Scottish Trauma Audit Group

Audit of Trauma Management in Scotland 2015
Reporting on 2013-2014

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Foreword

The Scottish Government remains committed to improving services for people with injuries that may be life threatening or limit their functional outcome and quality of life.

The Scottish Trauma Audit Group (STAG) returned to collecting data on trauma patients in 2011 and these data have been fundamental in the review of current trauma services and planning for the new Major Trauma Service which is due to be introduced in Scotland during 2016. STAG reporting of Key Performance Indicators will be essential in monitoring this new service and supporting its ongoing development and improvement.

The success of the audit is due to the active participation, commitment and support of the clinical teams in NHS Boards across Scotland and I am pleased to see that the audit is expanding to include all hospitals with an Emergency Department and also paediatric patients for the first time. It is also worthwhile noting the plan to commence collection of rehabilitation data as this is an important component of the trauma patient's journey through our health services to enable optimum recovery from their injuries.

The audit has encouraged and enabled clinicians to look at how they can use the data to drive improvement in services locally. I would encourage them to continue this good work in particular following the introduction of the new Major Trauma Service next year and to share best practice across Scotland.

I look forward to seeing the views of patients through Patient Reported Outcomes Measures in the future allowing a person centred approach to service improvement.

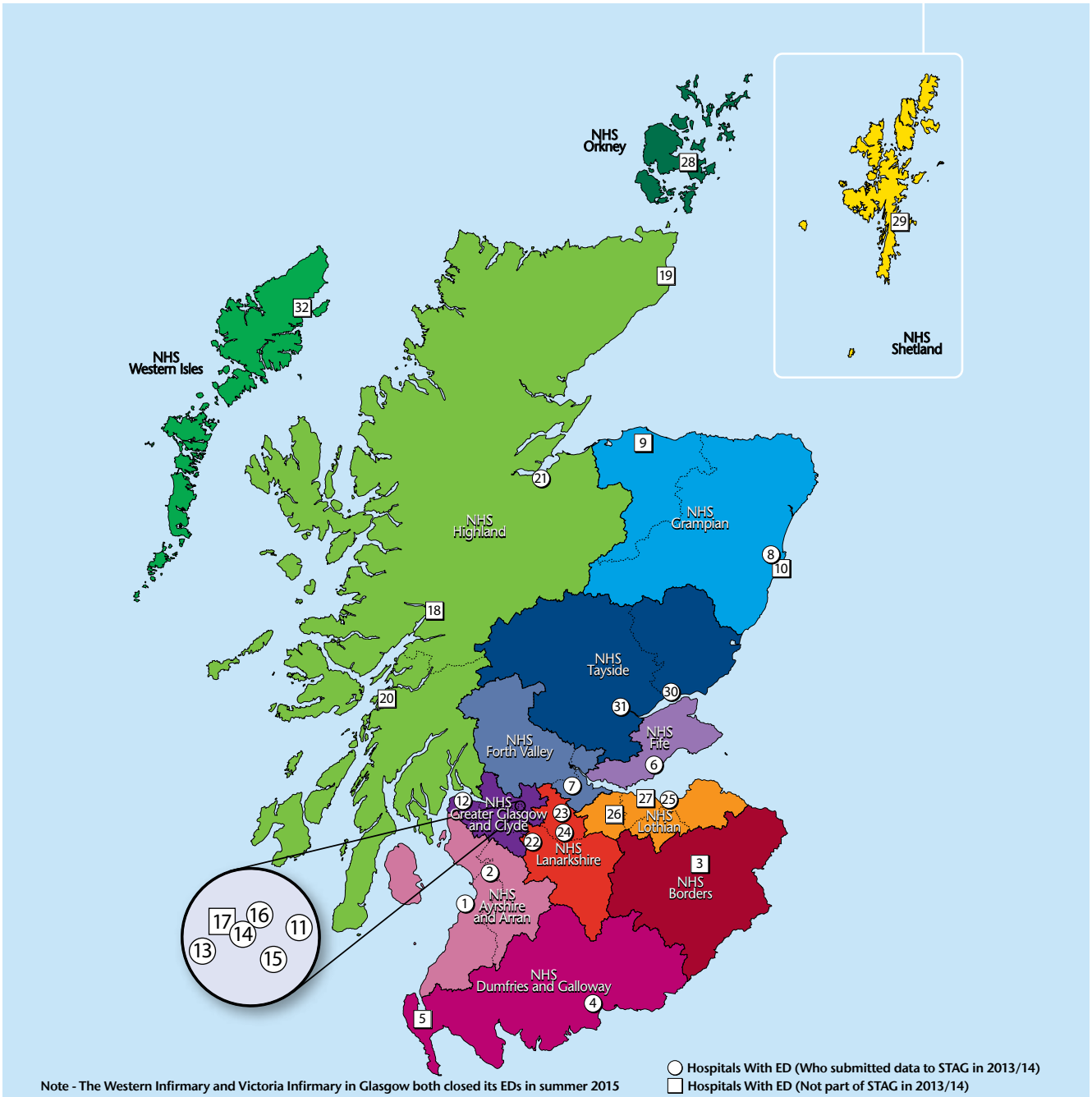
I would like to commend all those involved in the audit for their continuing hard work and their important contribution to the care of injured patients across Scotland.

Alex McMahon

Director, Strategic Planning, Performance Reporting and Information, NHS Lothian

Chair, Major Trauma Oversight Group

Location Map



Note - The Western Infirmary and Victoria Infirmary in Glasgow both closed its EDs in summer 2015

1. University Hospital Ayr
2. University Hospital Crosshouse
3. Borders General Hospital
4. Dumfries and Galloway Royal Infirmary
5. Galloway Community Hospital
6. Victoria Hospital
7. Forth Valley Hospital
8. Aberdeen Royal Infirmary
9. Dr Gray's Hospital
10. Royal Aberdeen Childrens Hospital
11. Glasgow Royal Infirmary
12. Inverclyde Royal Hospital
13. Royal Alexandra Hospital
14. Southern General Hospital
15. Victoria Infirmary Glasgow
16. Western Infirmary Glasgow
17. Royal Hospital for Children,Glasgow
18. Belford Hospital
19. Caithness General Hospital
20. Lorn and Islands District General Hospital
21. Raigmore Hospital
22. Hairmyres Hospital
23. Monklands General Hospital
24. Wishaw General Hospital
25. Royal Infirmary Edinburgh
26. St John's Hospital
27. Royal Hospital Sick Children, Edinburgh
28. Balfour Hospital
29. Gilbert Bain Hospital
30. Ninewells Hospital
31. Perth Royal Infirmary
32. Western Isles Hospital

Introduction

The morbidity and mortality caused by injury continued to be a major public health issue for the population of Scotland in 2013 and 2014. Scotland saw a significant and rapid reduction of deaths as a consequence of an accident from the 1970s to the 1990s. However, since then accidents as a cause of death have remained fairly static[1]. Consequently the impact of deaths and ongoing morbidity and disability following serious injury remains a great burden for the Scottish National Health Service (NHS) and the population of Scotland. In 2014 injury was the commonest cause of death for those under the age of 45 years and the third most common cause of death for those aged less than 55 years, after neoplasm and diseases of the circulatory system[2]. Injury creates a considerable burden for the NHS in Scotland. Unintentional injuries accounted for approximately 1 in 8 emergency hospital admissions for children and 1 in 10 emergency admissions for adults in Scotland in the years 2012-2013[3].

The publication of the 2015 STAG annual report, reporting on 2013 and 2014 data, presents detailed information of the patient journeys of 5930 trauma patients that had passed through the Scottish Healthcare System. This can be broken down into 3185 for 2013 and 2745 patients for 2014, although data are presented for both years combined in most of the graphs. Within the report we describe trauma in three groups: minor, moderate and major, however it is important to remember that the "minor" group of patients have to have been injured severely enough to spend a minimum of three days in hospital or have died as a consequence of their injuries. Although there are many more admissions to our hospitals as a consequence of an injury, this audit focuses on the most severely injured end of the spectrum.

At the time of publication we are not yet in a position to be able to provide a comparison with the years 2011 and 2012, because we have changed our outcome prediction methodology and have moved from the Abbreviated Injury Scale (AIS) 1990 Revision, Update 1998 dictionary to the AIS 2005, Update 2008[4]. We have however almost completed rescoring the years 2011 and 2012 and recalculating expected outcomes with the Trauma Audit and Research Network (TARN) Ps12 methodology[5], which will allow a comparison over time in our next report. These changes in methodology bring us into line with major trauma networks across the UK that use this methodology. We have also committed to continue to utilise the TRISS[6] methodology to allow international comparisons.

There are further developments for the STAG audit, which are outlined on page 22. The most important of these is the extension of the audit to include children and rehabilitation and the introduction of new Key Performance Indicators (KPIs) in preparation for the development of major trauma networks and the establishment of major trauma centres in Scotland.

Thousands of healthcare providers are providing high quality care aligned with these patient journeys. The role of the STAG audit and the dedicated audit professionals on each contributing hospital site is to collect, verify and feedback outcome information to global teams, and to ensure patients, families and clinicians that the care we provide is the best possible. Identifying areas where trauma care could be further improved and then achieving this improvement is paramount.

Mr Malcolm WG Gordon
Chairman, Scottish Trauma Audit Group

Summary and Key Findings

As noted in the introduction STAG updated the inclusion criteria and methodology in January 2013 therefore direct comparison with previous years is not possible at this time. Data from 2011 and 2012 are currently being mapped to the new methods and will be available next year.

STAG are publishing a range of Quality Indicator (QI) data at hospital level for the first time. QIs support quality improvement by highlighting patients (who have not achieved the indicator) for review by local clinical teams where there is comprehensive understanding of how trauma services are configured and individual patient information is available. There is considerable variation between hospitals regarding compliance against these indicators. STAG will be working closely with hospitals to understand what is causing this variation and support sharing of best practice.

Key findings (for the combined period 2013 and 2014 unless otherwise stated)

Patients, demography and trauma type

- A total of 19 out of 32 hospitals with an Emergency Department (ED) submitted data to STAG in 2013-2014. Data on 5930 patients are included in this report, of which 1278 are classified as major trauma.
- Males make up the majority of trauma patients (59%). For major trauma this rises to 70%.
- Male trauma patients tend to be younger (median age 50 years compared to 62 years for female patients).
- 4% of all patients sustained a penetrating injury and 96% sustained a blunt injury.
- The mechanism of injury differed between males and females with males sustaining a higher proportion of injuries due to assault, falls from a height of over two metres and motor vehicle accidents.
- There is evidence to suggest that alcohol was involved in 1 in 5 of minor trauma patients rising to 1 in 3 of major trauma patients. Alcohol was either ingested by the trauma patient or another person involved in the trauma incident.
- 89% of all trauma patients arrived by the Scottish Ambulance Service (SAS) with 4% arriving by air ambulance.
- More than half (55%) of major trauma patients are “out of hours” arriving in the ED between 8pm and 8am or at the weekend.
- 30% of major trauma patients are transferred to another hospital, primarily to a hospital with Neurological facilities or to the Spinal Injuries Unit (SIU) in Glasgow.
- The majority of trauma patients (56%) were in hospital for more than one week and 30% of patients require more than two weeks of in-patient hospital care.

Quality Indicators

- 70% of major trauma patients were pre-alerted to the receiving hospital by the SAS in 2014, a small increase from 68% in 2013.
- 83% of major trauma patients were triaged to the resuscitation room in 2014.
- 62% of major trauma patients were seen by an Emergency Medicine (EM) Consultant within one hour of arrival.
- Less than 40% of patients with a severe head injury had a Computerised Tomography (CT) scan within one hour in 2014.

- 44% of patients with a severe head injury were admitted or transferred to a hospital with a neurological Intensive Care Unit (ICU) in 2014.
- 86% of patients with an open limb fracture received intravenous (IV) antibiotics within three hours in 2014. Two hospitals met this standard for all the relevant patients in 2014.

Outcome

The methodology for calculating survival changed in 2013 and therefore it is not comparable with earlier years at this time.

- The crude mortality of all patients included in this report is 6% rising to 22% for patients who have sustained major trauma.
- 55% of major trauma patients who die following an injury die within two days.
- STAG use the Ps 12[5] methodology to determine the probability of survival for each patient. Actual survival is compared to expected survival using the Revised W-Statistic (page 31) and this shows that in 2013-2014 the Scottish mean is close to the prediction model reference database. The reference data base was generated from UK data (not including Scotland) from 2010-2013. One hospital has been identified as having potentially a significantly higher number of deaths than would be expected. The hospital has been informed before the publication of this report and are commissioning an internal review of this result.

Section 1: Data completeness

Figure 1.1 Data completeness by hospital (2013)

Key: Data submitted

No data submitted

Hospital	2013												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Patients Included
Aberdeen Royal Infirmary													387
University Hospital Ayr													79
University Hospital Crosshouse, Kilmarnock													149
Dumfries & Galloway Royal Infirmary													84
Forth Valley Royal Hospital													205
Glasgow Royal Infirmary													295
Hairmyres Hospital, East Kilbride													34
Inverclyde Royal Hospital													98
Monklands Hospital, Airdrie													100
Ninewells Hospital, Dundee													276
Perth Royal Infirmary													56
Raigmore Hospital, Inverness													137
Royal Alexandra Hospital, Paisley													228
Royal Infirmary of Edinburgh													333
Queen Elizabeth University Hospital, previously Southern General Hospital, Glasgow													138
Victoria Hospital, Kirkcaldy													166
Victoria Infirmary, Glasgow													113
Western Infirmary, Glasgow													209
Wishaw Hospital													106
Patients Included	251	214	240	230	282	314	294	288	283	250	282	265	3193

Note In 2013, eight audit patients attended two STAG EDs during a single episode of care. Only the first STAG ED attendance has been analysed in this report (N=3185).

Figure 1.2 Data completeness by hospital (2014)

Key: Data submitted

No data submitted

Hospital	2014												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Patients Included
Aberdeen Royal Infirmary													72
University Hospital Ayr													94
University Hospital Crosshouse, Kilmarnock													187
Dumfries & Galloway Royal Infirmary													92
Forth Valley Royal Hospital													180
Glasgow Royal Infirmary													292
Hairmyres Hospital, East Kilbride													86
Inverclyde Royal Hospital													84
Monklands Hospital, Airdrie													90
Ninewells Hospital, Dundee													272
Perth Royal Infirmary													59
Raigmore Hospital, Inverness													165
Royal Alexandra Hospital, Paisley													238
Royal Infirmary of Edinburgh													351
Queen Elizabeth University Hospital, previously Southern General Hospital, Glasgow													50
Victoria Hospital, Kirkcaldy													97
Victoria Infirmary, Glasgow													48
Western Infirmary, Glasgow													217
Wishaw Hospital													85
Patients Included	275	201	186	201	209	216	258	234	222	238	222	297	2759

Note In 2014, 12 audit patients attended two STAG EDs during a single episode of care. Only the first STAG ED attendance has been analysed in this report. A further two patients were removed from this analysis because there was not enough information available to code the trauma injury, (N= 2745).

In 2013 and 2014, 19 hospitals submitted data to STAG. A total of 3185 patients were included in the audit in 2013 and 2745 in 2014. The number of patients included in the audit has reduced from 2012 due to changes to the inclusion criteria which aimed to reduce the number of patients with minor injuries.

Local staffing issues in some hospitals meant that information was not available for the full year, and this was more pronounced in 2014 (Figure 1.2). The STAG team continue to work with all Health Boards to ensure Local Audit Coordinator vacancies are filled and support is provided to ensure ongoing data submission. This must be seen as a priority to all Health Boards as changes are made to further enhance trauma care in Scotland in 2016.

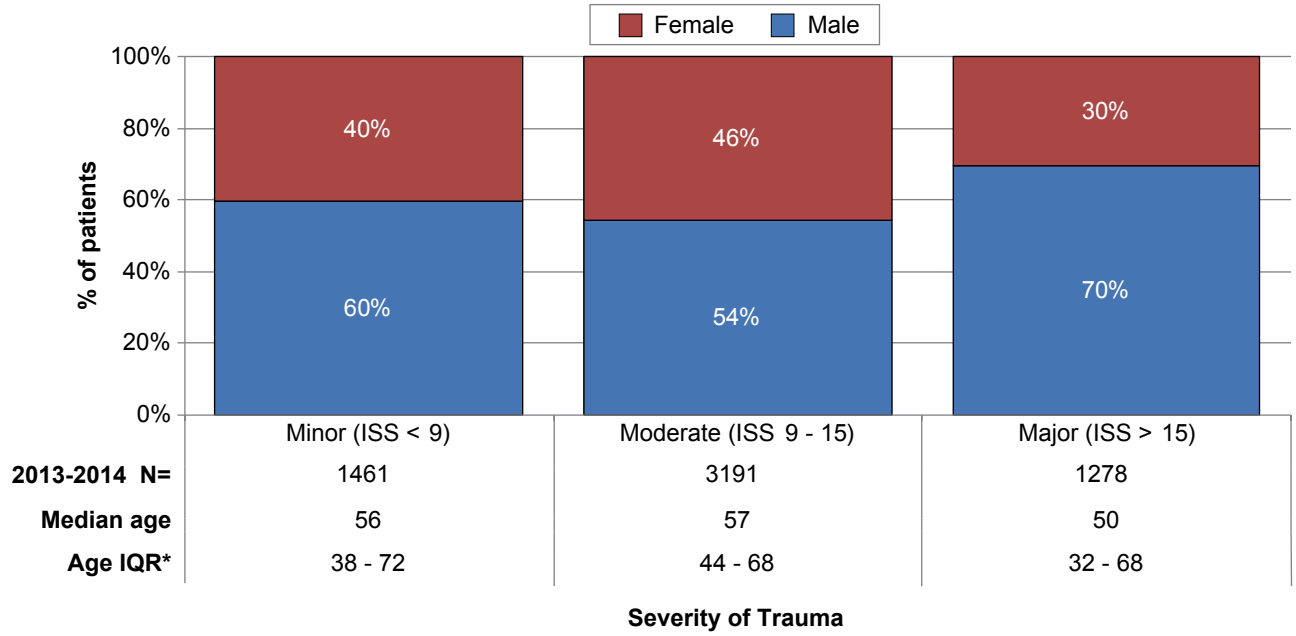
Section 2: Demographics and type and severity of trauma

It is important to note that the inclusion criteria were changed after 2012. The database is now better aligned with TARN[7].

The proportion of male patients in the audit has risen from 52% in 2012 to 59% in 2013-2014, and is most likely due to inclusion criteria changes.

Male patients tend to be younger (median age is 50 years compared to 62 years for female patients in 2013-2014). More information on age can be found on the STAG website www.stag.scot.nhs.uk in tables that compliment this report.

Figure 2.1 Percentage of male and female patients by severity of trauma (2013-2014)

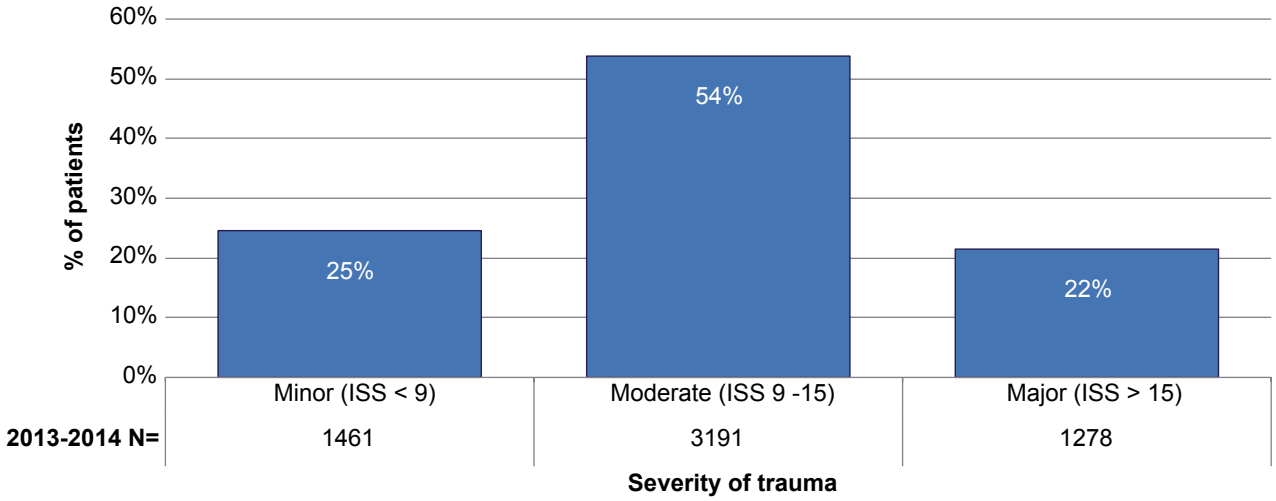


IQR: Inter-quartile range.

Major trauma patients are more likely to be male.

It is worth noting that the median age of patients who have sustained major trauma is lower than those who have sustained either minor or moderate trauma (Figure 2.1).

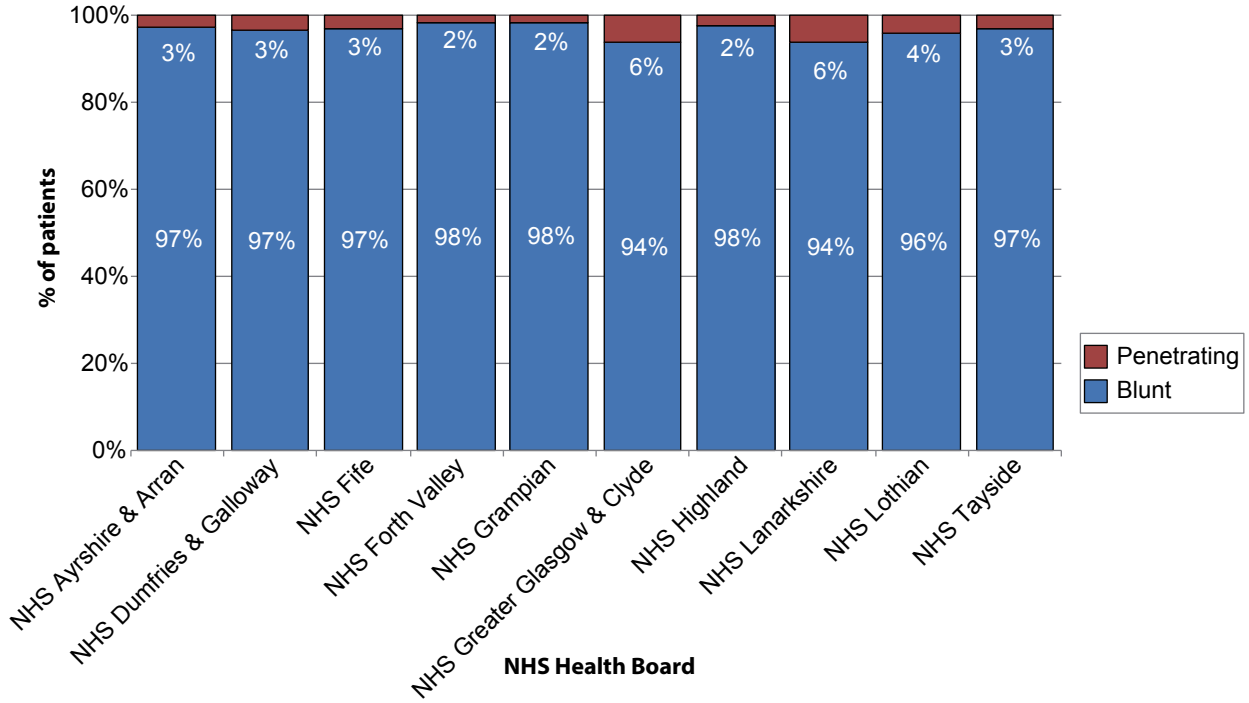
Figure 2.2 Percentage of patients with minor, moderate and major trauma (2013-2014)



The proportion of minor, moderate and major trauma patients included in the audit has remained stable in 2013 and 2014. It has changed from 2012 (24% minor, 61% moderate and 15% major), again probably as a result of changes to the inclusion criteria and the injury coding dictionary (AIS)[4], therefore it is not possible to make comparisons at this time.

In the 2013 STAG report (http://www.stag.scot.nhs.uk/publications/main.html), patients with an ISS score of 8 were classified as having moderate trauma. This group of patients are now being included in the minor category as this classification is more commonly accepted.

Figure 2.3 Percentage of patients with blunt or penetrating trauma, by Health Board (2013-2014)

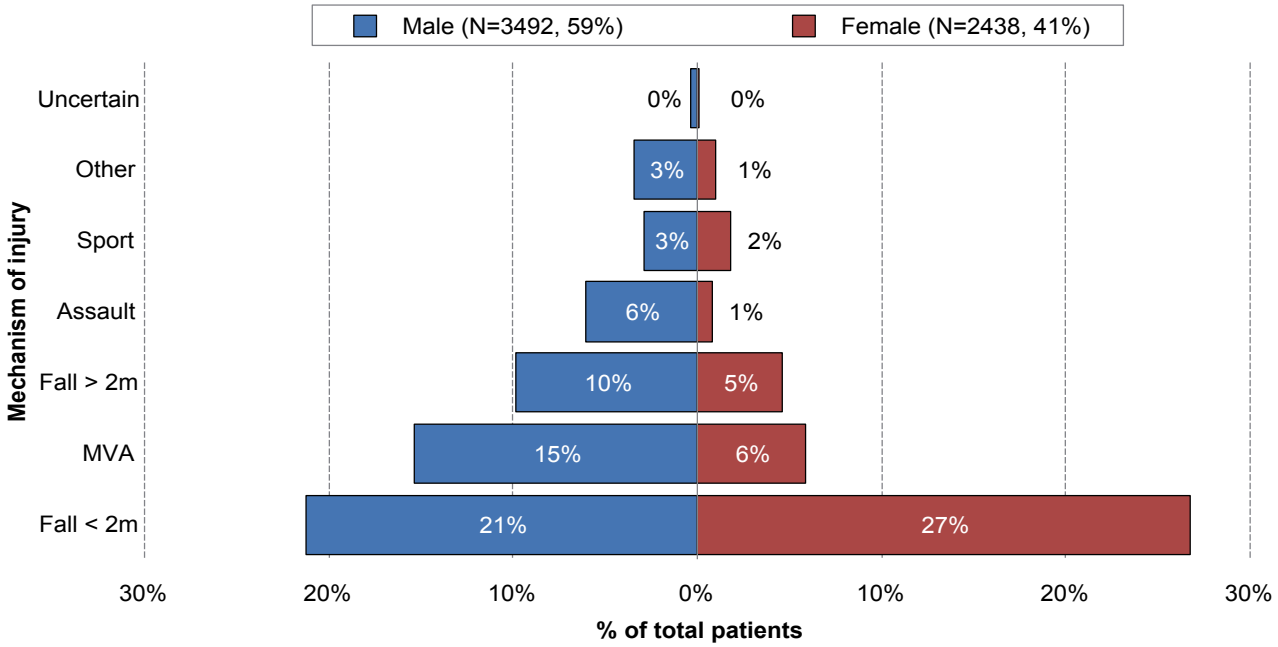


Note: Please note that not all Health Boards contribute to STAG at this time.

In Scotland, 96% of patients sustained a blunt injury in 2013-2014, with the remaining 4% classified as having sustained a penetrating injury.

Figure 2.3 breaks this data down to Health Board level.

Figure 2.4 Percentage of male and female patients by mechanism of injury (2013-2014)



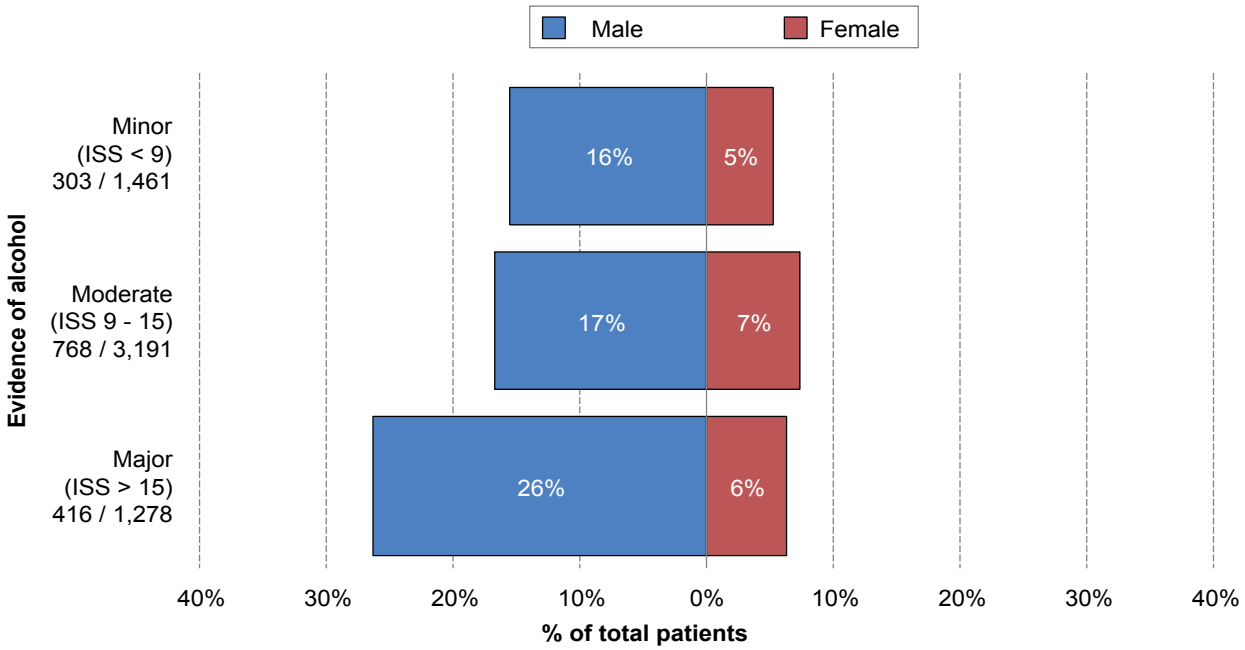
MVA: Motor vehicle accident.

Other: mechanisms of injury such as deliberate self harm, contact with a moving object (not MVA) and accidents involving machinery.

The proportion of trauma patients sub-divided by mechanism of injury remained relatively constant over the two years.

There was a statistical difference in the mechanism of injury for males and females with males more likely to have an injury following assault, falls of more than two metres and MVAs, and females more likely to be injured following a low fall. ($p<0.0001$).

Figure 2.5 Percentage of male and female patients where there was evidence of involvement of alcohol, by severity of trauma (2013-2014)



N = number of cases where evidence of alcohol existed/number of cases with this severity of trauma

Note: Data is collected on whether alcohol played a role in trauma injuries. It is recorded if evidence existed that either the trauma patient or another contributor to the trauma had ingested alcohol.

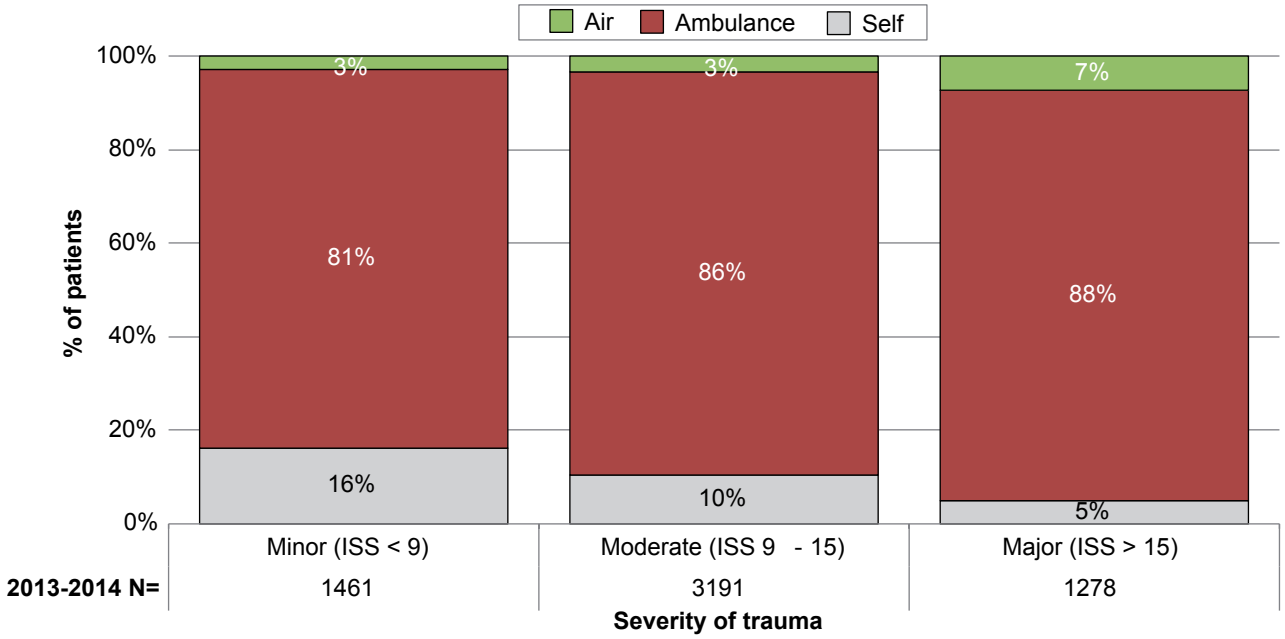
Consistently, alcohol continues to be associated with 33% of major trauma patients and 25% of all trauma patients.

Evidence of involvement of alcohol is nearly twice as common in male trauma patients (31% compared to 16% in females).

47% (N = 119/251) of penetrating injuries had evidence of involvement of alcohol compared to 24% (N = 1368/5679) of blunt injuries.

Section 3: The Patient Journey

Figure 3.1 Percentage of patients arriving by air, ambulance or self, by severity of trauma (2013-2014)

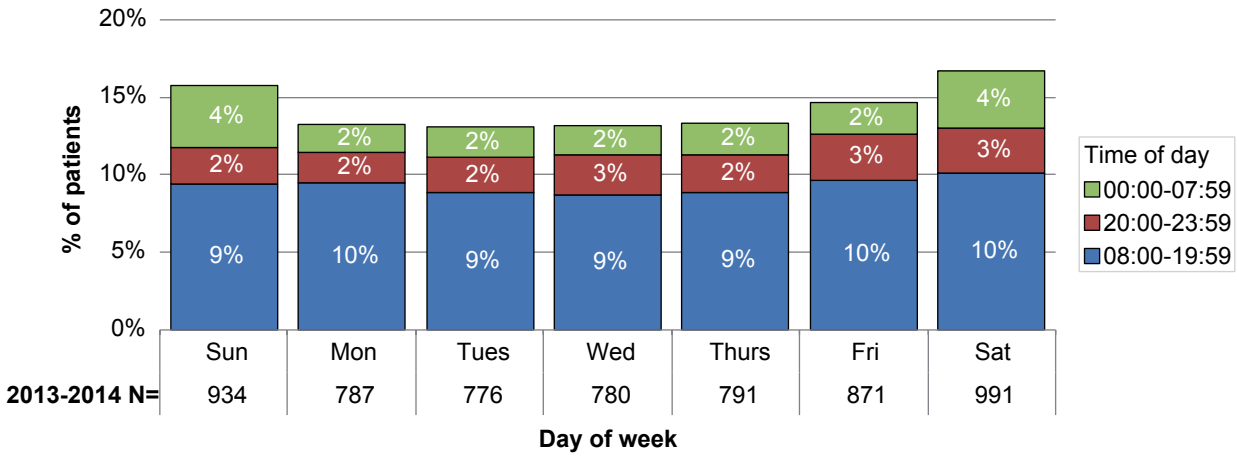


89% of trauma patients included in STAG arrive by the SAS (by air or road ambulance). This illustrates the importance of database linkage with the SAS to allow for comprehensive information on pre hospital care to be reported in the future.

If changes were necessary to the provision of trauma services, then it may be possible to influence patient destination through the SAS.

A higher proportion of patients with major injuries arrive by air ambulance.

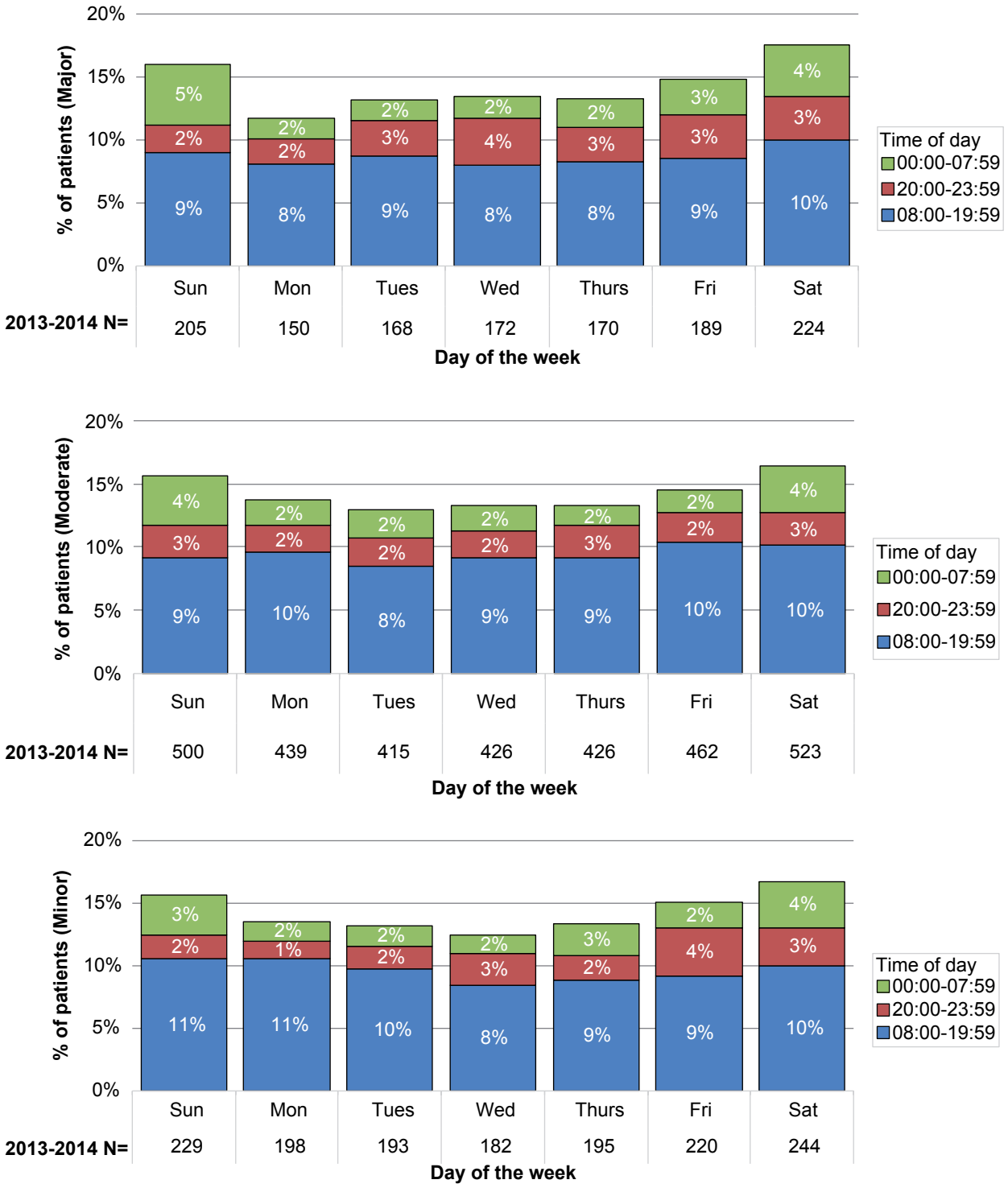
Figure 3.2.1 Percentage of patients by day and time of attendance (2013-2014)



Note: 'Out of hour' attendances are those that took place at the weekend or between the hours of 8:00pm and 7:59am.

The number of trauma patients attending ED is stable from Monday to Thursday and then increases from Friday to Sunday.
55% of attendances are considered out of hours which is comparable with previous years.

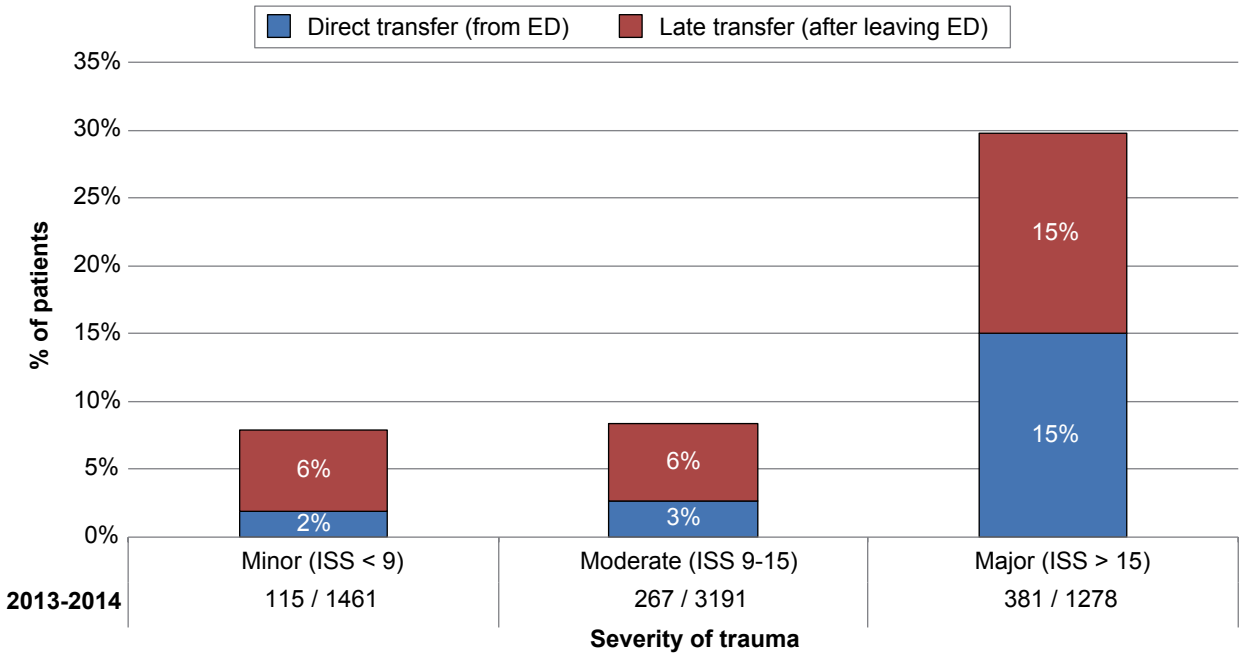
Figure 3.2.2 Percentage of patients by day and time of attendance, by severity of trauma (2013 -2014)



Admissions to EDs have a similar pattern for all severities of injury. The weekend shows an increase of attendances at night time (00.00-07.59hrs).

Timing and severity of trauma information should be one of the considerations used to inform future workforce planning including rota management.

Figure 3.3 Percentage of patients transferred to another STAG hospital or regional centre, by severity of trauma (2013-2014)

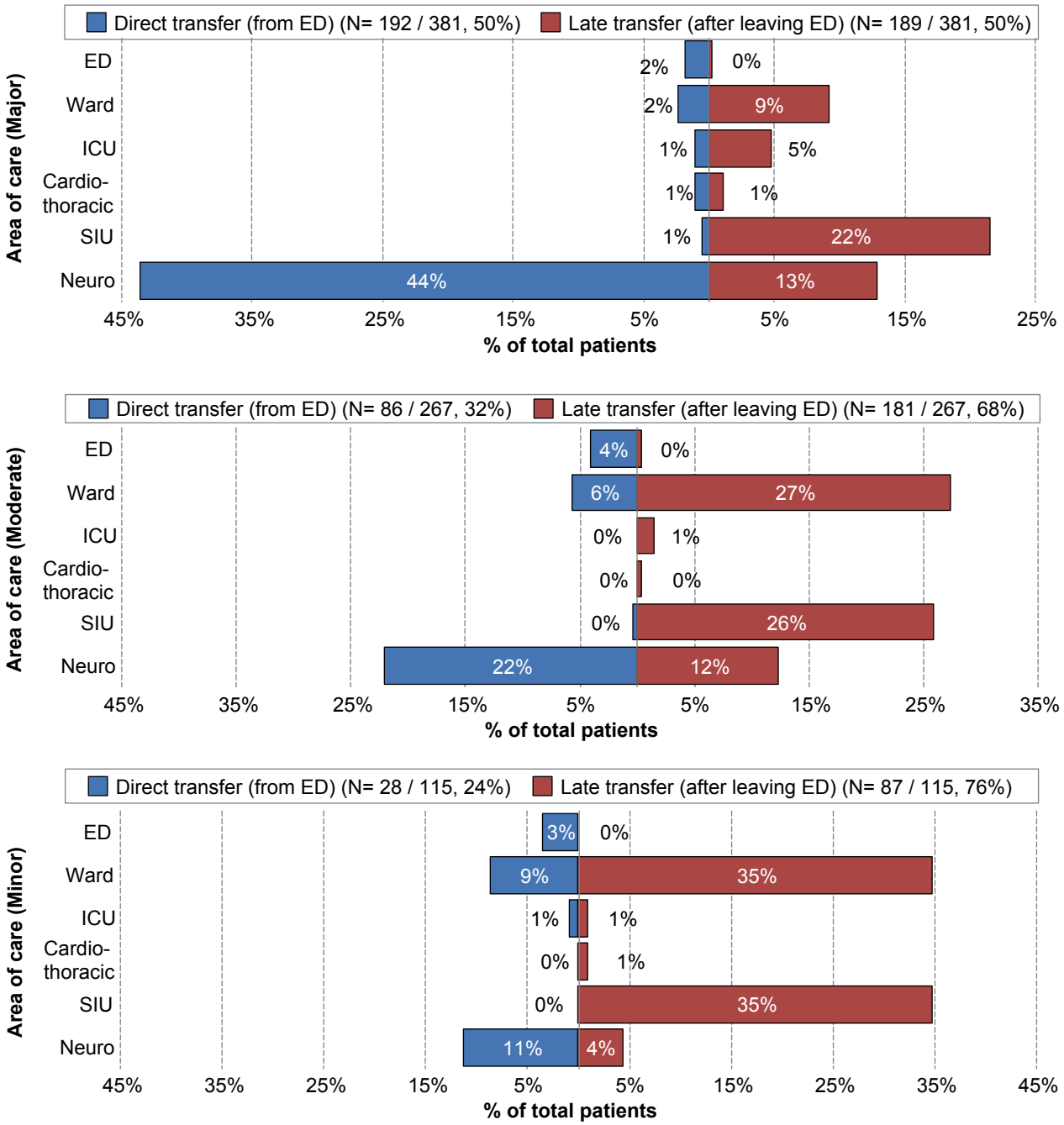


N = number of cases where the patient was transferred / number of cases with this severity of trauma.

Note: 'Direct transfers' are those that occur directly from the receiving ED. 'Late transfers' are those that occur after the patient left the receiving ED. Internal transfers that occur within regional specialist centres (e.g. Ninewells ED to Ninewells Neuro) are not counted as transfers.

30% of patients with major trauma were transferred to another hospital from the ED or hospital of initial attendance in 2013-2014, highlighting the complex journey many severely injured patients have. In addition, 8% of minor and 9% of moderate trauma patients were transferred in 2013-2014 which suggests that the initial receiving hospital could not meet all of the healthcare needs of patients who were transferred and it is an important determinant in the planning of the provision of trauma services.

Figure 3.4 Area of care that patients were transferred to in the receiving hospitals, by severity of trauma and type of transfer (2013-2014)

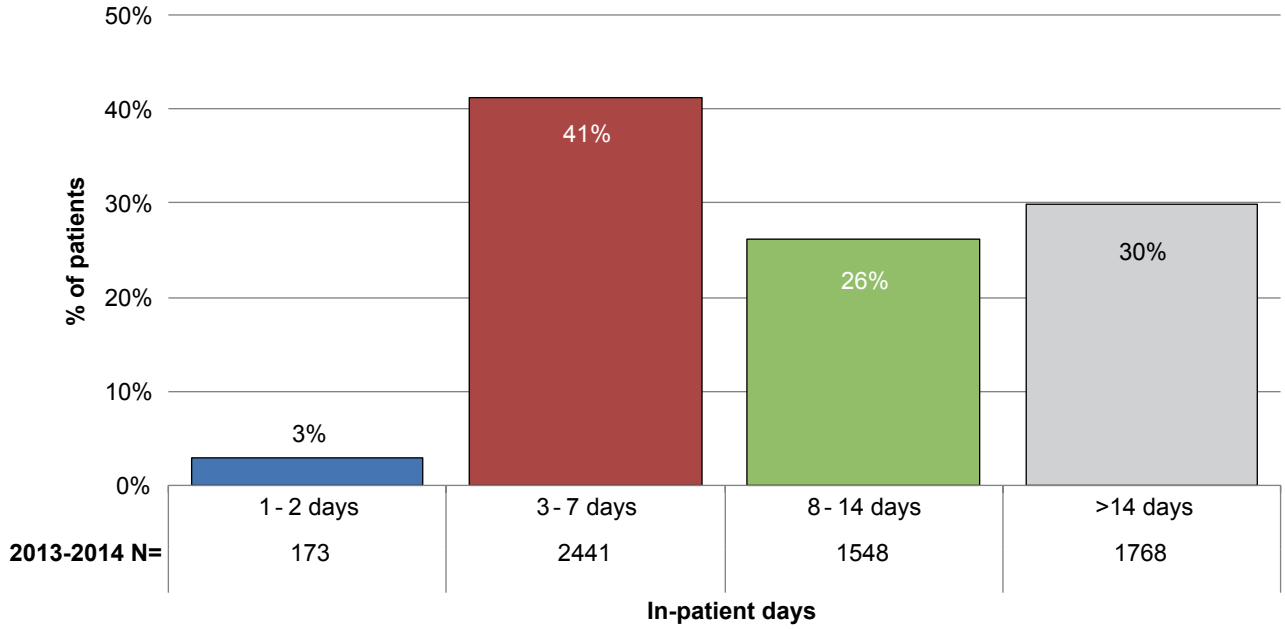


Note: Percentages were calculated using cases where the patient was transferred to another STAG hospital or regional centre (N=763).

The vast majority of patients who are transferred from the initial receiving hospital are transferred either to neurosurgery or spinal injuries. This pattern has remained consistent. Transfers to neurosurgery are more commonly direct transfers from ED whereas transfers to the Spinal Injuries Unit (SIU) happen later in the patient journey. This is due to normal clinical practice as the SIU would rarely admit a patient in the first 24 hours after injury.

Please note that more comprehensive information on specialty type will be collected from 2016 which will allow STAG to determine the specialty patients are referred to if they are transferred to an ED, Ward or ICU.

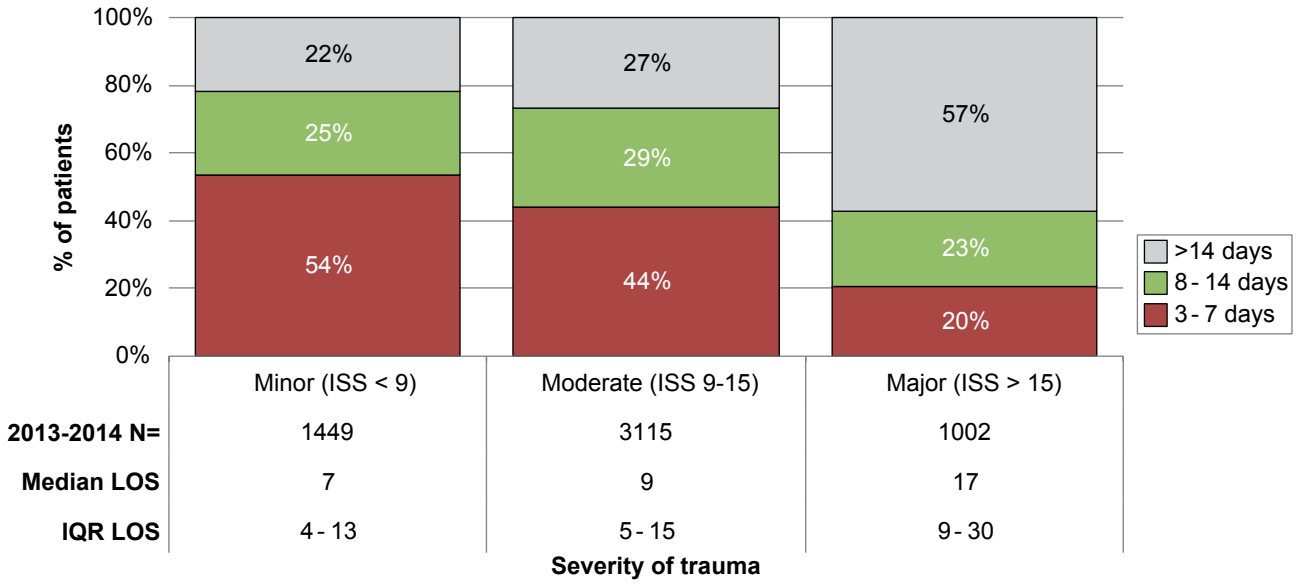
Figure 3.5 Length of inpatient stay for all patients (2013-2014)



STAG include patients whose length of stay (LOS) is at least three days or who die in hospital within 30 days of attendance. This means that in Figure 3.5, patients with a LOS of 1-2 days are deceased.

For this reason, STAG have split these data into patients who survived and patients who died in Figures 3.6.1 and 3.6.2.

Figure 3.6.1 Length of inpatient stay, by severity of trauma, for patients who survived to discharge from hospital or up to day 30 (2013-2014)

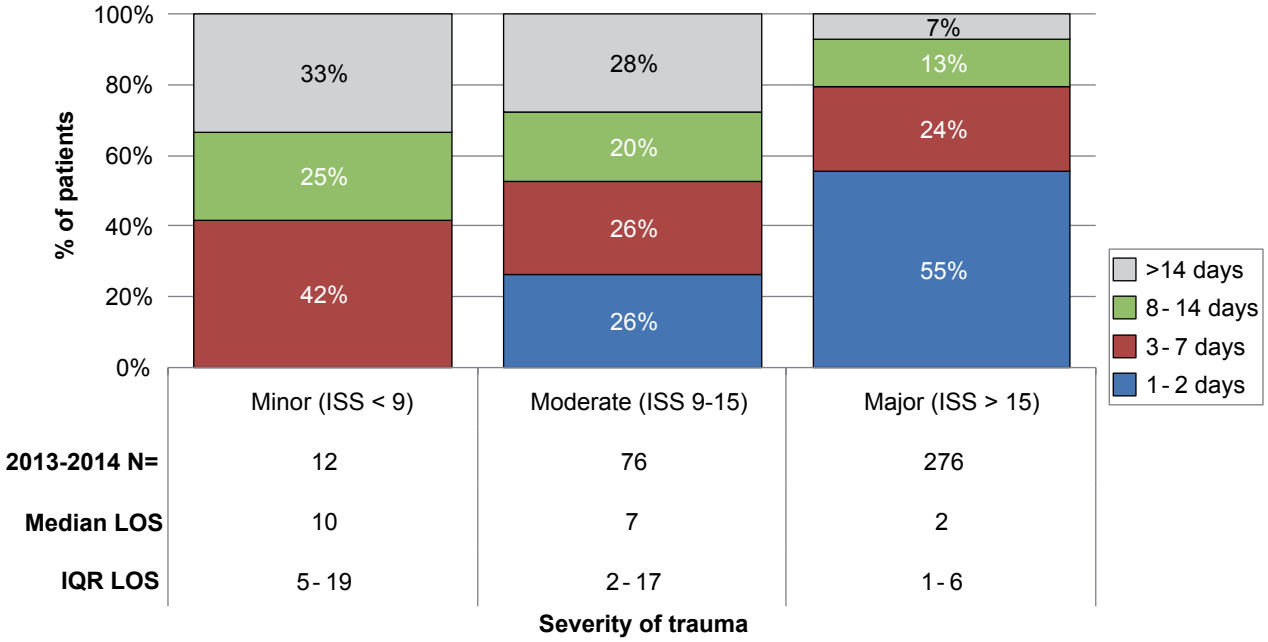


Note: STAG follow up patients to point of discharge or a maximum of 30 days.

LOS profiles for more significantly injured patients (who survived to discharge from hospital or up to day 30) are longer with a median LOS of 17 days compared to nine and seven days for moderate and minor trauma patients. There is comparative timeframes over the two reported years. This does not reflect true LOS as STAG only follow up patients until a maximum of 30 days.

These data serve a reminder that even the "minor" trauma patients have significant injuries and consume large amounts of NHS resources.

Figure 3.6.2 Length of inpatient stay, by severity of trauma, for patients who died in less than or equal to 30 days (2013-2014)



Note STAG follow up patients to point of discharge or a maximum of 30 days.

A higher proportion of patients with major trauma die within the first two days.

Section 4: Quality Indicators

Improving Quality is about ensuring health care is safe, effective, person centred, timely, efficient and equitable. Improving the quality of health services is a key focus across the NHS in Scotland. In December 2007, the Better Health, Better Care Action Plan (2007)[8] made a series of commitments to improve the health of everyone in Scotland and to improve the quality of healthcare and the healthcare experience. The Quality Strategy[9] is a development of Better Health, Better Care to build on these foundations and is essentially about three things:

- It is about putting people at the heart of our NHS. It will mean that our NHS will listen to peoples' views, gather information about their perceptions and personal experience of care and use that information to further improve care;
- It is about building on the values of the people working in and with NHS Scotland and their commitment to providing the best possible care and advice compassionately and reliably by making the right thing easier to do for every person, every time; and
- It is about making measurable improvement in the aspects of quality of care that patients, their families and carers and those providing healthcare services see as really important.

Quality improvement within the Scottish Trauma Audit draws on a wide variety of methodologies, approaches and tools. Measurement and gathering data are vital elements of quality improvement in addition to the learning which develops through the process over time. The Scottish Trauma Audit utilises key Quality Indicators (QIs) to evaluate the success of the activities in which it engages and ultimately the identification of quality improvement approaches for use in redesign and service improvement in Trauma care at a local level.

The use of QIs in the trauma patient journey is to identify patients' who have not had the optimal journey for local review maximising learning and improving patient care through use of the audit data.

If a QI has not been achieved, or the information required to determine this is not available, then the case should be reviewed locally where there is a comprehensive understanding of how trauma services are configured and individual patient information is available.

The fact that a QI has not been met does not infer that the management of the patient has been sub-optimal however this should be considered. Often the number and severity of injuries sustained by a patient may not initially be fully apparent and may only become evident following further care or investigation.

This is the first report where STAG have published QI data at hospital level. Hospitals receive this information on a monthly basis in order to review the cases that do not meet the QI. The introduction of an electronic data collection and reporting system in 2016 will allow clinicians to monitor this information more timely.

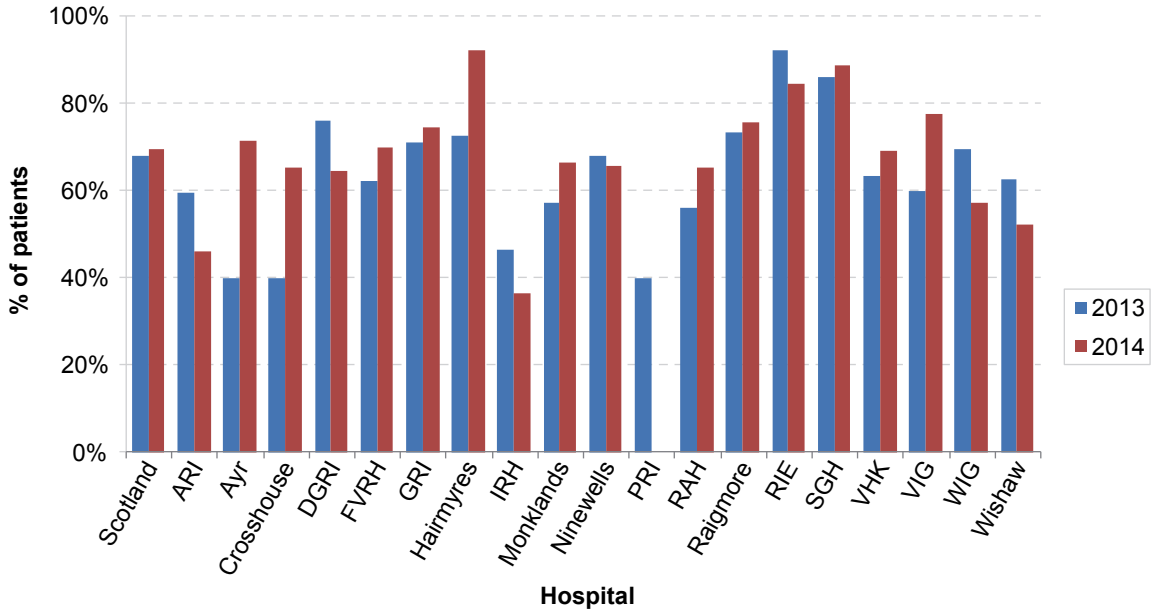
STAG have reviewed current QIs to ensure they are still relevant and have stopped reporting on five QIs which are either embedded or no longer relevant:

1. Patients with major trauma should have oxygen saturation measured in ED.
2. Patients with major trauma should have 12-lead Electro Cardio Graph performed in ED.
3. Patients with major trauma should have Early Warning Score chart or resuscitation room physiological observation chart commenced in ED.
4. Patients with signs of shock and abdominal injury AIS $\geq$ 3 should have a laparotomy within hour.
5. Patients with head injury should have a GCS recorded on attendance.

STAG recognise the need to work closer with hospitals in the future to support quality improvement and are in the process of setting up a robust governance process similar to what is used and proved successful in other national audits within the Scottish Healthcare Audit Team[10].

Please see page 37 for a list of hospital abbreviations used in the charts included in this section.

Figure 4.1 Percentage of major trauma patients who were pre-alerted, by hospital (2013 and 2014)



Note This definition is based on the current Quality Indicators used by STAG. Full details can be found at www.stag.scot.nhs.uk

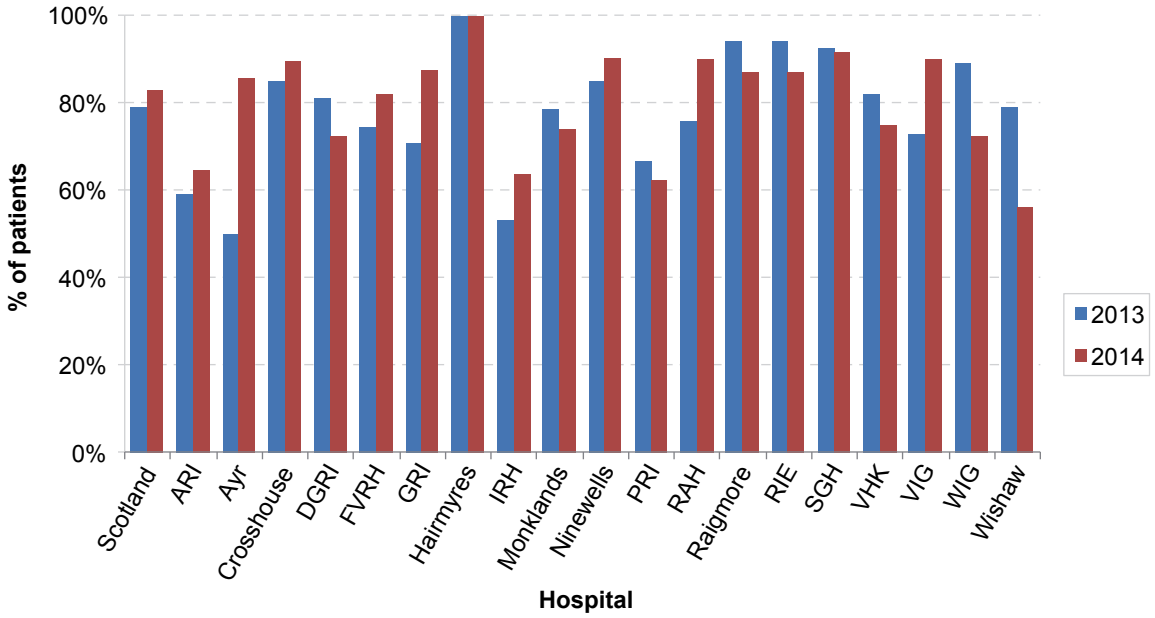
A pre alert by the SAS allows trauma teams to be assembled prior to the arrival of the patient, and may improve the care they receive in the initial stages of their hospital journey.

Figure 4.1 shows there has been a small increase in the number of major trauma patients who are pre-alerted to the receiving hospital in Scotland from 2013 to 2014 however there is wide variation between hospitals with a range of 0-92% in 2014.

The introduction of a major trauma triage tool by the SAS in 2016 intends to identify this group of patients, which then triggers a pathway of care which includes pre-alerting the receiving hospital.

The SAS are reinforcing the importance of pre-alerts to paramedics and ambulance technicians and ensuring this is documented. Major work is underway by the SAS to improve its data recording system (ePRF) with a new system being launched in 2016.

Figure 4.2 Percentage of major trauma patients triaged to a resuscitation room, by hospital (2013 and 2014)

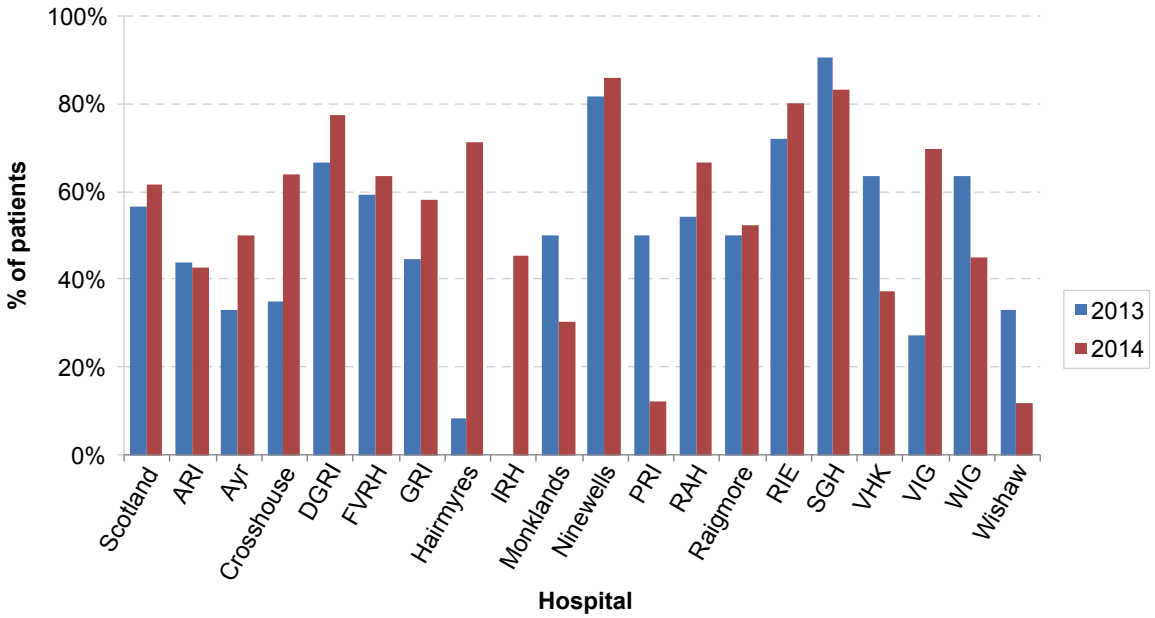


Note This definition is based on the current Quality Indicators used by STAG.

Figure 4.2 shows the percentage of patients who were immediately triaged to the resuscitation room or re-triaged to the resuscitation room following triage to another part of the ED. It is common practice for patients who are pre-alerted by the SAS to be taken directly to the resuscitation room.

The number of major trauma patients triaged to the resuscitation room in Scotland has risen from 79% in 2013 to 83% in 2014. There is wide variation between units (56-100% in 2014).

Figure 4.3 Percentage of major trauma patients seen by an Emergency Medicine Consultant within one hour, by hospital (2013 and 2014)

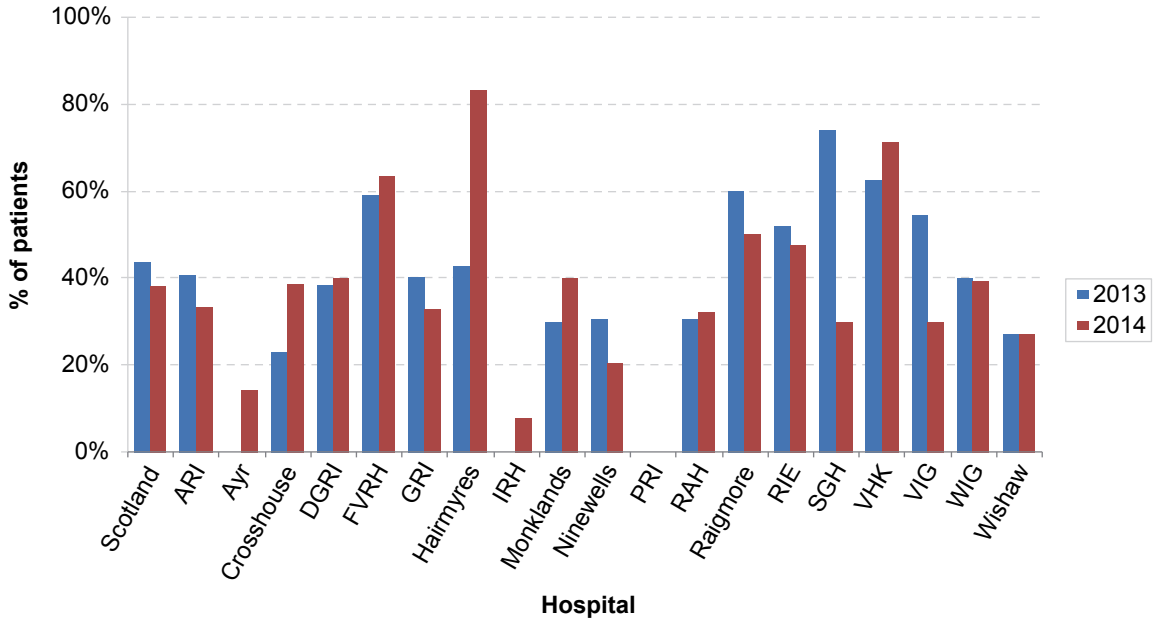


Note This definition is based on the current Quality Indicators used by STAG.

There is very little change in the number of major trauma patients being seen by an EM consultant within one hour and again wide variation between units.

STAG are currently working with some hospitals to improve documentation of consultant presence, as rotas confirm that consultants were in the department, but there is no documentation in the patients' notes or electronic records to confirm the patient was reviewed by an EM consultant within one hour.

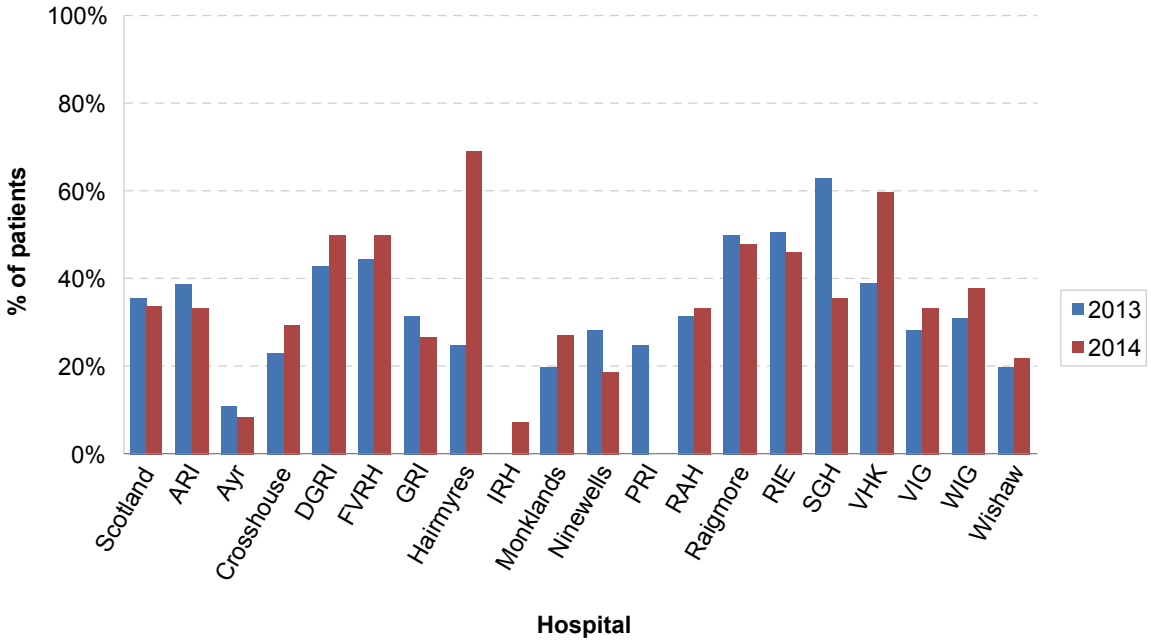
Figure 4.4.1 Percentage of patients with a GCS ≤ 12 and/or a base of or depressed skull fracture who had a head CT scan within one hour, by hospital (2013 and 2014)



Note This definition is based on the current Quality Indicators used by STAG.

There is a slight decrease in the percentage of head injured patients that meet this criteria having a CT scan within one hour and wide variation between hospitals (0-83%). Three hospitals had 0% compliance in 2013 and/or 2014 (range between 1-10 patients).

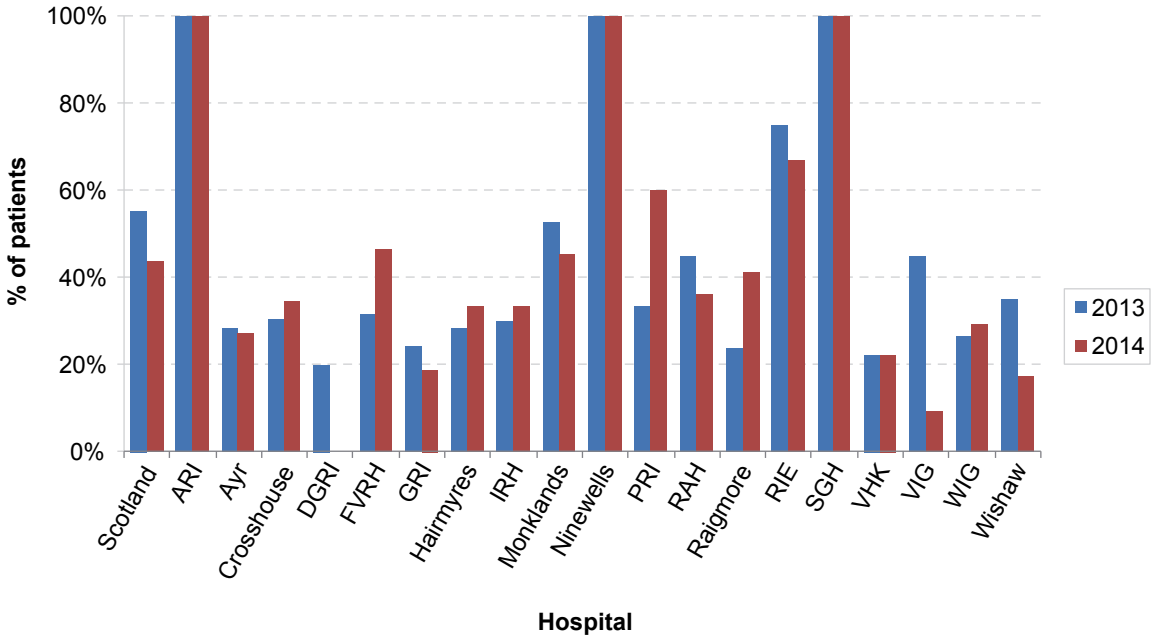
Figure 4.4.2 Percentage of patients with a GCS ≤ 8 and/or severe head injuries AIS (head) ≥ 3 who had a head CT scan within one hour, by hospital (2013 and 2014)



Note This definition is based on the new Key Performance Indicators (KPI) that will be introduced in 2016. See Appendix one for more details.

The indicator definition for head injured patients receiving a CT scan within one hour will change in 2016 to the above criteria (Figure 4.4.2). Figure 4.4.2 gives us a baseline measurement for the new KPI and highlights there is work to do in order to improve access to CT scan for patients with severe head injuries.

Figure 4.5.1 Percentage of patients with a severe head injury who are admitted or transferred to a setting with 24 hour access to a Neurosurgical ICU, by hospital (2013 and 2014)



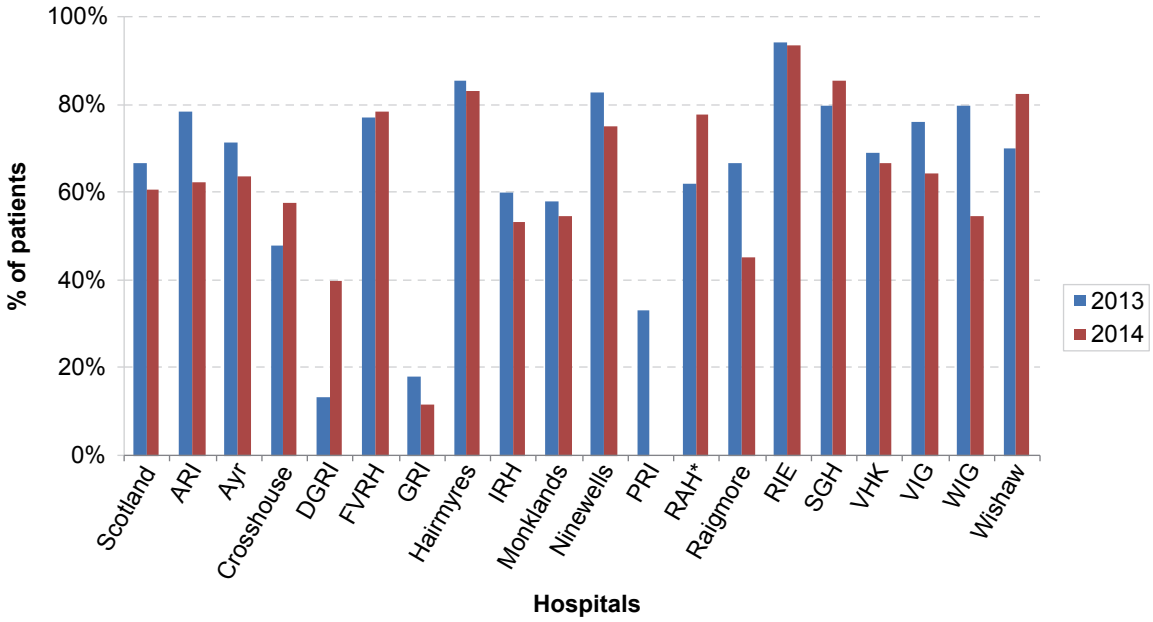
Note This definition is based on the current Quality Indicators used by STAG.
Severe head injury is defined as a patient with an Abbreviated Injury Score (AIS) (Head) ≥3.

The three hospitals with 100% compliance have an onsite neurological ICU facility and data does not allow STAG to determine which patients were accepted by the Neurological specialty. By removing data from these hospitals, in 2013 and 2014, 37% and 41% of patients with a severe head injury were transferred to a hospital with neurological ICU facilities.

The range of transfers is between 0-67% and further analysis is required to determine the reasons for this. Figure 4.5.2 shows that 61% of patients with a severe head injury had a referral (documented) whilst in ED in 2014.

The STAG dataset will be improved to ensure this information is collected more robustly from 2016 onwards.

Figure 4.5.2 Percentage of patients with a severe head injury who have a neurological specialist referral whilst in the ED, by hospital (2013 and 2014)



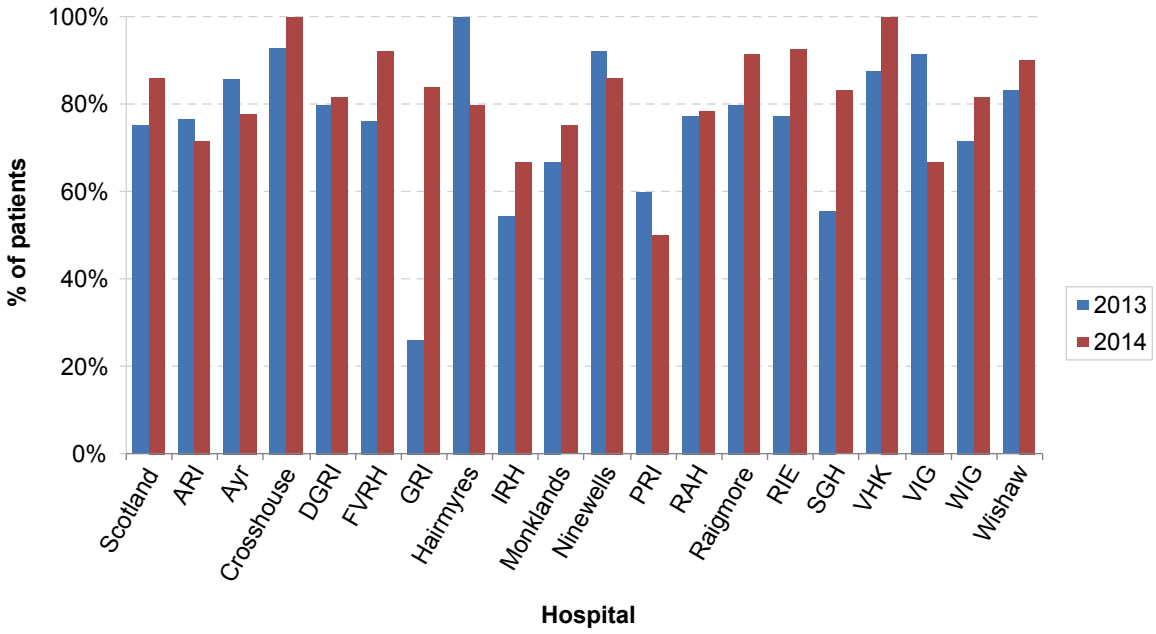
* 1 case removed in 2013

Note Please note this is not a QI but supplements the information in Figure 4.5.1.

Severe head injury is defined as patient who has an AIS[4] head ≥ 3. Please note that AIS codes are applied retrospectively once all tests including imaging have been completed. The significance of the injury may not always be immediately apparent whilst the patient is in the ED.

Figure 4.5.2 shows large variation between the percentage of patients with severe head injury being referred (0-86% in 2014) whilst in ED, and this should be reviewed locally.

Figure 4.6 Percentage of patients with an open limb fracture who received intra venous (IV) antibiotics within three hours, by hospital (2013 and 2014)



Note This definition is based on the new Key Performance Indicators and the current QI (updated in July 2015).

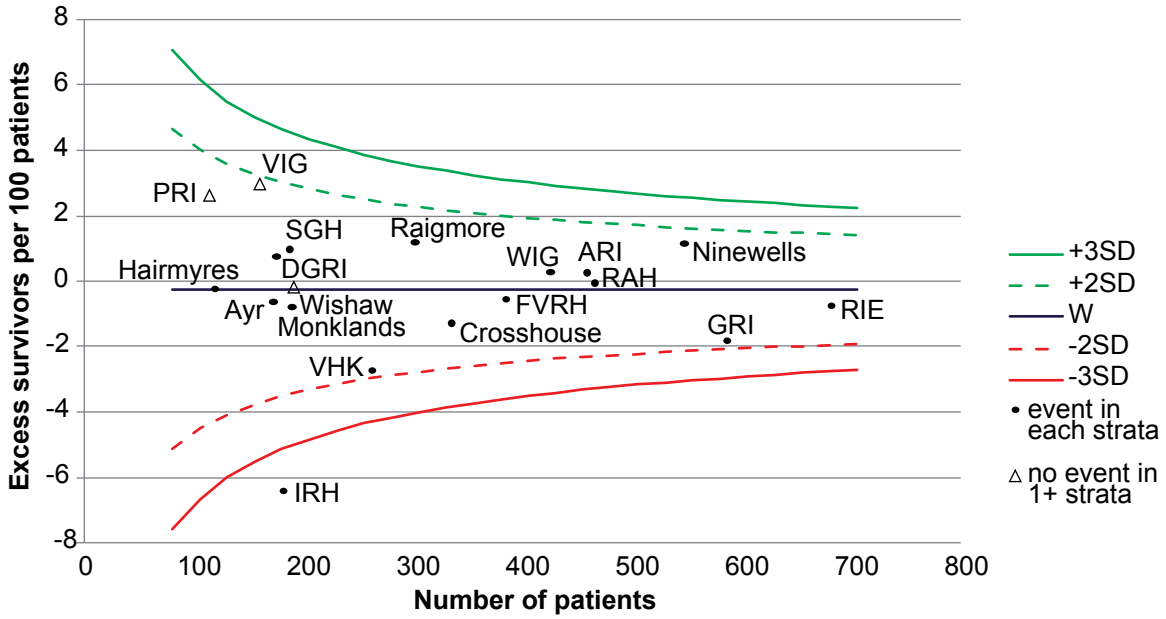
STAG previously measured administration of IV antibiotics within one hour for patients with an open limb fracture but have updated this to IV antibiotics within three hours in line with current evidence[11]. Scottish compliance has risen from 75% in 2013 to 86% in 2014.

Section 5: Outcome

The crude mortality for all the patients included in this report is 6% (N=364). The mortality rate rises to 22% in patients who have sustained major trauma.

In Figure 5.1, the Revised W-Statistic shows the number of actual survivors compared with the number of expected survivors. This allows a better comparison of mortality over time and between different hospitals, as trauma severity and hospital case-mix are adjusted for. In 2013, STAG changed the methodology for calculating expected survival rates from TRISS[6] to TARN Ps 12[5] method. STAG also started to use an updated dictionary (AIS 2005; Update 2008)[4] for coding injuries in order to calculate an Injury Severity Score[12] (ISS), which is part of the Ps 12 calculation[5]. Work is still underway to map 2011 and 2012 data but unfortunately was not completed by the time this report content had to be finalised therefore we are unable at this time to compare these data over time.

Figure 5.1 Revised W-Statistic: by hospital (2013 – 2014)



Note: The numbers of expected survivors is generated from the TARN database (2010-2013) which includes data on patients who have already been treated for similar injuries. The revised w statistic shows the number of excess survivors per 100 patients.

STAG are presenting the Revised W-statistic in a funnel plot for the first time. Please see page 32 for more information on funnel plots.

Hospitals outside 2 Standard Deviations (SD) from the mean "might be different" and outside 3 SD "are different". It should be recognised that in a comparison of 19 units there is a considerable chance of an outlier at the 2 SD (5%).

Being an outlier may be explained by data quality, questions over standards of care, different referral patterns, admission policies or resources but it also may be due to random variation.

Figure 5.1 shows the Revised W-statistic for all hospitals who currently contribute to STAG (N = 19). Please note that three hospitals did not have at least one patient in every survival band (illustrated by a triangle) and therefore results should be interpreted with caution. See methodology (page 30) for more detail on analysis.

Inverclyde Royal Hospital (IRH) is below 3 SD from the Scottish mean line and hence is statistically different from the Scottish mean. The hospital has been informed before the publication of this report and are commissioning an internal review of this result.

The Future of major trauma care in Scotland

Major Trauma Service

In order to deliver safe, effective and person centred care for major trauma patients and achieve the best outcomes, we need to reduce death and disability and ensure patients continue to be supported to help maximise their quality of life.

In 2013 a report produced by the Major Trauma Subgroup of the National Planning Forum (NPF) at the Scottish Government, outlined possible ways to enhance existing major trauma services for all ages in Scotland. Patients who sustain major trauma have a better outcome if they are quickly taken to a hospital where all the specialist services they will require are available, often referred to as definitive care. One of the significant changes in Scotland will be the introduction of Major Trauma Centres (MTCs), where patients with suspected major trauma will be taken either directly or after initial assessment and treatment in a Trauma Unit (TU) or Local Emergency Hospital (LEH). Work to achieve this objective is well underway with the network expected to be established in 2016. The system will rely on the right patients being taken to the right facility and the SAS, MTCs, TUs and LEHs will play a key role in the whole service being effective for all trauma patients.

Key recommendations for STAG

The NPF made a series of recommendations for the future of trauma data collection provided by STAG in view of establishing a major trauma service:

- All hospitals with an ED should contribute to STAG (N=30);
- The audit should expand to include paediatric trauma;
- National KPIs should be agreed and measured to help monitor the success of the major trauma service and drive improvements;
- STAG should be extended to include data collection on the full patient journey including rehabilitation and Patient Reported Outcome Measures (PROMS[13]);
- STAG and the SAS data should be linked to allow for more robust information on the early stages of care; and
- STAG and hospital in-patient data (ISD SMR01 data[14]) linkage should be progressed allowing valuable information to be explored in relation to outcomes and survival.

All of these recommendations are either completed or being progressed.

Mandatory participation

In September 2015, there are 30 hospitals with an ED and 18 of these hospitals are contributing to STAG. STAG await confirmation from the Major Trauma Oversight Group on designation of Major Trauma Centres and Trauma Units before progressing this objective. STAG are currently reviewing the approximate numbers of patients that would attend the 12 non-contributing hospitals by using the International statistical Classification of Diseases and related health problems (ICD) 10[14] trauma codes and data from the SMR01 dataset in ISD[15]. This will allow us to decide whether these hospitals will require a Local Audit Coordinator or whether data could be collected by other methods eg local 'STAG champion, existing Local or Regional Coordinators. See Appendix three for a full list of hospitals with EDs and which hospitals currently contribute to STAG or are planning to progress this.

Paediatric trauma

The NPF has highlighted paediatric trauma in Scotland as a priority making this an exciting time to move forward with the expansion of STAG to include the paediatric population (under 13 years.)

There is currently no single audit or data source for capturing specific information on paediatric trauma in Scotland, but extrapolation from available data from England would suggest an annual figure of 100 paediatric major trauma cases across Scotland are to be expected.

We have undertaken a scoping exercise of paediatric services across Scotland focusing on current available resources and utilisation of transfer networks.

A major focus of this project is identifying the correct resource within each site to facilitate paediatric data collection. Clearly this requires new resources in the two paediatric centres in Scotland but also a significant uplift in additional resources in sites that currently submit STAG data. This is a rate limiting step to this process.

We are currently in the early stages of developing data collection tools for this age group. Although ISS is not verified for use in children, in the absence of a suitable alternative as a group we have decided to utilise this tool in line with the adult audit and our colleagues within TARNlet[16]. This will allow direct comparison to both adult data and other nationally collected data.

Data collection was commenced in June 2015 in one Scottish tertiary paediatric centre. It is hoped that this will be extended to all STAG centres in 2016 and provide useful data on the demographics of paediatric trauma within Scotland thereby advising trauma services, transfer networks and public health in keeping with the aim of the NPF.

Key Performance Indicators (KPIs)

The KPI Subgroup of the STAG Steering Group first met in September 2014. The indicators have been selected following a long consultation process and literature reviews for supportive evidence. See appendix one (page 33) for the full list of indicators.

Each indicator has a description explaining the performance to be achieved and a rationale as to why it is considered to be important.

The KPIs have been agreed to help monitor the system as a whole, and, over time, drive its ongoing development and improvement. Furthermore, the KPIs themselves will be reviewed and updated regularly, to ensure that they are fit for purpose, and capture the necessary information.

The introduction of a governance process in STAG is essential in order to support hospitals with improvement and a working group has been set up to progress this objective.

Rehabilitation

STAG are working closely with rehabilitation colleagues to ensure data are available on this essential part of the trauma patient's journey. Two of the KPIs are related to rehabilitation with the introduction of a Rehabilitation Plan for trauma patients who are admitted to a MTC in 2016. Initially STAG will collect information on whether the plan is written and whether this is within three days, and once this is established then the indicators will evolve. Rehabilitation colleagues have been invited to join the STAG Steering group.

Patient Reported Outcomes Measure

In order to improve trauma services and assure the public that the major trauma service is achieving its aim of reducing mortality and improving quality of life, STAG will continue to report mortality data and start to collect and report on quality of life data in the future.

Patients may survive their injuries, but be left with long-term disabilities therefore improving functional outcomes and quality of life should be regarded as equally important when considering the effectiveness of trauma care.

STAG intend to use Patient Reported Outcomes Measures (PROMS)[13] in order to gather data on functional outcome and quality of life, and at the time of writing this report, have organised the first meeting of a working group to decide on the methodology. A colleague from rehabilitation has been co-opted onto this group to ensure we are aligned with the work of the rehabilitation specialty and its objectives.

Data linkage

STAG are currently progressing data linkage with the SAS in order to report on the KPIs in 2016 and allow for more robust information on pre hospital care for trauma patients.

STAG have also linked with ISD datasets to allow more information on trauma patients including deprivation data and patients long term survival status. This will allow STAG to widen the scope of its reports in future without the need for further data collection.

All linkage of NHS and Social Care data requires additional permissions by the Public Benefit and Privacy Panel for Health and Social Care[17] within ISD and strict processes and protocols need to be adhered to.

Electronic data collection

In order for STAG to fulfil the recommendations of the NPF it is essential that electronic data collection is implemented. A scoping exercise by NHS ehealth and National Services Scotland Information Technology Strategic Business Unit has reviewed various ways of collecting STAG data electronically and have concluded that a bespoke system build is required. The aim is to have a live system by 2016 which will mean a more efficient process for data collection and improved access to real time data for local clinical staff. This will allow timely review of performance against KPIs and facilitate improvement in service delivery and patient care.

Use of STAG data in research

The STAG research subgroup was brought together in August 2013 with two main objectives:

- coordinate the academic activity undertaken using STAG data; and
- facilitate the development of academic capacity.

Over the past two years the group has worked to develop robust structures for processing requests for STAG information, in line with other ISD policies to ensure a timely and well governed response to data requests. Along with this, a process has been put in place to ensure scientific validity of requests, supported by STAG analyst time. All data recipients are now required to give formal feedback on how the data released to them has been used.

In 2014, ten information requests have been received and reviewed by the research sub group. Papers using STAG data have been published in peer reviewed journals such as the Emergency Medicine Journal. The group has also been active in planning for analysis of the impact of the proposed changes in national trauma provision.

Conclusion

STAG has reported on 5930 patients who were treated in 19 hospitals during 2013 and 2014. The report includes complete data for seven months within that time period for all hospitals and 13 of the 19 hospitals have complete data for both years. The Western Infirmary and Victoria Infirmary in Glasgow EDs closed in 2015 and we thank the staff in these hospitals for their contribution to STAG since its inception in 1992.

There are a further 12 hospitals that STAG expect to contribute to the audit in the future and the Royal Hospital for Children in Glasgow started collecting STAG data in June 2015, expanding the audit to include paediatric data for the first time.

The great majority of trauma patients arrive by ambulance and they generally do so in the out-of-hours period which presents staffing challenges for NHS. 13% of all patients in the audit and 30% of the major trauma subset require further ambulance transfer to a second centre for definitive care. By far the commonest reason for secondary transfer was for the care of a significant head injury.

30% of all patients require more than 14 days of in-patient hospital care. As expected the more severely injured patients spend longer in hospital.

STAG has been able to stop reporting on five of our QIs because they have either been embedded in clinical practice or are no longer clinically relevant. Of the remaining 15 quality indicators (six of which are reported on in this report) we have observed significant variation. This is most noticeable in the time taken to get a patient to the CT scanner and in the proportion of patients transferred to the neurosurgical centre for the management of severe head injury.

The overall 30 day mortality all trauma patients included in the audit is 6% (364). The mortality rate rises to 22% in patients who have sustained major trauma (ISS >15).

In 2013 STAG changed the statistical outcome prediction model to TARN PS[12] methodology[5]. STAG have also used a funnel plot for presenting the survival rates for the first time. This plot shows that the overall outcome for all the Scottish centres is close to the prediction model reference data base and this should reassure the Scottish public. All the contributing Scottish hospitals are within 2 standard deviations of the Scottish mean but one hospital falls lower than 3 standard deviations from the Scottish mean. An internal review has been commissioned to establish whether this difference is due to chance or variation in clinical practice.

We look ahead to a major change in the provision of care for patients with major trauma with the introduction of the Major Trauma Service in 2016. STAG will play a crucial role in this new service by reporting on the new KPIs (Appendix one, page 33) in order to help monitor the service as a whole, and over time, drive its ongoing development and improvement. This will support the aims of the new service of reducing mortality and improving quality of life for patients who survive trauma.

List of References

1. Accidental deaths registered in Scotland, 1979-2014. Available: http://www.nrscotland.gov.uk/files//statistics/accidental-deaths/2014/accidents-14-chart-1.pdf [Accessed on 22nd August 2015]
2. Deaths, numbers and rates by sex, age and cause, Scotland 2014. Available: http://www.nrscotland.gov.uk/files//statistics/vital-events-ref-tables/2014/section-6/14-vital-events-ref-tabs-6-2.pdf [Accessed on 22nd August 2015]
3. Unintentional injuries ISD report 2014. Available: https://isdscotland.scot.nhs.uk/Health-Topics/Emergency-Care/Publications/2014-02-25/2014-02-25-UI-Report.pdf?97723025084 [Accessed on 8th September 2015]
4. The Association for the Advancement of Automotive Medicine. Abbreviated Injury Scale (AIS); 2005 Update 2008. Available: http://www.aaam.org/about-ais.html [Accessed on 31st August 2015]
5. The Trauma Audit & Research Network, Ps12 details. Available at: https://www.tarn.ac.uk/Content.aspx?c=3065 [Accessed on 31st August 2015]
6. Boyd CR, Tolson MA, Copes W. (1987) Evaluating Trauma Care The TRISS Method Trauma Score and the Injury Severity Score. J Trauma - Injury Infection & Critical Care. 27:370–378.
7. The Trauma Audit and Research Network(TARN) https://www.tarn.ac.uk/Home.aspx [Accessed on 12th October 2015]
8. The Scottish Government. (2007). Better Health Better Care. Available: http://www.gov.scot/Resource/Doc/206458/0054871.pdf [Accessed on 31st August 2015]
9. The Scottish Government. (2010). The Healthcare Quality Strategy for NHS Scotland. Available: www.scotland.gov.uk/Publications/2010/05/10102307/0 [Accessed on 11th September 2015]
10. Scottish Healthcare Audits. http://www.isdscotland.org/Health-Topics/Scottish-Healthcare-Audits/ [Accessed on 12th October 2015]
11. British Orthopaedic Association and British Association of Plastic, Reconstructive and Aesthetic Surgeons (2009) Standards for Trauma - Boast 4: The Management of severe open lower limb fractures Available: https://www.boa.ac.uk/wp-content/uploads/2014/12/BOAST-4.pdf [Accessed on 8th September 2015]
12. Baker SP, O'Neill B, Haddon W., Jr, Long WB. (1974). The Injury Severity Score: a method for describing patients with multiple injuries and evaluating emergency care. J Trauma - Injury Infection & Critical Care. 14:187-196.
13. Black N. (2013) Patient reported outcome measures could help transform healthcare. BMJ . 346:f167.
14. WHO. (2105). International Statistical Classification of Diseases and Related Health Problems 10th Revision (ICD 10). Available: http://apps.who.int/classifications/icd10/browse/2015/en [Accessed on 8th September 2015]
15. ISD linked datasets – Data Sources and Clinical Coding Document. Available: http://www.isdscotland.org/Health-Topics/Hospital-Care/Data_Sources_and_Clinical_Coding.doc [Accessed on 11th September 2015]

16. TARNlet.
Available: https://www.tarn.ac.uk/Content.aspx?ca=7 [Accessed on 12th October 2015]
17. The Public Health and Privacy Panel for Health and Social Care
http://www.informationgovernance.scot.nhs.uk/ [Accessed on 12th October 2015]
18. Bouamra O, Wrotchford A, Hollis S, Vail A, Woodford M, Lecky F. (2006). A New Approach to Outcome Prediction in Trauma: A comparison with the TRISS Model. *J of Trauma*. 61: 701-710

Abbreviations

AIS	Abbreviated injury scale
CHI	Community Health Index
CT	Computerised tomography
ED	Emergency department
EM	Emergency Medicine
GCS	Glasgow coma scale
ICD10	International Statistical Classification of Diseases and Related Health Problems 10th Version
ICU	Intensive Care Unit
IQR	Interquartile range
ISD	Information Services Division
ISS	Injury severity score
IV	Intra venous
KPI	Key Performance Indicator
LAC	Local Audit Coordinator
LOS	Length of stay
MTC	Major Trauma Centre
MTS	Major Trauma Service
NHS	National Health Service
PHI	Public Health and Intelligence
PROMS	Patient Reported Outcome Measures
PS12	Probability of Survival 12
QI	Quality Indicator
SAS	Scottish Ambulance Service
SHA	Scottish Healthcare Audits
SIU	Spinal Injuries Unit
SMR01	Scottish Morbidity Record 01
STAG	Scottish Trauma Audit Group
TARN	Trauma Audit and Research Network
TU	Trauma Unit
TXA	Tranexamic acid

Methodology

Data Collection

STAG has a team of Local Audit Coordinators (LACs) who are employed by the participating Health Boards to identify patients, collect data and feedback results to their local sites. Data were collected by LACs in each of the 19 participating sites (Fig 1.1 and 1.2, pages 1 and 2).

Data are recorded prospectively by clinical and administrative staff as part of the patient's routine care and are collected retrospectively by the STAG LACs. Data sources include patient's case notes, patient administration systems and results of diagnostic imaging and surgical procedures.

Anonymised paper proforma are submitted to STAG central office at ISD for processing and conversion to electronic form by a third party contractor, who use dual data entry to ensure accuracy.

Eligibility

All patients who attend participating STAG EDs are reviewed to determine the following criteria for inclusion:

- All patients aged ≥ 13 years, and
- who have sustained injury within the previous seven days requiring an inpatient stay of at least three days or who die during their inpatient episode.

Full details of inclusion/exclusion criteria are available on the STAG website: www.stag.scot.nhs.uk/Projects/Trauma_Audit_Inclusion_Exclusion.pdf.

Patients are followed up for 30 days, or until death or discharge within these 30 days.

Injury Coding Dictionary

During the period described in this report the 2005 Abbreviated Injury Scale (AIS) dictionary (2008 update)[4] was used to code and score patient injuries. STAG started using this version in January 2013 having previously used AIS 1990 Revision, Update 1998.

Quality assurance

A high standard of data quality is essential to ensure the STAG database is accurate, consistent and comparable across time, and between hospitals. This will ensure decisions to improve quality of care and service provision at hospital, Health Board and national level are based on correct information. Without quality it would be impossible to interpret results with any accuracy or conviction.

The data quality processes undertaken by STAG are incorporated into the following:

- At point of data collection/proforma completion
- Central validation, and
- Quality Assurance visits to each site at least once a year.

At point of data proforma completion

LACs carry out data quality checks prior to submitting the proforma to the STAG Central office. Once submitted, further data quality checks are carried out prior to data being entered into the central database.

Central Validation

All data are subject to a computer based validation process using IBM SPSS Statistics 21. All queries are raised and LACs provide confirmation on correction of the query. Monthly validations are collated and sent out to the LACs. Any issues with data fields are queried, and any changes to the data are fed back to central office for corrections to be made.

Central validation processes are being developed to separate proforma errors (that must be corrected) from proforma warnings (checks where the information does not seem correct, but may be accurate and not require to be corrected) when feeding back information to LACs. This will allow identification of any data quality issues more effectively.

Quality Assurance visits to each site at least once a year

Data collection processes are quality assured by the Quality Assurance Manager and/or Regional Coordinators during sites visits, and includes assessment of individual site's case ascertainment rate. A random sample of ten validated cases is generated from the STAG dataset. The algorithm selects the sample data including major and/or moderately injured patients, covering a specific timeframe to guarantee that enough cases are quality assured for each STAG site during the visit. Any data quality findings are reported back to each site and amended if appropriate.

Missing GCS

The first observation of the GCS recorded on arrival to the STAG ED is used to calculate the Ps 12[5]. Where this is not available, the last observation recorded by the SAS, or the first within the first hour of arrival to the STAG hospital are used. In the event that no GCS is available from these three sources, a 'normal' GCS score of 15 is allocated. A normal value of GCS was allocated in 222 cases. This process allows the patient to be included in the audit but may introduce a degree of bias around the calculation of the probability of survival for these patients. If the patient was intubated, an accurate GCS cannot be recorded. TARN advise that 'intubation' needs to be used as predictor in the Ps 12 calculation where GCS is missing. Each instance of this was investigated by the relevant Local Audit Coordinator, including proactive education on the impact of the use of allocated values in an attempt to improve the availability of a GCS.

Interpretation of Statistics

Probability of Survival

STAG use a logistic regression model developed by TARN (Ps 12[5])to determine probability of survival for each patient. This is a population based statistic which uses the patient's age, gender, GCS, a transformation of Injury Severity Score[12] (ISS), and an interaction between age and gender to determine whether a patient would normally be expected to survive. Ps 12 is a mathematical calculation which gives an indication of the probability of survival and not an absolute measure of mortality[18].

The aggregation of all eligible trauma patients within a hospital gives a W-statistic for that hospital stated in terms of excess survivors per 100 trauma patients, relative to the reference database.

Observed survival is compared to expected survival. A positive W-statistic indicates unexpected survivors, whereas a negative W-statistic indicates unexpected deaths. The W-statistics is standardised with respect to injury severities to allow case-mix variation amongst hospitals.

When the number of eligible cases in each survival group is small, the estimated rates may be unreliable because the direct standardisation is very sensitive to small numbers.

It is important to realise that TARN prediction model Ps 12 does not consider pre-existing medical conditions. TARN has recently developed a new version for calculating probability of survival, Ps 14 which includes pre-existing medical conditions of patients and STAG will start using this model in 2016. Including this additional information will improve the accuracy of the prediction tool.

Funnel plots

To show the differences between hospitals, Figure 5.1 is shown as a funnel plot.

In a funnel plot, a **performance indicator** is shown on the y-axis, while the **numbers of admissions are** shown on the x-axis. There is a data point for every hospital 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. Hence the name funnel plot.

When a hospital's performance indicator falls outside the confidence intervals, that hospital might be different from the rest. The inner curves correspond with 2 standard deviations (2 SD) from the Scottish mean, while the outer curves correspond with 3 standard deviations (3 SD) from the Scottish mean. Hospitals whose performance indicator is outside the outer confidence interval are considered to be different from the majority of other hospitals. Differences may arise from many sources: differences in data accuracy, case-mix, service provision or practice. And sometimes a difference is just a random difference caused by chance alone.

Median and Inter-Quartile Range

Medians are used as a measure of central tendency. The median is simply the point at which, if values in the data range were sorted from high to low, the middle point would lie. Where median values are reported the inter-quartile range (IQR) is also given. The IQR represents the data range within which the middle 50% of values lie.

Appendix one: Key Performance Indicators for the Major Trauma Service

Pre Hospital Care: Pre hospital care encompasses the response from the call alerting the emergency services, to on-scene care, triage and primary transfer.

1.1 Pre hospital Triage	
Description	Patients who have suffered significant trauma are assessed by the SAS using the SAS Trauma Triage Tool.
Rationale	The Trauma system relies on the need of the patient and the capacity of the service being matched and triage will help deliver this.

1.2 Pre alert	
Description	Patients who are triaged as requiring Major Trauma Centre (MTC) care are notified to the receiving hospital (pre alert).
Rationale	Pre-alerts allow trauma teams to be assembled prior to arrival of the patient, improving the care they receive in the initial stages of their hospital journey.

1.3 Diversion to lower level of care	
Description	Patients who are triaged as requiring MTC care are taken directly to a MTC if they are within 45 minutes travel time.
Rationale	The aim of the trauma system is to deliver patients to definitive care, whenever possible; to provide safer care, decrease mortality and improve functional outcome.

Early hospital Care: Early hospital care includes initial reception of the patient in the ED and inter-hospital transfer (if required), through to the patient being discharged to a rehabilitation service or home.

2.1.1 Consultant led reception for patients triaged and taken to MTC care	
Description	Patients who are triaged and taken to MTC care are received by a consultant led trauma team.
Rationale	A consultant will have the necessary expertise and experience to effectively coordinate the initial assessment and treatment of a major trauma patient.
Paediatrics	Paediatric Emergency Medicine Consultant: Same definition as adult from 8.00-23.59. Seen by a consultant within 30 minutes from 00.00 to 7.59.

2.1.2 Consultant review for patients triaged to MTC care and taken to a Trauma Unit (TU)	
Description	Patients who are triaged to MTC care and are taken to a TU should be seen by a consultant within 60 minutes of arrival.
Rationale	*As 2.1.1*

2.2 Time to Major Trauma Centre care	
Description	Major trauma patients who are not taken directly to a MTC and are later transferred to a MTC are transferred within 24 hours.
Rationale	Some patients with major trauma will not be taken directly to a MTC due to a number of reasons including prolonged distance to a MTC, unstable clinical condition, under triage and patients been taken to hospital by private transport. It is essential that these patients are transferred to definitive care (MTC) as soon as possible, improving the patient experience and outcome.

2.3 Time to secondary transfer	
Description	Time to secondary transfer to a MTC for patients who have suffered major trauma is minimised to ≤ four hours from time of call to SAS to departure.
Rationale	Major trauma patients who are not taken directly to a MTC should be transferred without delay to definitive care after initial assessment and optimisation in the receiving hospital.
Paediatrics	Referral to mobilisation of transfer team is <60 minutes. Referral to team arrival with patient <3 hours (road/mainland responses). Referral to team arrival with patient <4 hours (island/air responses).

2.4.1 Time to CT head	
Description	Patients with a severe head injury have a CT scan within 60 minutes of arrival.
Rationale	Severe head injury is defined as a patient with a GCS ≤ 8 and/or an AIS (head) ≥ 3. All patients with a severe head injury following trauma to the head should have a CT scan as soon as possible to determine treatment required in order to ensure the best outcome.

2.4.2 Time to CT head written report	
Description	Patients with a severe head injury have a CT scan written report sent within one hour.
Rationale	*As in 2.4.1*

2.5 Major Trauma Centre care for patients with a severe head injury	
Description	Patients who have suffered a severe head injury are managed in a MTC.
Rationale	Severe head injury for this KPI is defined as a patient with an AIS (Head) ≥3. Patients who have suffered severe head injury should be managed in a MTC with specialist facilities to reduce mortality and improve functional outcome.

2.6 Management of severe open long bone fractures	
Description	Patients with a severe open long bone fracture will receive IV antibiotics within three hours of arrival.
Rationale	Evidence recommends that IV antibiotics are given to patients with severe open long bone fractures as soon as possible (ideally within three hours).

2.7 Administration of Tranexamic Acid in patients with severe haemorrhage	
Description	Trauma patients with severe haemorrhage start the administration of tranexamic acid (TXA) within three hours of first contact with emergency services.
Rationale	Trauma patients with severe haemorrhage are defined as having received at least one unit of blood products within six hours of injury for the purpose of this indicator. TXA has been shown to reduce death by bleeding if given within three hours of injury to bleeding trauma patients.

2.8 Specialist care	
Description	Patients who have suffered major trauma and are taken to a MTC, are admitted under the care of a Major Trauma Service.
Rationale	The Major Trauma Service would coordinate care from the acute phase through to rehabilitation ensuring patients receive all necessary care in a timely manner.

Ongoing hospital care: Ongoing hospital care includes rehabilitation of the patient within a hospital setting and/or within the community.

3.1.1 Assessment of rehabilitation needs	
Description	Patients admitted to a MTC have a rehabilitation plan written.
Rationale	Rehabilitation should start as soon as appropriate to enable patients to achieve their functional potential.

3.1.2 Time to assessment of rehabilitation needs	
Description	Patients admitted to a MTC have their rehabilitation plan written within three days of admission.
Rationale	As in 3.1.1

3.2 Functional outcome	
Description	Patients who have survived major trauma have their functional outcomes assessed at specified timelines.
Rationale	Trauma systems have been shown to reduce mortality and reduce disability. This will provide information on the functional outcome of patients with major trauma to ensure that the Major Trauma Service is effective.

KPIs for adults and paediatrics are the same except for 2.1.1 and 2.3.

The KPI document will be available on the STAG website www.stag.scot.nhs.uk later this year.

Appendix two: Governance of STAG - Clinical Outcomes and Measures for Quality Improvement working group (COMQI)

STAG is part of the Scottish Healthcare Audits[10] (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.

The agreed governance arrangements reached between Public Health and Intelligence (PHI, previously ISD) and the National Clinical Data Advisory Group (NCDAG) remain, however NCDAG has now been subsumed into COMQI and they will now provide national governance across the SHA. In light of the introduction of these new governance arrangements, SHA is proactively auditing the remit, scope, outputs and value of all the Scottish Healthcare Audits to ensure continued improvement and demonstrable value for money. The auditing of STAG took place in May 2015 and the findings of this work are expected to be presented to COMQI in a full report in the autumn of 2015.

This gives an opportunity to:

- increase the visibility and influence of the Scottish Healthcare Audits to improve public health in Scotland;
- share our achievements and demonstrate the impact of our efforts;
- focus on improving our effectiveness, and work more efficiently to improve outcomes for patients; and
- better support COMQI in its commitment to improve patient care.

Appendix three: Scottish hospitals with an Emergency Department, 2015

Health Board	Hospital (Abbreviation if used on charts in section 4)	Contributing to STAG (2015)
NHS Ayrshire and Arran	University Hospital Ayr	Y
	University Hospital Crosshouse, Kilmarnock	Y
NHS Borders	Borders General Hospital	Pending
NHS Dumfries and Galloway	Dumfries and Galloway Royal Infirmary (DGRI)	Y
	Galloway Community Hospital	N
NHS Fife	Victoria Hospital, Kirkcaldy (VHK)	Y
NHS Forth Valley	Forth Valley Royal Hospital (FVRH)	Y
NHS Grampian	Aberdeen Royal Infirmary (ARI)	Y
	Dr Grays Hospital. Elgin	N
	Royal Aberdeen Children's Hospital	pending
NHS GG&C	Glasgow Royal Infirmary (GRI)	Y
	Inverclyde Royal Hospital (IRH)	Y
	Royal Alexandra Hospital, Paisley (RAH)	Y
	Royal Hospital for Children, Glasgow	Y - from June 2015
	Queen Elizabeth University Hospital, previously Southern General Hospital, Glasgow (SGH)	Y
	Victoria Infirmary, Glasgow (VIG)	Closed May 2015
	Western Infirmary, Glasgow (WIG)	Closed June 2015
NHS Highland	Belford Hospital, Fort William	N
	Caithness General Hospital	N
	Lorn and Islands District General Hospital, Oban	N
	Raigmore Hospital, Inverness	Y
NHS Lanarkshire	Hairmyres Hospital, East Kilbride	Y
	Monklands Hospital, Airdrie	Y
	Wishaw Hospital	Y
NHS Lothian	Royal Infirmary of Edinburgh(RIE)	Y
	St John's Hospital, Livingston	Pending
	Royal Hospital for Sick Children, Edinburgh	pending
NHS Orkney	Balfour Hospital, Kirkwall	N
NHS Shetland	Gilbert Bain Hospital, Lerwick	N
NHS Tayside	Ninewells Hospital, Dundee	Y
	Perth Royal Infirmary (PRI)	Y
NHS Western Isles	Western Isles Hospital, Stornoway	N

Note: Data taken from A&E data mart (last updated January 15). Changes to NHS Greater Glasgow and Clyde (May/June 2015) added by STAG.

The hospitals not yet contributing to STAG will be contacted by the STAG team once the designation of Major Trauma Centres and Trauma Units has been finalised by the NHS Boards and the Major Trauma Oversight Group at the Scottish Government. Contribution to STAG has already been discussed with some clinical leads and these hospitals are marked as pending.

Acknowledgements

This report was written and produced by the report writing sub group of the STAG steering group.

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