profiles 2015

Capacity and Multi-disciplinary Team Information								
Hospital	Actual beds	Funded Level 2/1 beds ¹	Trained Nursing WTE*	Dedicat-ed HDU Consultant	HDU pharmacist	Microbi-ologist	Physio-therapy	Dietetic review
Ayr HDU	4	4	3	no	weekdays	other	everyday	weekdays
Crosshouse SHDU	12	8	3.5	no	weekdays	everyday	other	weekdays
Crosshouse MHDU	12	12	1.81	everyday	weekdays	other	weekdays	weekdays
DGRI MHDU	8	8	3.3	no	other	other	other	weekdays
DGRI SHDU	4	4	4.1	referring consultant	weekdays	weekdays	everyday	weekdays
VHK SHDU	10	8	2.86	weekdays	weekdays	other	everyday	weekdays
VHK MHDU	8	8	2.8	no	weekdays	other	weekdays	weekdays
VHK RHDU	3	3	2/3	yes	other	other	other	weekdays
ARI SHDU (31/32) Ward 503	7	7	2.5	no	weekdays	other	weekdays	other
ARI SHDU (35) Ward 506	9	8	3	no	weekdays	other	everyday	weekdays
ARI CHDU	6	6	2.6	no	weekdays	other	weekdays	weekdays
ARI NHDU	4	2	No separate funding	yes	weekdays	other	everyday	weekdays
ARI MHDU	10	10	12	yes	weekdays	weekdays	weekdays	weekdays
Dr Gray's HDU	10	10	2.9	no	other	other	other	other
GRI SHDU	8	8	2.9	everyday	everyday	weekdays	everyday	weekdays
GRI MHDU	6	6 (Jan to Jun) 8 (Jul-Dec)	2.7	weekdays	weekdays	other	everyday	weekdays
Princess Royal OHDU	2	No separate funding	No separate funding	No	Hospital pharmacist covers all admissions	On call for hospital	everyday	Cover given when requested
QEU HDU1	10	8	3.23	everyday	weekdays	weekdays	everyday	weekdays
QEU HDU2	10	10	3.23	everyday	weekdays	weekdays	everyday	weekdays
QEU HDU5	9	9	2.7	everyday	weekdays	Phone service	everyday	weekdays
QEU HDU6	10	8	3.23	everyday	weekdays	weekdays	everyday	weekdays
IRH SHDU	4	4	See note below ²	no	weekdays	other	everyday	weekdays
RAH HDU	12	12	3.1	no	weekdays	other	weekdays	other
SGH NHDU	6	4	4.25	everyday	everyday	other	everyday	weekdays
Raigmore SHDU	6	6	2.94	no	weekdays	other	everyday	weekdays
Raigmore MHDU	4	4	3.5	weekdays	weekdays	other	weekdays	weekdays
Belford HDU	2	2	1.56	no	weekdays	other	weekdays	weekdays

Capacity and Multi-disciplinary Team Information								
Hospital	Actual beds	Funded Level 2/1 beds ¹	Trained Nursing WTE*	Dedicat-ed HDU Consultant	HDU pharmacist	Microbi-ologist	Physio-therapy	Dietetic review
Hairmyres MHDU	4	4	2.75	everyday	weekdays	weekdays	weekdays	weekdays
MDGH SHDU	8	8	2.6	no	weekdays	everyday	everyday	weekdays
MDGH MHDU	4	4	2.04	everyday	everyday	everyday	weekdays	weekdays
Wishaw SHDU	6	6.7	2.75	everyday	weekdays	everyday	everyday	weekdays
Wishaw MHDU	12	6/6	0.5	no	weekdays	weekdays	everyday	weekdays
RIE HDU	10	10	3.1	everyday	weekdays	other	everyday	weekdays
RIE RHDU	8	8	0.5	everyday	weekdays	other	everyday	weekdays
RIE Transplant HDU	4	4	4.25	no	weekdays	weekdays	weekdays	weekdays
RIE Vascular (Level 1)	4	0/4	Shared with Vascular ward	no	other	other	other	weekdays
RIE CHDU	10	8	3.78	everyday	weekdays	weekdays	everyday	other
WGH SHDU	10	6/4	2.9	no	weekdays	weekdays	weekdays	weekdays
WGH NHDU/ Level 1	7	4/3	3.4	other	other	other	everyday	weekdays
Balfour Hospital HDU	3	2	1	everyday	weekdays	weekdays	everyday	weekdays
GBH HDU	2	No separate funding ³	Staffed as required	weekdays	weekdays	other	weekdays	weekdays
Ninewells SHDU	10	10	3.7	everyday	other	everyday	everyday	weekdays
Ninewells MHDU	6	6	3.1	no	other	weekdays	weekdays	other
Ninewells OHDU	2	1 ⁴	0.5	no	other	other	other	weekdays
PRI HDU	4	4	2.74	no	weekdays	other	everyday	weekdays
WIH HDU	4	4	0.5	no	weekdays	other	weekdays	weekdays

Key:

SHDU – Surgical HDU

MHDU – Medical HDU

NHDU – Neurological HDU

CHDU – Cardiothoracic HDU

RHDU – Renal HDU

Notes

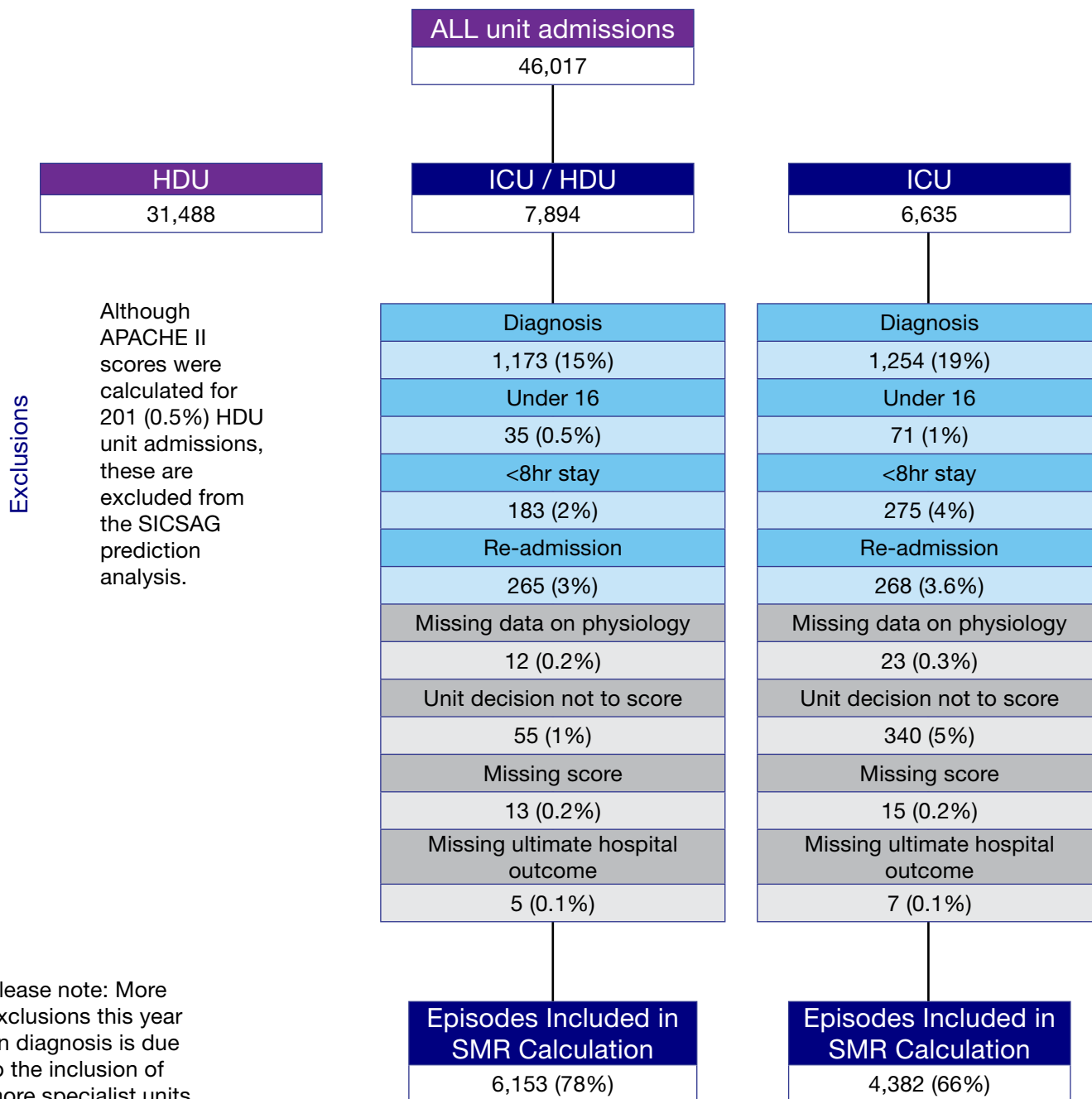
1 Nursing staff cover ICU, SHDU and CCU beds therefore this figure is approximate.

2 Currently under review (ICU 2 beds, HDU 4 beds and CCU 11 beds has a total funded establishment of 43.79wte with current staffing at 8.74wte).

3 HDUs are open when necessary and staffed by ward nurses (with HDU training). Occupancy is calculated on one bed in these units. 4 Level 0 patients are excluded from the occupancy calculations for this unit.

* Whole time equivalent per level 2 bed.

Appendix 3 Eligibility for APACHE II scores and selection for analysis (2015)



Appendix 4 Level of care

Level of care is calculated on a daily basis from the Augmented Care Period (ACP) page of WardWatcher.

WardWatcher scores levels of care based on support of five organ systems: respiratory, cardiovascular, renal, neurological and dermatological.

Level 3

Advanced respiratory support (connected to a ventilator via ETT or tracheostomy) OR

Two or more organ systems are being supported (except basic respiratory and basic cardiac)

Level 2

One organ supported

Level 1

Epidural or/and

General observations requiring more monitoring than can be provided on a general ward

Level 0

A patient is assessed as level 0 if not assessed as level 1, 2 or 3 (e.g. no organ support and adequate monitoring could be provided on a general ward)

Level of care is based on the Intensive Care Society guidelines⁶.

Appendix 5 HAI Reader's Notes

Confidence Intervals

A range of values within which we are fairly confident the true population value lies. A 95% CI means that we can be 95% confident that the population value lies within the lower and higher confidence limits.

Incidence for BSI and PN

Total number of BSI/PN as a proportion of the sum of the ICU in-patient days contributed by each patient in the study population. The proportion is expressed as the number of BSI/PN per 1000 patient days.

Incidence for CRI and CR-BSI

Total number of CRI/CR-BSI as a proportion of the sum of the CVC days (days that a patient had a CVC *in situ*) contributed by each patient in the study population. The proportion is expressed as the number CRI/CR-BSI per 1000 CVC days

Incidence for VAP

Total number of VAP as a proportion of the sum of the invasive respiratory device days (days that a patient required intubation) contributed by each patient in the study population. The proportion is expressed as the number VAP per 1000 invasive respiratory device days.

Device Utilisation

Total number of days that a patient had a CVC or invasive respiratory device *in situ* as a proportion of the sum of the patient days contributed by each patient in the study population. The proportion is expressed as the number of CVC or invasive respiratory device per 100 patient days.

Appendix 6 List of abbreviations

ACP	Augmented Care Period
APACHE	Acute Physiology and Chronic Health Evaluation
CLABSI	Central Line Associated Bloodstream Infection
COMQI	Clinical Outcome Measures for Quality Improvement
CPAP	Continuous Positive Airway Pressure
CR-BSI	Catheter Related Bloodstream Infection
CRI	CVC Related Infection
CVC	Central Venous Catheter
ECDC	European Centre for Disease Prevention and Control
GPICS	Guidelines for the Provision of Intensive Care Services
HAI	Healthcare Associated Infection
HAN	Hospital at Night
HDU	High Dependency Unit
HPS	Health Protection Scotland
ICS	Intensive Care Society
ICU	Intensive Care Unit
ISD	Information Services Division
LCP	Liverpool Care Pathway
M & M	Morbidity and Mortality
NIV	Non Invasive Ventilation
QI	Quality Indicator
RRT	Renal Replacement Therapy
SCCTG	Scottish Critical Care Trials Group
SD	Standard Deviation
SICS	Scottish Intensive Care Society
SICSAG	Scottish Intensive Care Society Audit Group
SHA	Scottish Healthcare Audit
SMR	Standardised Mortality Ratio
SPSP	Scottish Patient Safety Programme
VAP	Ventilator Associated Pneumonia
WTE	Whole Time Equivalent
WW	WardWatcher

List of References

1. The Scottish Government. *Healthcare Quality Strategy for NHS Scotland*; 2010. Available at: <http://www.scotland.gov.uk/Resource/Doc/311667/0098354.pdf>. Last accessed July 2016.
2. The Scottish Government. *2020 Vision*; 2012. Available at: <http://www.gov.scot/Topics/Health/Policy/2020-Vision>. Last accessed July 2016.
3. The Scottish Intensive Care Society Quality Improvement Group. *Quality Indicators for Critical Care in Scotland*; 2012, Version 2.0. Edinburgh, Scotland.
4. The Faculty of Intensive Care Medicine (FICM) and the Intensive Care Society (ICS). *Guidelines for the Provision of Intensive Care Services (GPICS)*. First Edition. 2013. London. Available at: <https://www.ficm.ac.uk/news-events/gpics-published-%E2%80%93-guidelines-icm-services-2015>. Last accessed July 2016.
5. The Scottish Intensive Care Society Quality Improvement Group. *Minimum Standards and Quality Indicators for Critical Care in Scotland (Dec 2015)*; Version 3.0. Available at: <http://www.sicsag.scot.nhs.uk/quality/indicators.html>. Last accessed July 2016.
6. The Intensive Care Society. Levels of Critical Care for Adult Patients: 2009. Available at: <http://members.ics.ac.uk/ICS/guidelines-and-standards.aspx>. Last accessed July 2016.
7. Scottish Government Health Department. *Healthcare Associated Infection (HAI) and Antimicrobial Resistance (AMR) Policy Requirements*. DL(2015)19. SEHD 2015 [cited June 2016]. Available at: [www.sehd.scot.nhs.uk/dl/DL\(2015\)19.pdf](http://www.sehd.scot.nhs.uk/dl/DL(2015)19.pdf). Last accessed July 2016.
8. Dr Calderwood C., Chief Medical Officer Scotland. *Realistic Medicine, the Chief Medical Officer's Annual Report 2014-15*. Available at: <http://www.gov.scot/Publications/2016/01/3745>. Last accessed July 2016.
9. Healthcare Quality Quest. *Standards for a National Clinical Audit or a Quality Improvement Study*. 2012. Available at; <http://www.hqq.co.uk/html/publications/pdfs/Standards-for-National-Clinical-Audits.pdf>. Last accessed July 2016.
10. Livingston B., Mackenzie S. & MacKirdy F. et al (2000) Should the pre-sedation Glasgow Coma Scale value be used when calculating Acute Physiology and Chronic Health Evaluation scores for sedated patients? *Critical Care Medicine*, 28: 389-94.
11. NHS Blood and Transplant. *Taking Organ Transplantation to 2020: A detailed strategy*. Available at: <http://www.nhsbt.nhs.uk/to2020/get-the-strategy/>. Last accessed July 2016.
12. European Centre for Disease Prevention and Control. *European Surveillance of Healthcare-Associated Infections in Intensive Care Units. HAIICU Protocol v1.0. Standard and Light*. Stockholm: ECDC; 2010.
13. European Centre for Disease Prevention and Control. *Hospital in Europe Link for Infection Control through Surveillance* (2004). Surveillance of Nosocomial Infections in Intensive Care Units Protocol 6.1.
14. European Centre for Disease Prevention and Control. *Annual Epidemiological Report 2012. Reporting on 2010 surveillance data and 2011 epidemic intelligence data*. Stockholm: ECDC 2013. [cited June 2016] Available at: <http://ecdc.europa.eu/en/publications/Publications/Annual-Epidemiological-Report-2012.pdf>. Last accessed July 2016.

15. Health Protection Scotland. *Surveillance of Healthcare Associated Infections in Scottish Intensive Care Units. Annual report of data from January 2010 to December 2010.* Health Protection Scotland, 2011. [cited June 2016] Available at: <http://www.documents.hps.scot.nhs.uk/hai/sshaip/publications/icu-surveillance/icu-annual-report-2011.pdf>. Accessed June 2016
16. European Centre for Disease Prevention and Control. *Annual Epidemiological Report 2012. Reporting on 2011 surveillance data and 2012 epidemic intelligence data.* Stockholm: ECDC; 2013. [cited June 2016] Available at: <http://ecdc.europa.eu/en/publications/Publications/annual-epidemiological-report-2013.pdf>. Accessed June 2016
17. Health Protection Scotland. *Surveillance of Healthcare Associated Infections in Scottish Intensive Care Units. Annual report of data from January 2011 to December 2011.* Health Protection Scotland, 2012. [cited June 2016] Available at: <http://www.documents.hps.scot.nhs.uk/hai/sshaip/publications/icu-surveillance/icu-annual-report-2013.pdf>. Accessed June 2016
18. European Centre for Disease Prevention and Control. *Annual epidemiological report 2014. Antimicrobial resistance and healthcare-associated infections.* Stockholm: ECDC; 2015. [cited June 2016] Available at: <http://ecdc.europa.eu/en/publications/Publications/antimicrobial-resistance-annual-epidemiological-report.pdf>. Accessed June 2016
19. Health Protection Scotland. *Surveillance of Healthcare Associated Infections in Scottish Intensive Care Units. Annual report of data from January 2012 to December 2012.* Health Protection Scotland, 2013. [cited June 2016] Available at: <http://www.documents.hps.scot.nhs.uk/hai/sshaip/publications/icu-surveillance/icu-annual-report-2013.pdf>. Accessed June 2016

Acknowledgements

This report was written by the Report Writing Subgroup of the SICSAG Steering Group, in conjunction with the HAI surveillance programme at National Services Scotland.

Report Writing Subgroup 2015		
Name	Title	Address
Dr Stephen Cole	Chairman	Consultant in Critical Care, Ninewells Hospital, Dundee
Dr Charles Wallis	Vice Chairman	Consultant in Critical Care, Western General Hospital, Edinburgh
Professor Jacqui Reilly	Consultant Lead HAI, AMR, Infection Prevention and Control and Decontamination	Health Protection Scotland, NHS National Services Scotland
Mr Paul Smith	National Clinical Coordinator	SICSAG, Information Services Division, NHS National Services Scotland
Ms Lorraine Smyth	Senior Information Analyst	SICSAG, Information Services Division, NHS National Services Scotland
Dr Jodie McCoubrey	Epidemiologist, Surveillance of Scottish HAI Programme	Health Protection Scotland, NHS National Services Scotland
Dr Ian Mellor	Consultant in Anaesthesia and Intensive Care	Consultant in Critical Care, Ninewells Hospital, Dundee
Dr Jim Ruddy	Consultant	Consultant in Critical Care, Monklands District General Hospital, Airdrie
Ms Clare McGeoch	Quality Assurance Manager	SICSAG, Information Services Division, NHS National Services Scotland
Mrs Roselind Hall	Regional Coordinator	SICSAG, Information Services Division, NHS National Services Scotland

Abbreviation	ICUorHDU	Letter	HealthBoard
ARI Cardiothoracic HDU	HDU	W5	Grampian
ARI Cardiothoracic ICU	ICU	W7	Grampian
ARI ICU	ICU	W	Grampian
ARI MHDU	HDU	W8	Grampian
ARI Neuro HDU	HDU	W3	Grampian
ARI SHDU (31/32)	HDU	W2	Grampian
ARI SHDU (35)	HDU	W4	Grampian
Ayr HDU	HDU	E2	Ayrshire & Arran
Ayr ICU	ICU	E	Ayrshire & Arran
Balfour HDU	HDU	AE1	Orkney
Belford HDU	HDU	AC1	Highland
BGH ICU/HDU	ICU/HDU	U	Borders
Crosshouse ICU	ICU	G	Ayrshire & Arran
Crosshouse MHDU	HDU	G2	Ayrshire & Arran
Crosshouse SHDU	HDU	G3	Ayrshire & Arran
DGRI ICU	ICU	H	Dumfries & Galloway
DGRI MHDU	HDU	H2	Dumfries & Galloway
DGRI SHDU	HDU	H3	Dumfries & Galloway
Dr Grays HDU	HDU	AA1	Grampian
FVRH ICU/HDU	ICU/HDU	Q3	Forth Valley
GBH HDU	HDU	Z1	Shetland
GGH HDU	HDU	T2	Greater Glasgow & Clyde
GJNH Cardiothoracic ICU/HDU	ICU/HDU	AD1	National Waiting Times Centre
GRI ICU / HDU	ICU/HDU	K	Greater Glasgow & Clyde
GRI MDU	HDU	K3	Greater Glasgow & Clyde
GRI SHDU	HDU	K2	Greater Glasgow & Clyde
Hairmyres ICU/HDU	ICU/HDU	S	Lanarkshire
Hairmyres MHDU	HDU	S2	Lanarkshire
IRH ICU	ICU	A	Greater Glasgow & Clyde
IRH SHDU	HDU	A2	Greater Glasgow & Clyde
MDGH ICU	ICU	I	Lanarkshire
MDGH MHDU	HDU	I3	Lanarkshire
MDGH SHDU	HDU	I2	Lanarkshire
Ninewells ICU	ICU	N	Tayside
Ninewells MHDU	HDU	N2	Tayside
Ninewells Obstetric HDU	HDU	N5	Tayside
Ninewells SHDU	HDU	N3	Tayside
PRI HDU	HDU	C2	Tayside
PRI ICU	ICU	C	Tayside
PRM	HDU	G4	Greater Glasgow & Clyde
QEU HDU1	HDU	QE2	Greater Glasgow & Clyde
QEU HDU2	HDU	QE3	Greater Glasgow & Clyde
QEU HDU6	HDU	QE4	Greater Glasgow & Clyde
QEU ICU (all units for 2015)	ICU	GL1	Greater Glasgow & Clyde
QEU MHDU	HDU	QE5	Greater Glasgow & Clyde
RAH HDU	HDU	J2	Greater Glasgow & Clyde
RAH ICU	ICU	J	Greater Glasgow & Clyde
Raigmore ICU	ICU	P	Highland
Raigmore MHDU	HDU	P2	Highland
Raigmore SHDU	HDU	P3	Highland
RIE Cardiothoracic HDU	HDU	X7	Lothian
RIE Cardiothoracic ICU	ICU	X6	Lothian
RIE HDU	HDU	X2	Lothian
RIE ICU/HDU	ICU/HDU	X	Lothian
RIE Renal HDU	HDU	X3	Lothian
RIE Transpl	HDU	X4	Lothian
RIE Vasc (Level 1)	HDU	X5	Lothian
SGH ICU	ICU	F	Greater Glasgow & Clyde
SGH Neuro HDU	HDU	Y2	Greater Glasgow & Clyde
SGH Neuro ICU	ICU	Y	Greater Glasgow & Clyde
SGH SHDU	HDU	F2	Greater Glasgow & Clyde
SJH ICU/HDU	ICU/HDU	M	Lothian
VHK ICU	ICU	B	Fife
VHK MHDU	HDU	B2	Fife
VHK Renal HDU	HDU	B4	Fife
VHK SHDU	HDU	B3	Fife
VIG SHDU	HDU	L2	Greater Glasgow & Clyde
VI ICU	ICU	L	Greater Glasgow & Clyde
WGH ICU/HDU	ICU/HDU	R	Lothian
WGH Neuro (Level 1)	HDU	R5	Lothian
WGH Neuro HDU	HDU	R4	Lothian
WGH SHDU	HDU	R3	Lothian
WIG HDU	HDU	T3	Greater Glasgow & Clyde
WIG ICU	ICU	T	Greater Glasgow & Clyde
WIH HDU	HDU	AB1	Western Isles
Wishaw ICU	ICU	V	Lanarkshire
Wishaw MHDU	HDU	V3	Lanarkshire
Wishaw SHDU	HDU	V2	Lanarkshire

Letter	Abbreviation	ICUorHDU	HealthBoard
A	IRH ICU	ICU	Greater Glasgow & Clyde
A2	IRH SHDU	HDU	Greater Glasgow & Clyde
B	VHK ICU	ICU	Fife
B2	VHK MHDU	HDU	Fife
B3	VHK SHDU	HDU	Fife
B4	VHK Renal HDU	HDU	Fife
C	PRI ICU	ICU	Tayside
C2	PRI HDU	HDU	Tayside
E	Ayr ICU	ICU	Ayrshire & Arran
E2	Ayr HDU	HDU	Ayrshire & Arran
F	SGH ICU	ICU	Greater Glasgow & Clyde
F2	SGH SHDU	HDU	Greater Glasgow & Clyde
G	Crosshouse ICU	ICU	Ayrshire & Arran
G2	Crosshouse MHDU	HDU	Ayrshire & Arran
G3	Crosshouse SHDU	HDU	Ayrshire & Arran
G4	PRM	HDU	Greater Glasgow & Clyde
GL1	all New QEU ICU (all units)	ICU	Greater Glasgow & Clyde
H	DGRI ICU	ICU	Dumfries & Galloway
H2	DGRI MHDU	HDU	Dumfries & Galloway
H3	DGRI SHDU	HDU	Dumfries & Galloway
I	MDGH ICU	ICU	Lanarkshire
I2	MDGH SHDU	HDU	Lanarkshire
I3	MDGH MHDU	HDU	Lanarkshire
J	RAH ICU	ICU	Greater Glasgow & Clyde
J2	RAH HDU	HDU	Greater Glasgow & Clyde
K	GRI ICU / HDU	ICU/HDU	Greater Glasgow & Clyde
K2	GRI SHDU	HDU	Greater Glasgow & Clyde
K3	GRI MDU	HDU	Greater Glasgow & Clyde
L	VI ICU	ICU	Greater Glasgow & Clyde
L2	VIG SHDU	HDU	Greater Glasgow & Clyde
M	SJH ICU/HDU	ICU/HDU	Lothian
N	Ninewells ICU	ICU	Tayside
N2	Ninewells MHDU	HDU	Tayside
N3	Ninewells SHDU	HDU	Tayside
N5	Ninewells Obstetric HDU	HDU	Tayside
P	Raigmore ICU	ICU	Highland
P2	Raigmore MHDU	HDU	Highland
P3	Raigmore SHDU	HDU	Highland
Q3	FVRH ICU/HDU	ICU/HDU	Forth Valley
QE2	QEU HDU1	HDU	Greater Glasgow & Clyde
QE3	QEU HDU2	HDU	Greater Glasgow & Clyde
QE4	QEU HDU6	HDU	Greater Glasgow & Clyde
QE5	QEU MHDU	HDU	Greater Glasgow & Clyde
R	WGH ICU/HDU	ICU/HDU	Lothian
R3	WGH SHDU	HDU	Lothian
R4	WGH Neuro HDU	HDU	Lothian
R5	WGH Neuro (Level 1)	HDU	Lothian
S	Hairmyres ICU/HDU	ICU/HDU	Lanarkshire
S2	Hairmyres MHDU	HDU	Lanarkshire
T	WIG ICU	ICU	Greater Glasgow & Clyde
T2	GHG HDU	HDU	Greater Glasgow & Clyde
T3	WIG HDU	HDU	Greater Glasgow & Clyde
U	BGH ICU/HDU	ICU/HDU	Borders
V	Wishaw ICU	ICU	Lanarkshire
V2	Wishaw SHDU	HDU	Lanarkshire
V3	Wishaw MHDU	HDU	Lanarkshire
W	ARI ICU	ICU	Grampian
W2	ARI SHDU (31/32)	HDU	Grampian
W3	ARI Neuro HDU	HDU	Grampian
W4	ARI SHDU (35)	HDU	Grampian
W5	ARI Cardiothoracic HDU	HDU	Grampian
W7	ARI Cardiothoracic ICU	ICU	Grampian
W8	ARI MHDU	HDU	Grampian
X	RIE ICU/HDU	ICU/HDU	Lothian
X2	RIE HDU	HDU	Lothian
X3	RIE Renal HDU	HDU	Lothian
X4	RIE Transpl	HDU	Lothian
X5	RIE Vasc (Level 1)	HDU	Lothian
X6	RIE Cardiothoracic ICU	ICU	Lothian
X7	RIE Cardiothoracic HDU	HDU	Lothian
Y	SGH Neuro ICU	ICU	Greater Glasgow & Clyde
Y2	SGH Neuro HDU	HDU	Greater Glasgow & Clyde
Z1	GBH HDU	HDU	Shetland
AA1	Dr Grays HDU	HDU	Grampian
AB1	WIH HDU	HDU	Western Isles
AC1	Belford HDU	HDU	Highland
AD1	GJNH Cardiothoracic ICU/HDU	ICU/HDU	National Waiting Times Centre
AE1	Balfour HDU	HDU	Orkney