The Western Australian Audit of Surgical Mortality (WAASM)

2016 Report

Royal Australasian College of Surgeons

The Royal Australian and New Zealand College of Obstetricians and Gynaecologists

Excellence in Women's Health

ANZASM

Australian and New Zealand Audit of Surgical Mortality

WAASM

Western Australian Audit of Surgical Mortality

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The information contained in this annual report has been prepared by the Royal Australasian College of Surgeons Western Australian Audit of Surgical Mortality Management Committee, which, as part of the Australian and New Zealand Audit of Surgical Mortality is a declared quality assurance activity under the *Health Insurance Act 1973 (Cth)*, Part VC.

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CHAIRMAN'S REPORT

The dominant debate at the Australian and New Zealand Audit of Surgical Mortality (ANZASM) meetings during the last year has been how to balance the increasing demands for openness and transparency against the protection the ANZASM has under the Commonwealth Qualified Privilege Scheme. The demands for greater openness are coming from multiple directions and the ANZASM has to adapt to an environment that is quite different to when its mortality audits were established, whilst remaining true to its primary purpose which is educational, not punitive.

The protection the ANZASM is afforded under the Commonwealth Qualified Privilege Scheme is essential to both surgeons and assessors who need to be confident that they can make honest and frank comments without fear that these will later be used against them. Without the Qualified Privilege granted in 2002, it is unlikely the Western Australian Audit of Surgical Mortality (WAASM), or any of the other state audits, would have commenced. However, 15 years on, expectations have changed and health departments, our funders on behalf of our patients and the public, are of a view that the ANZASM needs to be able to address suboptimal care if it becomes aware of it. Legal advice has now confirmed that the ANZASM can advise health departments when it is concerned by patient care, provided this is done in a manner that is sufficiently broad so as not to identify individuals.

Whilst this might be an acceptable first step, it remains to be seen if in the longer term the ANZASM can retain its Qualified Privilege. The WA surgical cancer audits (see below) will not be protected by Qualified Privilege.

As part of its response to this pressure, the RACS may consider strengthening its continuing professional development (CPD) requirements for attendance and documentation at routine mortality and morbidity meetings. The RACS is likely to recommend that hospital accreditation committees ask surgeons to provide their ANZASM participation certificates or their CPD certification, on an annual basis. However, the RACS cannot change this culture alone. Numerous enquiries have often found that the poor care under review was well known, but was not acted upon until a whistle blower stepped forward, often at very considerable personal expense. This reflects poorly on Australian hospital governance.

Although recent discussions have focused on outlier identification and management, there is increased appreciation of the growing evidence base that demonstrates prospective surgical audits influence practice, not only improving outcomes but also providing cost savings. The Australian Orthopaedic Association implant register is an outstanding local example. In the United Kingdom the cardiothoracic audit commenced more than 10 years ago and it is still showing a fall in observed mortality, even as predicted risk adjusted mortality continues to rise. The American College of Surgeons National Surgical Quality Improvement Program has shown improvements in many areas it has studied. The fall in mortality that the WAASM observed during its first 10 years has been repeated in all other Australian regions as they have introduced their mortality audits. The RACS mortality audits have repeatedly highlighted the hugely detrimental impact of delay, the importance of direct consultant supervision when managing seriously ill patients, the better use of critical care areas and the necessity for emergencies to be given higher priority for theatre access. In the United Kingdom the Emergency Laparotomy Pathway Quality Improvement Care (ELPQuiC) project promoted care bundles based on these principles and reported a statistically significant reduction in both 30-day (15.6% to 9.6%; 38%) and in-hospital (17.4% to 10.1%; 42%) risk-adjusted mortality[1].

The Fintech revolution has profoundly impacted on the financial world that can now share data gathered from multiple sources, through a common open application programming interface (API). ‘Medtech’ has the potential to have a similar impact. The Queensland Cancer Control Analysis Team distils data from multiple sources into a single patient record. It then uses statistical control processes to examine its data. To date, its risk-adjusted reports have only been provided to hospitals for internal purposes, but the release of its first public report containing de-identified hospital performance is imminent. In WA, similar techniques have been used to monitor blood transfusions and have already been shown to influence local practice. The proposed WA audits of surgical cancers will use local experience gained from the blood transfusion audit and national experience, as in Queensland, to generate local reports for surgeons and hospitals.

Mortality is an important but crude measure of surgical outcome. Morbidity is much more common and can be catastrophic to patients. The previous difficulties encountered when risk-adjusting outcomes have been perceived as a significant impediment to the publication of both mortality and morbidity data. Surgeons must recognise the new reality and as the ability to collect and use risk-adjusted data rapidly improves, the demands of patients, the public and governments will increase. Surgeons must embrace and lead the inevitable changes. If we do not, others will.

The WAASM has repeatedly highlighted the problems that can arise around transfers and last year held a symposium that specifically addressed transfer issues. Data in this report shows that the number of surgical patients who were transferred prior to death continues to rise. Any transfer results in delay, and delay remains the leading preventable cause of death. The problems related to transfer remain a serious cause of concern.

At the coal face the ANZASM continues to develop. Individual hospital reports have been released and individual surgeon reports are now available. Electronic uptake via the Fellows Interface continues to increase. There are a number of examples in this report where data completeness rose sharply from 2013, when the WAASM introduced an electronic platform. It is a powerful reason to move entirely online and that is likely to be within the next year. Surgeon self-initiated forms can now be generated. The ANZASM receives numerous proposals relating to the use of its data for audit and research purposes. A joint research project with the University of Western Australia (UWA) is using machine learning techniques to interrogate the ANZASM database in novel ways, as an example of Medtech research in action (see section 5).

In early 2016, Diana Azzam, WAASM Project Manager, left to move on to other pastures. On behalf of all WA surgeons, I would like to acknowledge her considerable input over six years and wish her well into the future.

RJ Aitken
Chairman, WAASM

SHORTENED FORMS

ANZASM	Australian and New Zealand Audit of Surgical Mortality
ASA	American Society of Anesthesiologists
CPD	continuing professional development
DVT	deep vein thrombosis
FLA	first-line assessment
HDU	high dependency unit
ICU	intensive care unit
RAAS	Research, Audit and Academic Surgery
RACS	Royal Australasian College of Surgeons
SCF	surgical case form
SLA	second-line assessment
UWA	University of Western Australia
WA	Western Australia
WAASM	Western Australian Audit of Surgical Mortality
webPAS	web-based Patient Administration System

EXECUTIVE SUMMARY

Background

The WAASM is an external, independent, peer-reviewed audit of the process of care associated with surgically-related deaths in WA. The WAASM was established in 2001, is funded by the WA Department of Health and has protection under federal legislation. This report covers the period from 2011 to 2015.

Audit process and reporting conventions

The WAASM is notified of deaths in all WA hospitals and, in cases where a surgeon was involved in the care of the patient, the death is included in the audit. The WAASM then sends a surgical case form (SCF) to the surgeon for completion. Once returned, the SCF is anonymised and then peer-reviewed by another surgeon in a process referred to as first-line assessment (FLA). The reviewing surgeon uses the information in the SCF to decide whether the case warrants a second-line assessment (SLA). Cases are referred for SLA if clinical management issues are identified, or where it is thought a more detailed review could usefully draw attention to lessons to be learned. The WAASM provides feedback from the assessor to the treating surgeon.

Notification of deaths

From 2011 to 2015, 2,949 deaths were reported to the WAASM from 30 hospitals. The number of deaths per 100,000 population reported to the WAASM has decreased from 24 in 2011 to 21 in 2015, a decrease of 13%.

Consultant participation

For the 481 surgeons participating in the audit, 91% (439) have agreed to be first-line assessors and 91% (437) have agreed to be second-line assessors.

Analysis of completed cases

Data analysed for this report covers cases reported to the WAASM from 1 January 2011 to 31 December 2015, with data censored on 31 March 2016. The numbers reported for 2014 in this report vary from those in last year's report due to the ongoing process of late return after the census date. Cases that have not completed the entire audit process are classified as 'lost to follow-up'. Cases considered 'lost to follow-up' occur if forms have not been returned for two years following the date of death or where they were associated with a surgeon who is no longer working in WA and did not complete the case prior to moving. A case is also considered 'lost to follow-up' if it is not able to be completed due to a lack of access to medical records (i.e. being used in coroner enquiries or cannot be found in the medical records archives).

As at 31 March 2016, 60% (346/575) of the cases presented in 2015 had completed the entire audit process. A further 15% (88/575) of the completed WAASM SCFs have been returned and are awaiting completion of an FLA or SLA. These 434 cases account for 75% (434/575) of deaths reported in 2015.

Patient demographics

For the 2,949 deaths reported between 2011 and 2015 the median age was 77 years, with an interquartile range of 64–85. Males comprised 54% (1,603/2,949) of cases and females comprised 46% (1,346/2,949) of cases.

Clinical management issues

The proportion of cases associated with clinical management issues as identified by treating surgeons has increased since 2011. For the entire audit period, in the 370 completed cases with clinical management issues, assessors identified 543 individual issues. Of these, 14% (76/543) constituted adverse events, and of the adverse events, 57% (43/76) were reported to have caused death.

Emergency and elective admissions

A majority of the admissions were emergency (87%; 1,889/2,183) rather than elective (13%; 294/2,183) admissions and were to public rather than private/co-location hospitals. For operative cases, 81% (1,118/1,381) were emergency admissions while 19% (263/1,381) were elective admissions.

Operative and non-operative deaths

At least one operation was performed in 63% (1,404/2,221) of completed cases. Operative procedures were abandoned upon finding a terminal situation in 4% (89/2,169) of the operations performed. In 15% (217/1,404) of operative cases, surgeons reported an unplanned return to theatre.

RECOMMENDATIONS

The WAASM makes the following recommendations:

Audit management

- Through the RACS WA Regional Office, increase the profile of the audit to the WA surgical trainees. This will familiarise trainees with the audit's purposes and processes, and be of assistance should surgeons delegate cases to them.
- Collaborate closely with the WA Regional Office to identify newly graduated surgical trainees, thereby ensuring early recruitment of new Fellows/surgeons into the audit.
- Continue to improve surgeon recruitment to the online system (Fellows Interface) to 65% by December 2016 through promotion of new features and enhancements.
- Facilitate ANZASM processes to develop and test further enhancements to the Fellows Interface and the Bi-national Audit System. These include: one RACS portfolio single sign on, updates to the appearance of the Fellows Interface, and improvements to the case note tracker functionality.
- Further improve upon the high return rate of SCFs (96% in 2014).

Research and reporting on audit data

- Progress the joint initiative between the WAASM and the UWA which aims to examine the impact of process and regulatory changes using the WAASM/ANZASM data.
- Work with the ANZASM to enable reporting of patient Unit Record Number and Category 4 and 5 deaths under the Health Round Table to the WA Department of Health.

Clinical management

- Monitor trends in the inappropriate decisions on the use of deep vein thrombosis (DVT) prophylaxis as reported by assessors in 4% (63/1,646) of cases between 2011 and 2015.
- Monitor trends in the non-use of critical care units where assessors were of the opinion that they should have been used. Between 2011 and 2015, this accounted for 7% (intensive care unit 2%; 18/780 and high dependency unit 5%; 36/780) of cases where critical care units were not used.
- Explore the 12% (39%; 55/141 to 51%; 87/172) increase in the proportion of deaths involving an active decision not to operate between 2011 and 2014, as it relates to patients' end of life care.

Education

- Produce at least one case note review booklet to educate, facilitate change and improve practice.
- Conduct a symposium around issues on 'end of life care'.

1. INTRODUCTION

KEY POINTS
• The WAASM is an external, independent, peer-reviewed audit of the process of care associated with all surgically-related deaths in WA. • This report covers the period 1 January 2011 to 31 December 2015, as censored on 31 March 2016. • The WAASM's main role is to provide information to surgeons to educate, facilitate change and improve quality of practice.

1.1 Background

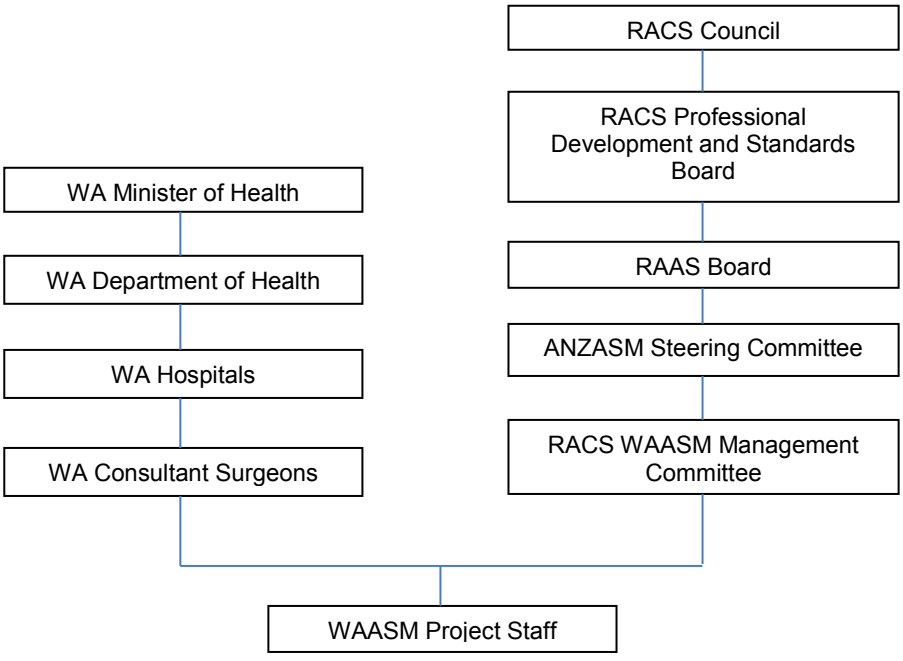
The WAASM is an external, independent, peer-reviewed audit of the process of care associated with surgically-related deaths in WA. The project is funded by the WA Department of Health and its methodology is based on the Scottish Audit of Surgical Mortality[2].

The WAASM commenced in June 2001 as a pilot project under the management of the UWA. In 2005 the WAASM's management was transferred to the Research, Audit and Academic Surgery (RAAS) division of the RACS. In the same year the RACS formed the ANZASM, with the purpose of establishing similar mortality audits in other states and territories. All Australian states and territories are now participating.

1.2 Project governance

The project governance structure is illustrated in Figure 1. ANZASM (including the WAASM) has protection under the Commonwealth Qualified Privilege Scheme, under Part VC of the *Health Insurance Act 1973* (gazetted 23 August 2011).

Figure 1 Project governance structure



2. THE AUDIT PROCESS

2.1 Methodology

The WAASM is notified of all in-hospital deaths through either The Open Patient Administration System (TOPAS), the web-based Patient Administration System (webPAS), or directly via medical records departments. All cases in which a surgeon was involved in the care of a patient are included in the audit, whether or not the patient underwent a surgical procedure.

The surgeon associated with the case is sent a structured SCF for completion. The completed SCF is returned to the WAASM where it is de-identified and then assessed by a first-line assessor. This assessor is another surgeon working in the same specialty (peer review) but not the same hospital. The first-line assessor will either complete the review and close the case or recommend that the case undergo further assessment in the form of an SLA.

Cases may be referred for an SLA if:

- there is insufficient detail or a lack of information in the SCF
- clinical management issues arising from the care of the patient are thought to warrant further investigation.

Like the first-line assessor, the second-line assessor of a case work in the same specialty but in a different hospital to that in which the death occurred.

2.2 Providing feedback

One of the main aims of the WAASM is to provide feedback to inform, educate, facilitate change and improve practice. Where a case has undergone an SLA, the associated case note review could usefully draw attention to lessons learned, either for clinicians involved in the case or as part of a collation of assessments (case note review booklet) for wider distribution.

2.3 Reporting conventions

2.3.1 Reporting clinical management issues

In the SCF the surgeon is asked to document whether there were any clinical management issues during the care of the patient. If so, the surgeon is also asked to:

- report on the impact of the clinical management issue on the outcome, that is, whether the issue:
  - made no difference to the outcome
  - may have contributed to death
  - caused the death of a patient who would otherwise have been expected to survive
- give their opinion as to whether the clinical management issue was preventable, using the following categories:
  - definitely
  - probably
  - probably not
  - definitely not
- indicate who the clinical management issue was associated with:
  - audited surgical team
  - another clinical team
  - hospital
  - other

First- and second-line assessors also complete the same assessment matrix.

2.3.2 Analysing clinical management issues

The WAASM primarily focuses on areas of concern and adverse events (see appendix A.2). Data regarding areas for consideration are collected, but they are considered ‘less serious events’ as they generally have little impact on the overall care of the patient.

2.4 Data analysis

The WAASM audits all deaths occurring in WA hospitals while the patient is under the care of a surgeon, although terminal care cases are excluded from the full audit process. The 2016 report covers deaths reported to the WAASM from 1 January 2011 to 31 December 2015, censored on 31 March 2016. Due to a time lag in reporting, some of the 2015 cases are still under review and the numbers documented in this report do not represent a complete data set for the year. Numbers in previous reports may vary from this report because some cases have been completed after the audit dates of the previous reports.

Data is entered and stored in the Bi-national Audit System database and analysed using the Statistical Package for Social Sciences (versions 19.0 and 22.0), and Microsoft Office Excel (2010). The number of cases analysed is represented in parentheses in the text (n). The total number of cases used in the analyses varies as each data point may not have been completed for every case reported.

2.5 Performance review

Recommendations were included in the WAASM 2015 Report[3]. An important measure of the success of the WAASM is whether these recommendations have been addressed or achieved. The progress on each of these recommendations is discussed in section 6 of this report.

3. AUDIT PARTICIPATION AND ASSESSMENT

3.1 Deaths reported to the WAASM

KEY POINT
• Participation in the WAASM has been a mandatory requirement since 2010 and monitored through RACS CPD since 2013.

Tables 1 and 2 summarise the deaths reported to the WAASM from 1 January 2011 to 31 December 2015.

Table 1 Deaths reported to the WAASM

	Number of Cases					
	2011	**2012**	**2013**	**2014**	**2015**	**Total**
Total deaths reported	571	601	593	598	586	2,949
Excluded error [a]	1	9	27	19	11	67
Deaths falling within WAASM criteria	570	592	566	579	575	2,882

[a] Cases reported as WAASM deaths that do not fall within the WAASM inclusion criteria are labelled 'excluded error'.
Refer to Appendix A.3 for further information on data.

Table 2 Number of deaths under a surgeon per 100,000 population

	2011	**2012**	**2013**	**2014**	**2015**
Deaths falling within WAASM criteria [a]	570	592	566	579	575
Estimated WAASM-reported surgical mortality rate per 100,000 population [b]	24	24	22	23	21

[a] Surgically-related deaths that meet the WAASM selection criteria.
[b] Population data compiled from the Australian Bureau of Statistics[4].
Refer to Appendix A.3 for further information on data.

Comment:

Deaths under the care of a surgeon are reported to the WAASM by the hospitals and the WA Department of Health. It is entirely independent of the surgeon and their participation in the audit. The WAASM has observed an overall decrease of 13% in the number of deaths under a surgeon per 100,000 population (24 in 2011 to 21 in 2015), with some fluctuation between 2012 and 2014 (Table 2).

The high number of cases that have been excluded from the audit due to error ('excluded error'; Table 1) in more recent years is primarily due to information in webPAS extracts that has not accurately reflected the discharge specialty and/or surgeon involvement in the case. As such, the WAASM must verify the information directly from medical records.

3.2 Surgeon participation in the WAASM

KEY POINT
• SCF returns have increased from 78% in 2011 to 96% in 2014, indicating greater engagement and participation of surgeons in the WAASM as well as mandatory completion of SCFs.

Table 3 Reported deaths and surgeon involvement

	Number of Cases (%)					
	2011	2012	2013	2014	2015	Total
Total deaths reported	571	601	593	598	586	2,949
Deaths falling within WAASM criteria	570	592	566	579	575	2,882
Surgeons associated with reported deaths	162	165	178	178	172	855
SCF returns [a]	447 (78)	475 (80)	520 (92)	558 (96)	513 (89)	2,513 (87)

[a] Includes terminal care cases.
Note: All percentages relate to deaths falling within the WAASM criteria.
Refer to Appendix A.3 for further information on data.

Table 4 Case statistics of surgeons associated with three or more deaths

	Number of Cases (%)					
	2011	2012	2013	2014	2015	Total
Surgeons associated with three or more deaths [a]	73 (45)	75 (45)	67 (38)	71 (40)	69 (40)	355 (42)
Cases related to surgeons associated with three or more deaths [b]	460 (81)	486 (82)	441 (78)	446 (77)	447 (78)	2,280 (79)

[a] Percentages relate to figures in Table 3 (surgeons associated with reported deaths).
[b] Percentages relate to figures in Table 3 (deaths falling within the WAASM criteria).
Refer to Appendix A.3 for further information on data.

Comment:

Table 3 shows the number of surgeons associated with deaths reported to the WAASM. The number of surgeons having a death reported to the WAASM steadily increased from 2011 to 2014. This is likely to reflect the greater number of surgeons now working in WA. Due to a time lag in reporting, some of the 2015 cases are still under review and therefore the figures for that year are not complete.

SCF returns increased from 78% (447/570) in 2011 to 96% (558/579) in 2014, as shown in Table 3. In 2015 the SCF return rate was 89% (513/575). This does not necessarily indicate a change in the pattern, as there are still a number of 2015 cases that are currently open and therefore some SCFs are yet to be returned.

The WAASM office can provide assistance to facilitate SCF completion and appreciates any information relating to delayed cases. Feedback to the WAASM regarding a delayed SCF return is important, as it enables any system-related issues to be identified and resolved, improving the audit process for all participants.

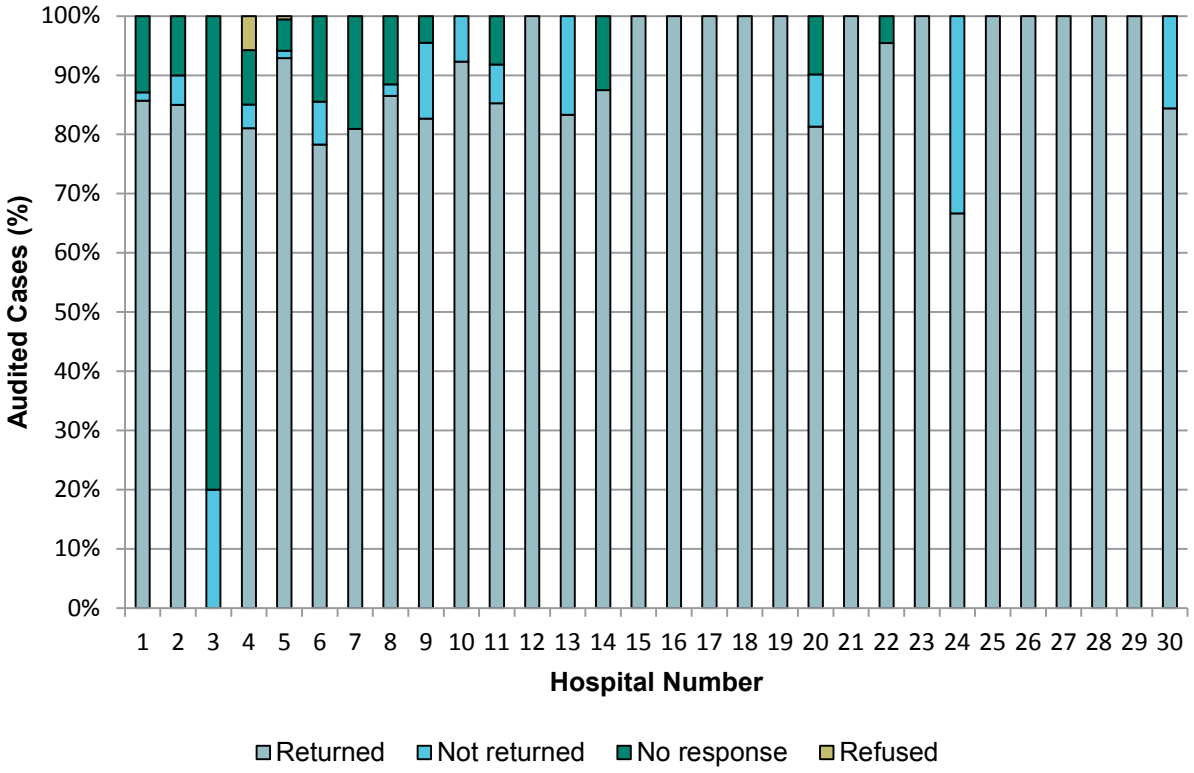
Table 4 gives a breakdown of the number of surgeons associated with three or more deaths. Cases relating to surgeons associated with three or more deaths accounted for 79% (2,280/2,882) of all deaths falling within the WAASM criteria.

3.3 Hospital participation in the WAASM

KEY POINT
• Between 2011 and 2015 there were 30 hospitals associated with 2,949 reported cases.

Figure 2 shows the SCF completion rates and status for individual WA hospitals between 2011 and 2015. Where cases are classified as 'Refused', it indicates that one or more non-participating surgeons worked in those hospitals.

Figure 2 Surgical case form completion rates in WA hospitals



Refer to Appendix A.4 for further information on data.

3.4 Case completion

KEY POINTS

- Between 2011 and 2014 there was an 11% increase in the number of completed cases.
- There have been no cases associated with non-participation since 2013, when participation in the WAASM became compulsory for CPD purposes.

Table 5 Audit case status

	Number of Cases (%)					
	2011	2012	2013	2014	2015	Total
Deaths falling within WAASM criteria	570	592	566	579	575	2,882
Audit process complete [a]	429 (75)	456 (77)	491 (87)	499 (86)	346 (60)	2,221 (77)
SCF complete, case awaiting assessment [b]	0 (0)	1 (<1)	3 (1)	30 (5)	88 (15)	122 (4)
SCF not returned [c]	0 (0)	0 (0)	0 (0)	17 (3)	60 (10)	77 (3)
Terminal care cases	18 (3)	18 (3)	26 (5)	29 (5)	81 (14)	172 (6)
Lost to follow-up [d]	90 (16)	95 (16)	46 (8)	4 (1)	0 (0)	235 (8)
Cases associated with non-participants [e]	33 (6)	22 (4)	0 (0)	0 (0)	0 (0)	55 (2)

[a] Audit process is considered complete when all required assessments have been received and a case has been closed.
[b] Case awaiting first- or second-line assessment.
[c] SCFs are considered 'not returned' (i.e. pending) if they have not been received by the WAASM office within two years of the notification of death but the consultant still works in WA.
[d] Cases are considered 'lost to follow-up' if forms have not been returned two years after the date of death; are associated with surgeons who are no longer working in WA and did not complete cases prior to moving; or if cases were not able to be completed due to lost medical records.
[e] Non-participants are surgeons who indicated that they did not wish to participate in the WAASM prior to the audit becoming compulsory.
Note: All percentages relate to deaths falling within the WAASM criteria.
Refer to Appendix A.3 for further information on data.

Comment:

Between 2011 (75%; 429/570) and 2014 (86%; 499/579) there was an 11% increase in the number of completed cases. The sharp increase in the number of completed cases from 2013 is likely to reflect the RACS decision to make participation mandatory for CPD purposes. Due to a time lag in reporting, some of the 2015 cases are still under review and therefore the figures for that year are not complete.

Table 6 First-line assessments (FLAs)

	Number of Cases (%)					
	2011	2012	2013	2014	2015	Total
Deaths falling within WAASM criteria	570	592	566	579	575	2,882
FLA returned	429 (75)	457 (77)	494 (87)	515 (89)	370 (64)	2,265 (79)
FLA pending	0 (0)	0 (0)	0 (0)	7 (1)	22 (4)	29 (1)

Note: All percentages relate to deaths falling within the WAASM criteria.
Refer to Appendix A.3 for further information on data.

Comment:

The FLA is a critical assessment and many cases can be closed at this point. The proportion of FLAs returned to the WAASM office has steadily increased, from 75% (429/570) in 2011 to 89% (515/579) in 2014. Although the number of returned FLAs has increased, it is in the interests of all that cases are closed promptly (not least the surgeon under whom the death occurred). Due to a time lag in reporting, some of the 2015 cases are still under review and therefore the figures for that year are not complete.

Table 7 Second-line assessments (SLAs)

	Number of Cases (%)					
	2011	2012	2013	2014	2015	Total
Deaths falling within WAASM criteria	570	592	566	579	575	2,882
Referred for SLA	66 (12)	69 (12)	76 (13)	74 (13)	48 (8)	333 (12)
SLA pending	0 (0)	1 (<1)	2 (<1)	4 (<1)	1 (<1)	8 (<1)

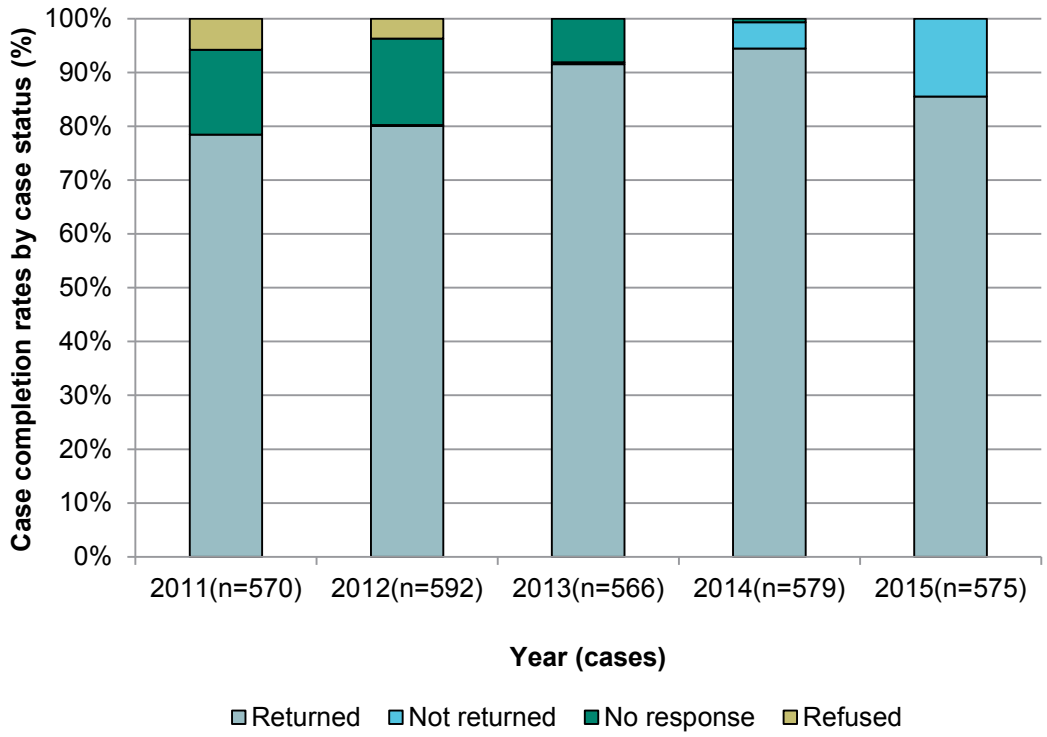
Note: All percentages relate to deaths falling within the WAASM criteria.
Refer to Appendix A.3 for further information on data.

Comment:

The proportion of cases referred for SLA remained relatively stable over the last four years. Due to a time lag in reporting, some of the 2015 cases are still under review and therefore the figures for that year are not complete.
To minimise the number of cases referred for SLA, surgeons are encouraged to fill out SCFs with a high level of detail. This assists first-line assessors with making appropriate decisions on cases, and avoids the need to refer cases for SLA due to a lack of information.

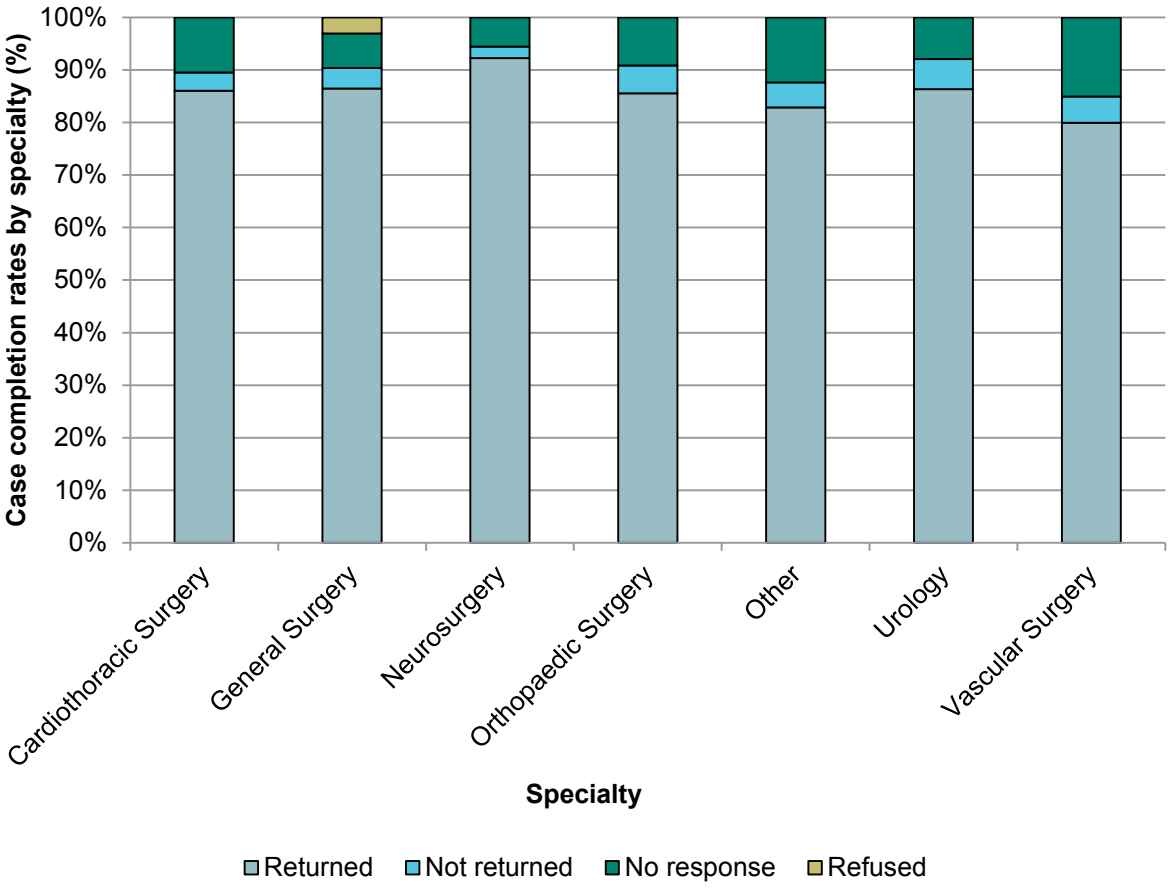
Figure 3 represents a summary of the case completion rates by the status of the cases in the audit process while Figure 4 gives a breakdown of the overall case status by surgical specialty.

Figure 3 Case completion rates by year



Refer to Appendix A.4 for further information on data.

Figure 4 Case completion rates by specialty



Note: 'Other' includes the specialties of Otolaryngology, Head and Neck Surgery, Ophthalmology, Paediatric Surgery, Obstetrics and Gynaecology, and Plastic Surgery.
Refer to Appendix A.4 for further information on data.

4. ANALYSIS OF AUDIT DATA

4.1 Overview of patient demographics

KEY POINTS

- Males comprised 54% of all deaths and females comprised 46% of deaths. The median age of patients was 75 years for males and 80 years for females.
- Cases of surgical mortality were most prevalent amongst both males and females aged between 81 and 90 years.

Age and gender distribution

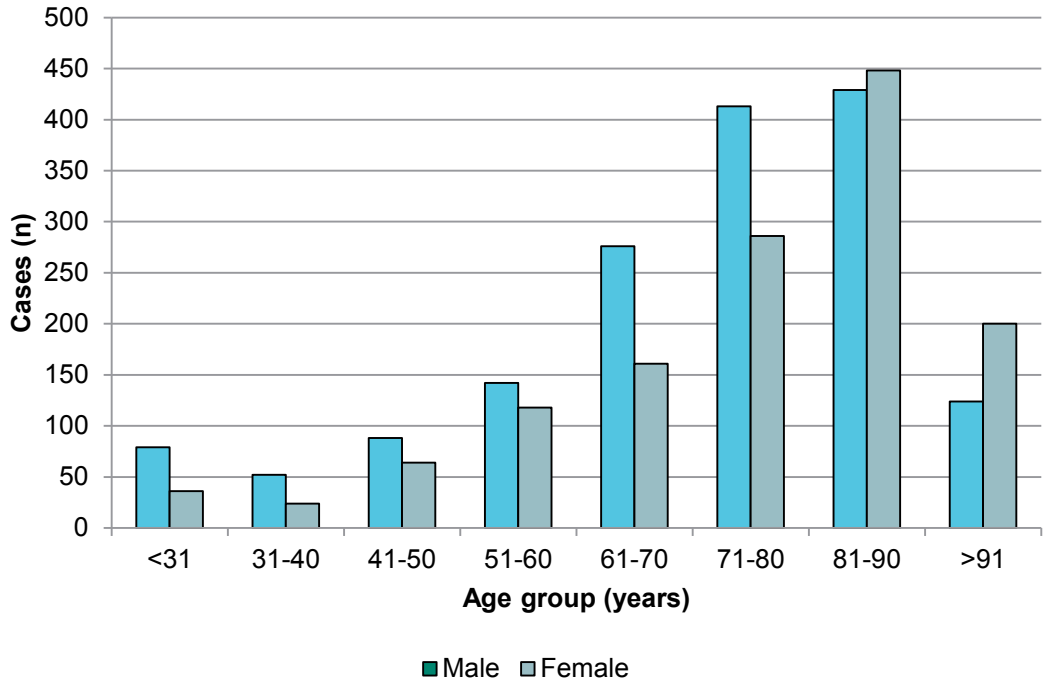
Table 8 shows the median age by gender of audited patients while Figure 5 looks at the distribution of age by gender. Figure 6 reports on the median age by specialty.

Table 8 Median age by gender

	Number of Cases	Median Age (Years)	Interquartile Range (Years)
All patients	2,949	77	64-85
Males	1,603	75	62-84
Females	1,346	80	67-87

Refer to Appendix A.3 for further information on data.

Figure 5 Cases by age group and gender

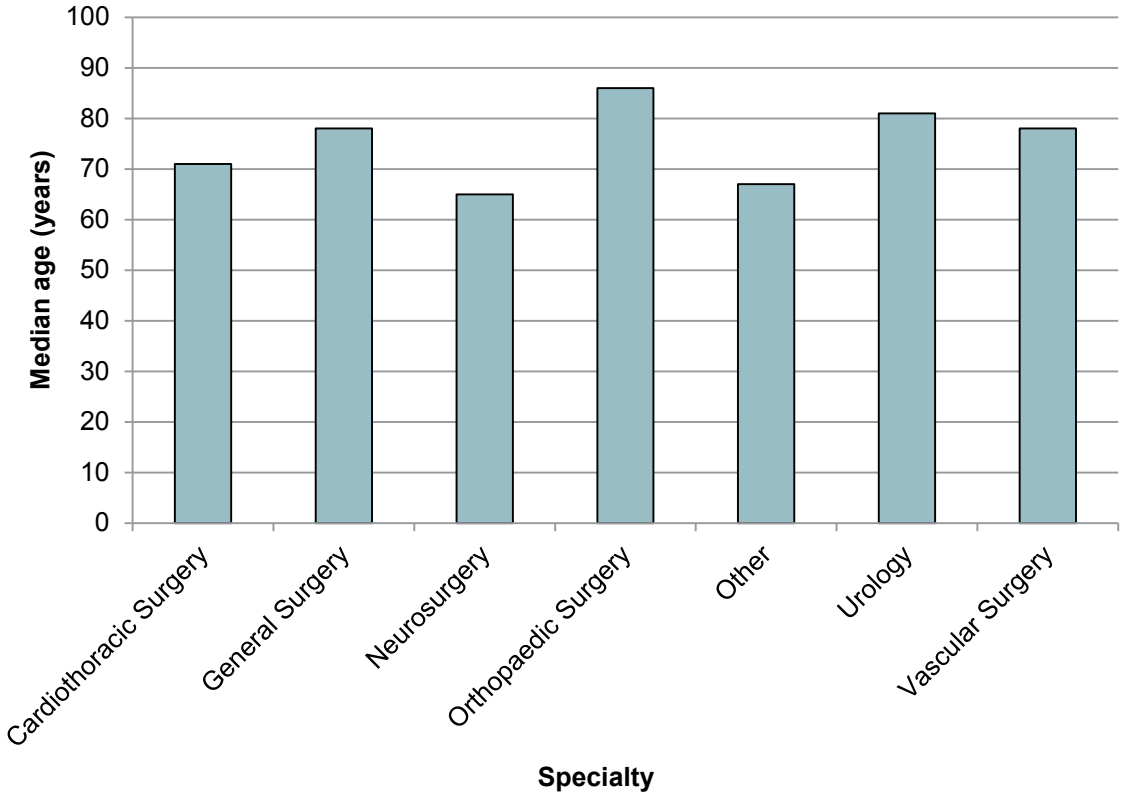


Refer to Appendix A.4 for further information on data.

Comment:

As age increased, there was a change in the gender trend. Males predominated in the first six age categories, while females formed the majority of cases in the 81-90 and >91 year age ranges (see Figure 5).

Figure 6 Median age by surgical specialty



Note: 'Other' includes Otolaryngology, Head and Neck Surgery, Ophthalmology, Plastic Surgery, Obstetrics and Gynaecology, and Paediatric Surgery.
Refer to Appendix A.4 for further information on data.

Comment:

Orthopaedic Surgery cases had the highest median age (86 years), and Neurosurgery had the lowest median age (65 years).

4.2 Overview of patient clinical information

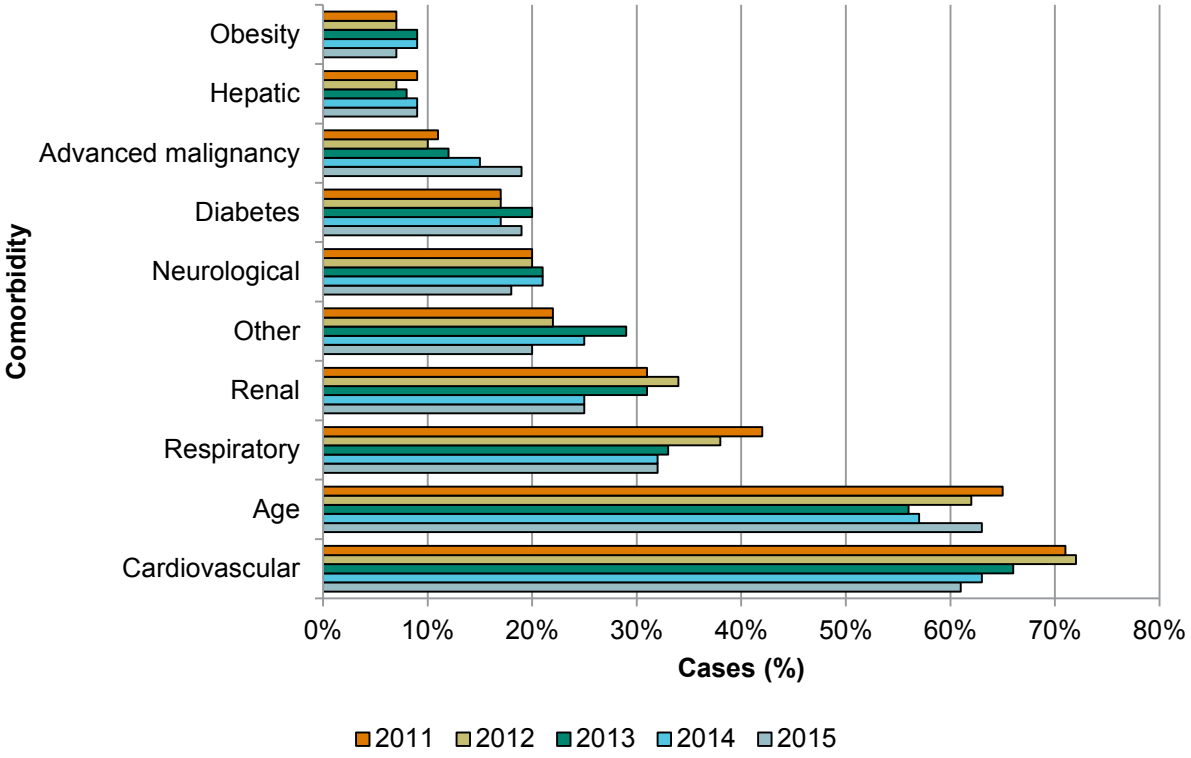
KEY POINTS

- Between 2011 and 2014 there was an increase in the number of patients with advanced malignancy and obesity comorbidities.
- In 4% of cases the assessors reported an inappropriate decision on the use of DVT prophylaxis.
- In 7% of cases in which critical care units were not used, assessors were of the opinion that patients would have benefited from the use of a critical care unit.

4.2.1 Comorbidities

Surgeons were asked to indicate if there were any significant comorbidities associated with each case (see Figure 7).

Figure 7 Frequency of comorbidities by type and year



Note: 'Other' refers to comorbidities other than those listed on the surgical case form and may include the presence of other chronic illnesses, haematological or drug-related conditions, vasculopathy, hypertension, dementia, malnutrition, alcoholism and cachexia. Refer to Appendix A.4 for further information on data.

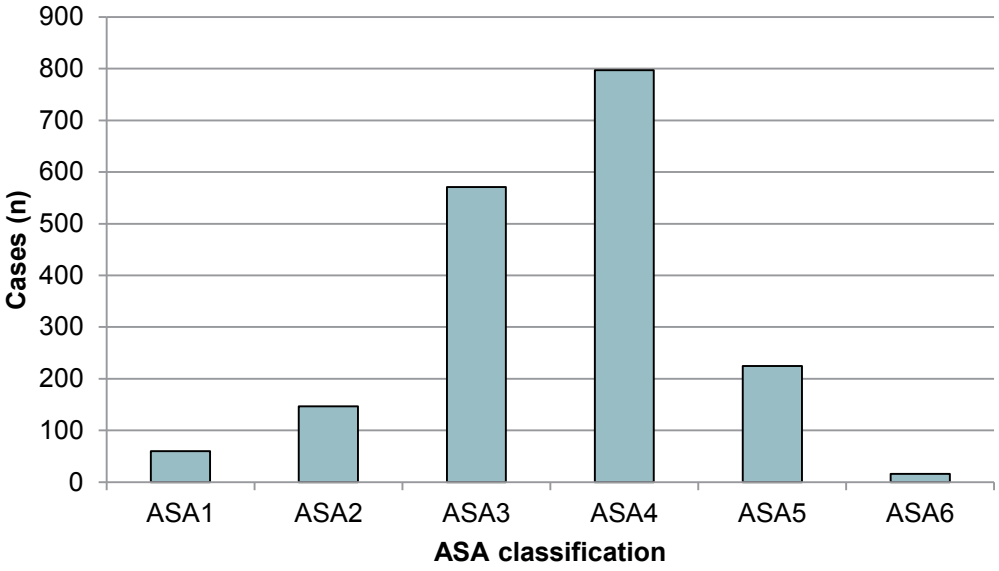
Comment:

Pre-existing medical comorbidities have a profound effect on outcome and are important when risk assessment is undertaken. The WAASM has previously noted that the 'traditional' medical comorbidities of cardiovascular, respiratory and renal diseases are being reported with less frequency[3,5]. This is likely to reflect better care in the community. The only 'traditional' medical comorbidity to show some increase was diabetes and this is likely to be secondary to obesity, which has been cited more frequently.

4.2.2 American Society of Anesthesiologists Physical Status Classifications

The American Society of Anesthesiologists (ASA) Physical Status Classifications are an internationally recognised classification of preoperative physical status. ASA classification definitions can be found in Appendix A.1. The ASA classification is a simple but important measure of comorbidity and is routinely recorded on the anaesthetic record.

Figure 8 Frequency of ASA classifications



Refer to Appendix A.1 for definitions of ASA classification.
Refer to Appendix A.4 for further information on data.

Comment:

Patients were assigned an ASA classification 4 (severe degree of systemic disease) on admission in 44% (797/1,816) of cases. ASA classification 3 (moderate degree of systemic disease) was the second most commonly assigned ASA classification (31%; 571/1,816).

4.2.3 Prophylaxis of deep vein thrombosis

Surgeons were asked on the SCF whether DVT prophylaxis was used and, if not, the reason why it was withheld (see Table 9). As part of the assessment process the assessors indicate whether they think that the decision was appropriate (see Table 10).

Table 9 Surgeon-reported use of DVT prophylaxis

	Number of cases (%)					
	2011	2012	2013	2014	2015	Total
Completed cases where DVT prophylaxis reported	344	354	414	490	338	1,940
Cases where DVT prophylaxis used	267 (78)	288 (81)	303 (73)	377 (77)	274 (81)	1,509 (78)
Cases where DVT prophylaxis not used	77 (22)	66 (19)	111 (27)	113 (23)	64 (19)	431 (22)

Note: All percentages relate to completed cases where DVT prophylaxis use was reported.
Refer to Appendix A.3 for further information on data.

Table 10 Assessors' opinions of appropriateness of DVT prophylaxis decision

	Number of cases (%)					
	2011	2012	2013	2014	2015	Total
Completed cases where appropriateness of DVT prophylaxis decision reported	300	317	382	390	257	1,646
Appropriate decision on use of DVT prophylaxis	279 (93)	293 (92)	325 (85)	342 (88)	227 (88)	1,466 (89)
Inappropriate decision on use of DVT prophylaxis	21 (7)	20 (6)	10 (3)	4 (1)	8 (3)	63 (4)
Appropriateness of decision on use of DVT prophylaxis unknown	0 (0)	4 (1)	47 (12)	44 (11)	22 (9)	117 (7)

Note: All percentages relate to completed cases where appropriateness of DVT prophylaxis decision was reported.
Refer to Appendix A.3 for further information on data.

Comment:

Overall, as shown in Table 9, the use of DVT prophylaxis showed some fluctuation across the audit period. Treating surgeons reported that prophylaxis was used in 78% (1,509/1,940) of completed cases overall.

In 4% (63/1,646) of cases assessors reported that there was an inappropriate decision on the use of DVT prophylaxis (see Table 10). Although only a small percentage of cases were identified as having had inappropriate use of DVT prophylaxis, any death secondary to inadequate protection has to be considered potentially preventable. As a matter of routine, in all SLAs where the patient has died from a pulmonary embolus, the WAASM reviews the medication charts. The case note review booklets contain many examples of cases in which the DVT prophylaxis was substantially less than required. More often than not the failure to provide appropriate DVT prophylaxis was not commented on, and was therefore presumably not noted by the treating surgeon.

4.2.4 Allocation of critical care units

Table 11 shows the use, and non-use, of critical care units (high dependency unit [HDU] or intensive care unit [ICU]).

Table 11 Surgeon-reported use of critical care units

	Number of cases (%)					
	2011	2012	2013	2014	2015	Total
Completed cases where use of critical care units reported	318	320	412	494	345	1,889
Cases where critical care units used	172 (54)	171 (53)	220 (53)	323 (65)	215 (62)	1,101 (58)
Cases where critical care units not used	146 (46)	149 (47)	192 (47)	171 (35)	130 (38)	788 (42)

Note: All percentages relate to completed cases where use of critical care units was reported.
Refer to Appendix A.3 for further information on data.

Table 12 Assessors' opinions of non-use of critical care units

	Number of cases (%)					
	2011	2012	2013	2014	2015	Total
Completed cases where non-use of critical care units reported	140	161	192	169	118	780
Cases where ICU should have been used	7 (5)	3 (2)	4 (2)	2 (1)	2 (2)	18 (2)
Cases where HDU should have been used	10 (7)	3 (2)	14 (7)	8 (5)	1 (1)	36 (5)

Note: All percentages relate to completed cases where non-use of critical care units was reported.
Refer to Appendix A.3 for further information on data.

Comment:

As shown in Table 11, critical care units (HDUs or ICUs) were used in 58% (1,101/1,889) of completed cases for which use was reported. In cases in which non-use of critical care units was reported, assessors were of the opinion that 7% (ICU: 2%; 18/780 and HDU: 5%; 36/780) of patients would have benefited from the use of critical care units as shown in Table 12.

4.2.5 Causes of death

Table 13 Most common causes of death

Top 10 causes of death READ Codes Description	n (%)
Multiple organ failure	298 (13)
Septicaemia	231 (10)
Respiratory failure	130 (6)
Acute myocardial infarction	114 (5)
Pneumonia due to unspecified organism	108 (5)
Vascular insufficiency of the intestine	100 (5)
Aspiration pneumonia	99 (4)
Cardiac arrest	96 (4)
Heart failure	94 (4)
Intracerebral haemorrhage	64 (3)

Note: All percentages relate to total number of completed cases (n= 2,221).
Refer to Appendix A.3 for further information on data.

Comment:

Multiple organ failure is frequently secondary to septicaemia, and as such there is considerable crossover between the two. Together they make up almost a quarter of all deaths. Numerous case note review booklets have highlighted cases in which the early signs of sepsis were overlooked. Cases in which there was more than one cause of death will have several READ Code descriptions ascribed to them.

4.3 Admissions

KEY POINTS

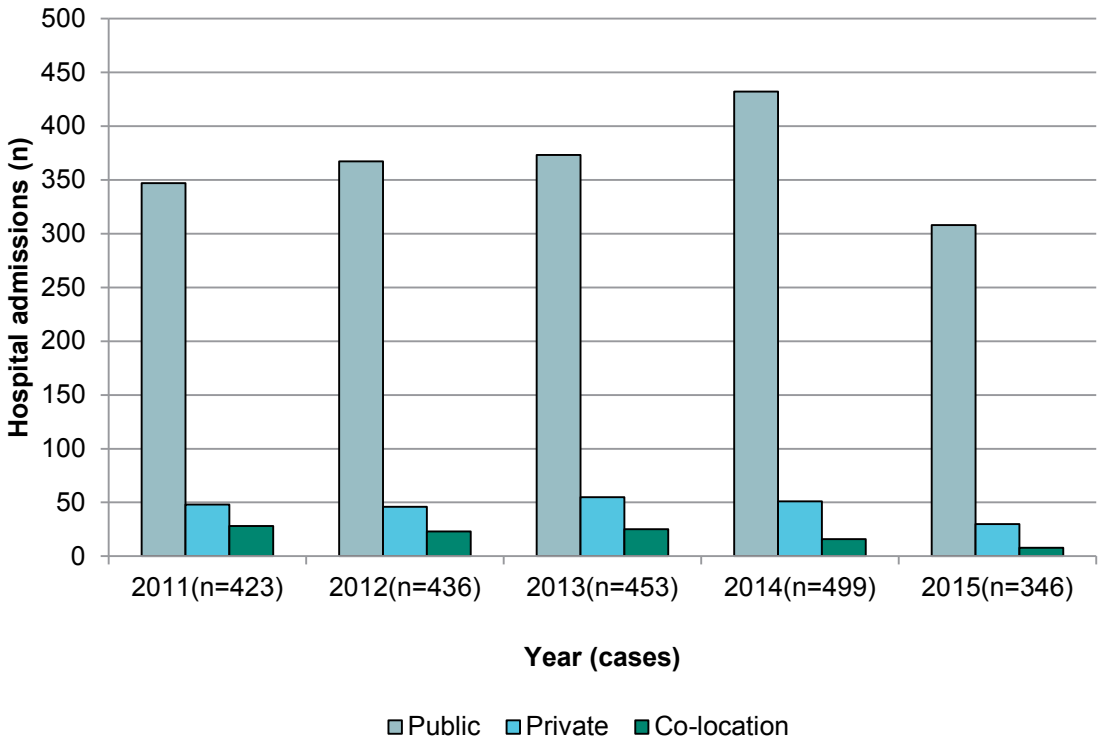
- Between 2011 and 2014, 84% of cases were admitted to public hospitals, 11% to private hospitals and 5% to co-location hospitals.
- The proportion of emergency and elective admissions has remained relatively steady.
- The proportion of emergency and elective admissions involving an operation has increased and decreased by 2% respectively.

The audit data, with regard to admissions, covers:

- the type of hospital (public, private or co-location)
- the type of admission (emergency or elective)
- whether the patient underwent an operation (operative or non-operative).

4.3.1 Hospital admissions

Figure 9 Hospital admissions by year



Refer to Appendix A.4 for further information on data.

Comment:

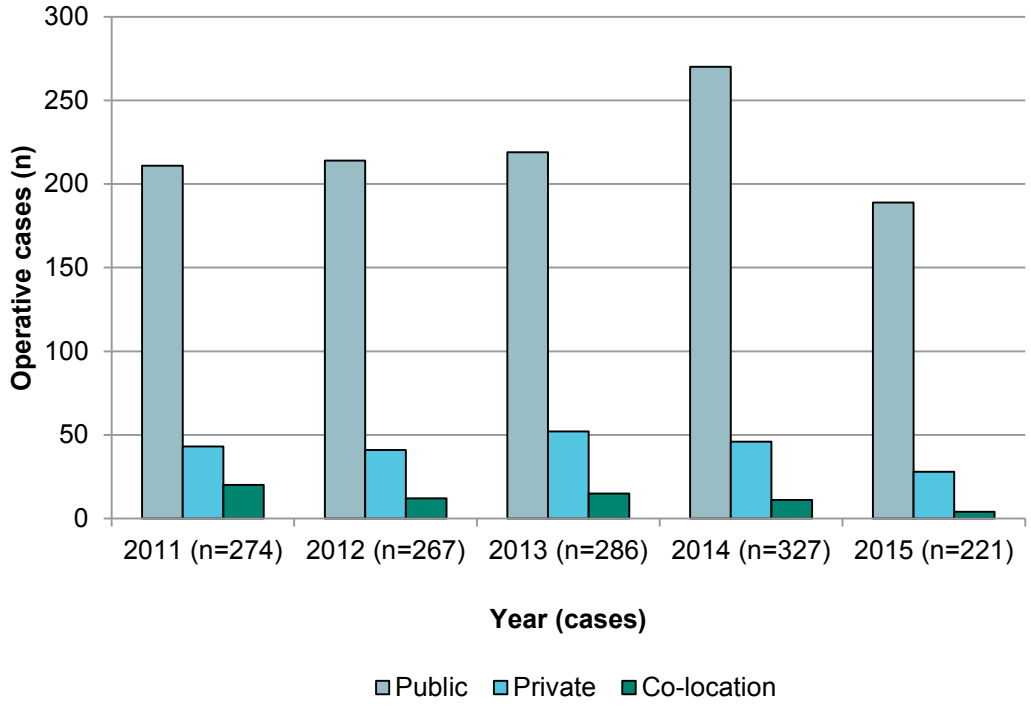
Between 2011 (82%; 347/423) and 2014 (87%; 432/499) there was a 5% increase in the proportion of public hospital admissions. Private hospital admissions remained relatively steady during the same period. There was a 4% decrease observed in the proportion of co-location hospital admissions between 2011 (7%; 28/423) and 2014 (3%; 16/499). Public hospitals accounted for 84% (1,519/1,811) of audited deaths, while private and co-location hospitals had 11% (200/1,811) and 5% (92/1,811) of audited deaths respectively. Due to a time lag in reporting, some of the 2015 cases are still under review and therefore the figures for that year are not complete.

Table 14 Admission type

	Number of Cases (%)					
	2011	2012	2013	2014	2015	Total
Completed cases	429	456	491	499	346	2,221
Completed cases where admission type not stated [a]	8 (2)	4 (1)	11 (2)	11 (2)	4 (1)	38 (2)
Completed cases where admission type stated [b]	421 (98)	452 (99)	480 (98)	488 (98)	342 (99)	2,183 (98)
Emergency admissions [c]	361 (86)	389 (86)	412 (86)	423 (87)	304 (89)	1,889 (87)
Elective admissions [d]	60 (14)	63 (14)	68 (14)	65 (13)	38 (11)	294 (13)

[a,b] All percentages relate to completed cases.
[c,d] All percentages relate to completed cases where admission type was stated.
Refer to Appendix A.3 for further information on data.

Figure 10 Operative cases by hospital type and year



Refer to Appendix A.4 for further information on data.

Comment:

Between 2011 (77%; 211/274) and 2014 (83%; 270/327), there was a 6% increase in the proportion of public hospital admissions that involved an operation.

Table 15 Operative cases by admission type and year

	Number of Cases (%)					
	2011	**2012**	**2013**	**2014**	**2015**	**Total**
Completed cases that involved an operation	272	273	297	320	219	1,381
Emergency admissions that involved an operation	217 (80)	219 (80)	238 (80)	262 (82)	182 (83)	1,118 (81)
Elective admissions that involved an operation	55 (20)	54 (20)	59 (20)	58 (18)	37 (17)	263 (19)

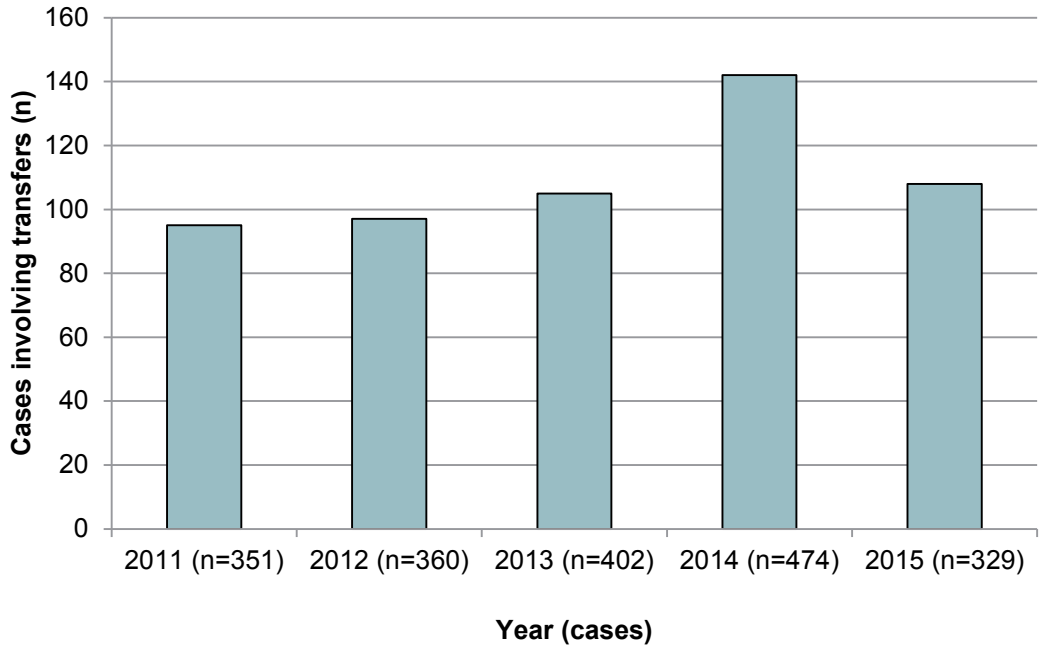
Note: All percentages relate to completed cases that involved an operation.
Refer to Appendix A.3 for further information on data.

Comment:

The proportion of emergency admissions that involved an operation increased by 2% between 2011 (80%; 217/272) and 2014 (82%; 262/320), while the proportion of elective admissions that involved an operation decreased by 2% between 2011 (20%; 55/272) and 2014 (18%; 58/320). Due to a time lag in reporting, some of the 2015 cases are still under review and therefore the figures for that year are not complete.

4.3.2 Patient transfers

Figure 11 Patient transfers by year



Refer to Appendix A.4 for further information on data.

Comment:

Between 2011 (27%; 95/351) and 2014 (30%; 142/474) there was a 3% increase in the proportion of patients transferred before death. The rise in 2014 may be a natural variation or it may be exaggerated by mandatory reporting. Although some 2015 cases are still under review and yet to be closed, the number of transfers in 2015 suggests the upward trend continues. Problems related to transfers have been highlighted in all state audits, and in 2015 the WAASM hosted a symposium that specifically addressed this issue (see section 6). Given that high risk patient were most likely to have been transferred for a higher level of care, their timely transfers, rapid assessments and prompt management on arrival was essential.

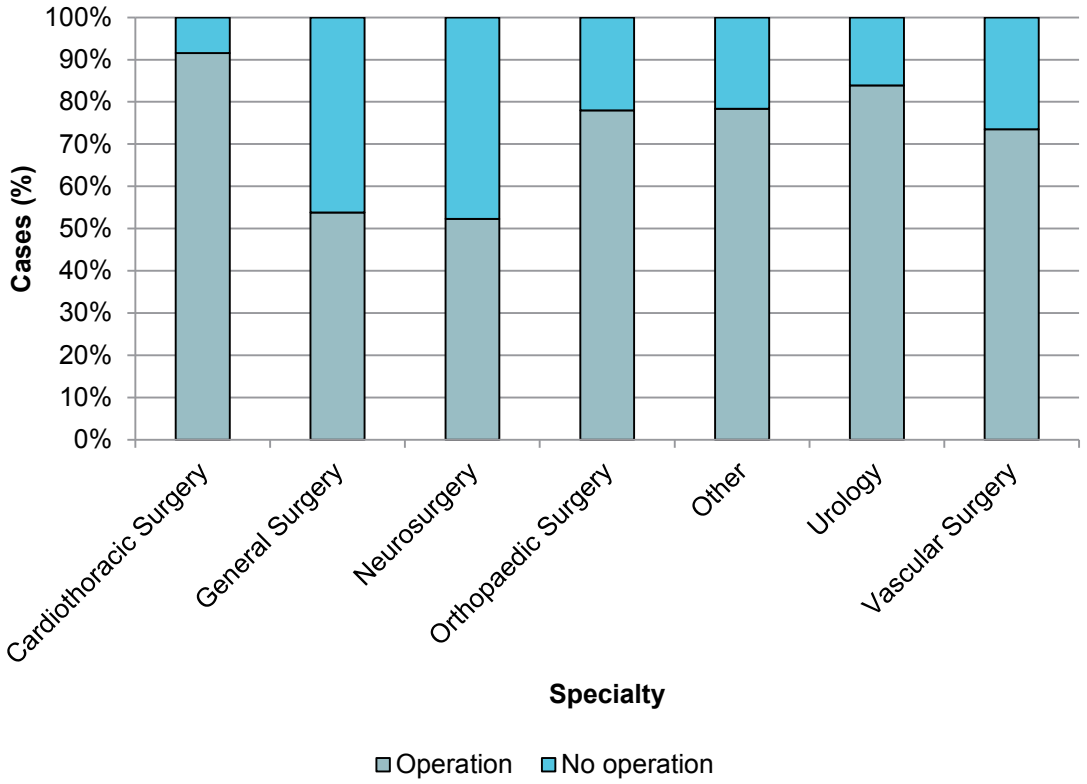
4.4 Operative and non-operative cases

KEY POINTS

- Cardiothoracic Surgery and Neurosurgery were the specialties with the highest and lowest rates of operations performed respectively.
- The proportion of unplanned returns to theatre increased by 5% between 2011 and 2014.

4.4.1 Operative cases

Figure 12 Operative status by specialty



Note: 'Other' includes Otolaryngology, Head and Neck Surgery, Opthalmology, Paediatric Surgery, Obstetrics and Gynaecology, and Plastic Surgery.
Refer to Appendix A.4 for further information on data.

Table 16 Operations abandoned

	Number of Cases (%)					
	2011	**2012**	**2013**	**2014**	**2015**	**Total**
Number of operations	520	444	432	473	300	2,169
Number of operations abandoned due to a terminal situation	18 (3)	14 (3)	20 (5)	19 (4)	18 (6)	89 (4)

Note: All percentages relate to number of operations.
Refer to Appendix A.3 for further information on data.

Table 17 Unplanned returns to theatre

	Number of Cases (%)					
	2011	2012	2013	2014	2015	Total
Number of operative cases	278	275	303	327	221	1,404
Unplanned returns to theatre	40 (14)	36 (13)	47 (16)	62 (19)	32 (14)	217 (15)

Note: All percentages relate to number of operative cases.
Refer to Appendix A.3 for further information on data.

Comment:

The proportion of unplanned returns to theatre increased by 5% between 2011 (14%; 40/278) and 2014 (19%; 62/327).Due to a time lag in reporting, some of the 2015 cases are still under review and therefore the figures for that year are not complete.

Table 18 Consultant involvement in operative cases

	Number of Cases (%)					
	2011	2012	2013	2014	2015	Total
Number of operations	520	444	432	473	300	2,169
Consultant deciding	341 (66)	298 (67)	340 (79)	432 (91)	286 (95)	1,697 (78)
Consultant operating	262 (50)	238 (54)	250 (58)	315 (67)	188 (63)	1,253 (58)
Consultant assisting	32 (6)	38 (9)	44 (10)	44 (9)	26 (9)	184 (8)
Consultant in theatre	36 (7)	51 (11)	50 (12)	102 (22)	39 (13)	278 (13)

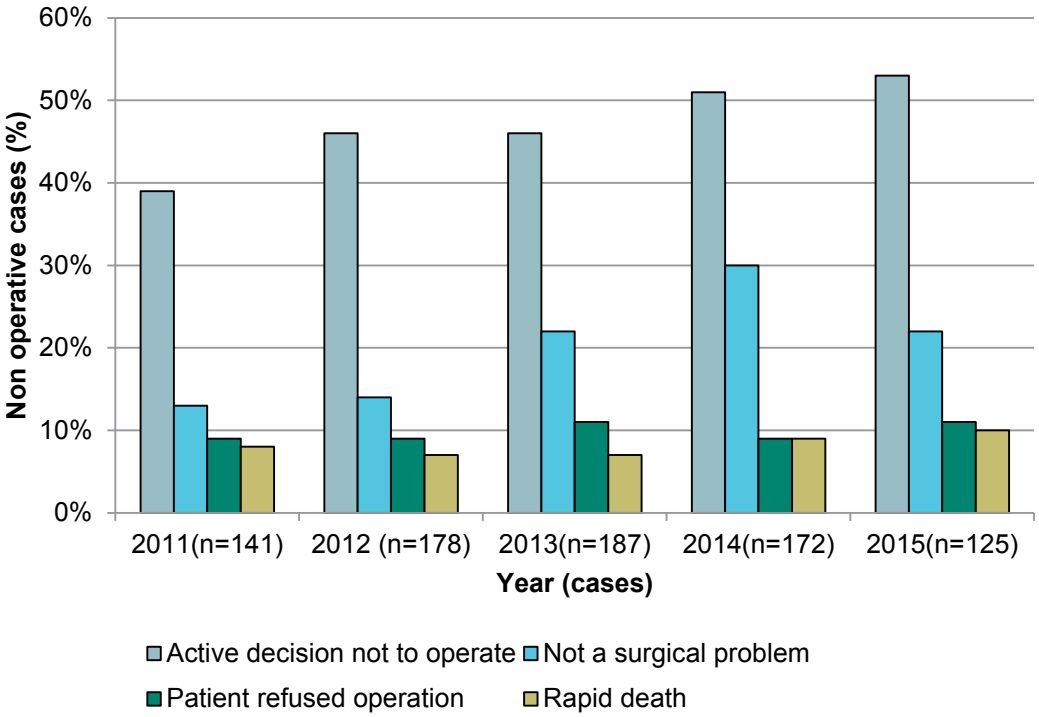
Note: All percentages relate to number of operations.
Refer to Appendix A.3 for further information on data.

Comment:

Between 2011 (66%; 341/520) and 2014 (91%; 432/473), the proportion of consultant surgeons involved in decision-making increased by 25%. There was a 17% increase in the proportion of consultant surgeons operating between 2011 (50%; 262/520) and 2014 (67%; 315/473). Some operations may have had multiple responses relating to consultant surgeon involvement. Due to a time lag in reporting, some of the 2015 cases are still under review and therefore the figures for that year are not complete.

4.4.2 Non-operative cases

Figure 13 Reasons for no operation



Refer to Appendix A.4 for further information on data.

Comment:

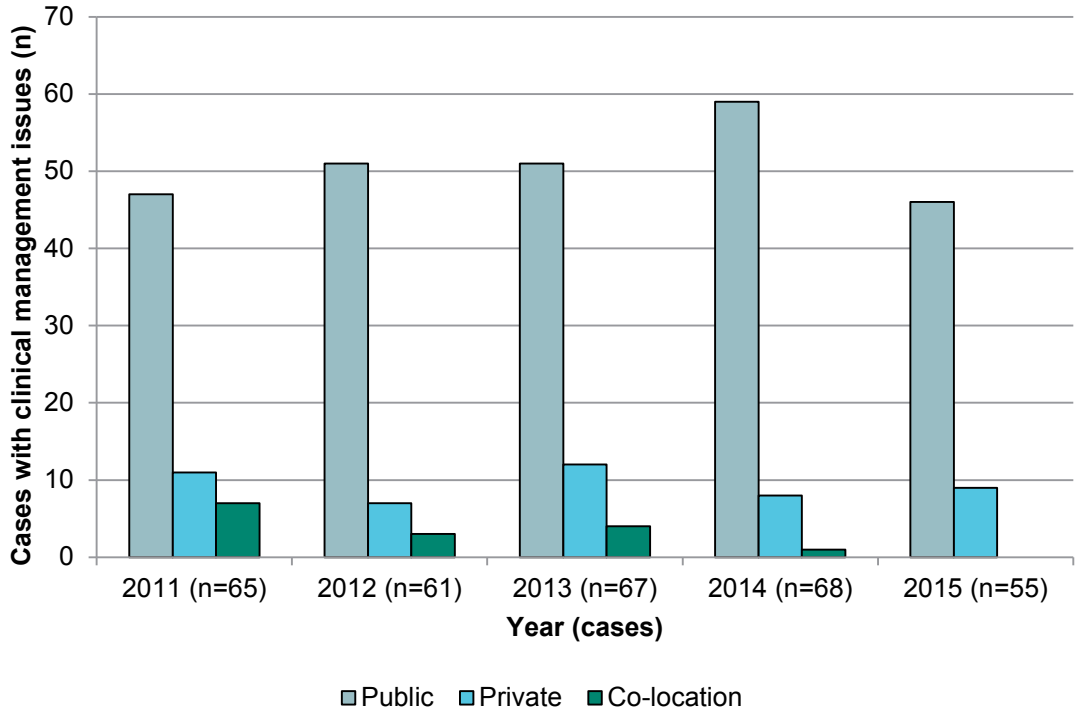
Between 2011 (39%; 55/141) and 2014 (51%; 87/172) there was a 12% increase in the proportion of deaths where there was an active decision not to operate. This possibly reflects discussions with patients and families. An important corollary to this is decision-making regarding the care that should be offered if the findings at surgery are worse than anticipated or the patient's postoperative course is complicated and the chances of survival fall sharply. There is a compelling case for preoperative discussions between the patient, family/carers and the surgeon, with the conclusions being documented, so that all are clear in the event of the patient not progressing as anticipated. Such discussions are particularly relevant if the patient is to be transferred. Due to a time lag in reporting, some of the 2015 cases are still under review and therefore the figures for that year are not complete.

4.5 Clinical management issues

KEY POINTS
• Between 2011 and 2014 treating surgeons reported a 15% increase in the proportion of cases with clinical management issues in public hospitals. • Assessors identified 543 individual issues in the 370 cases with clinical management issues.

4.5.1 Clinical management issues as reported by treating surgeons

Figure 14 Clinical management issues by hospital type, as reported by treating surgeons



Refer to Appendix A.2 for definitions of clinical management issues.
Refer to Appendix A.4 for further information on data.

Table 19 Clinical management issues by admission type, as reported by treating surgeons

	Number of Cases (%)					
	2011	2012	2013	2014	2015	Total
Completed cases with clinical management issues	63	62	73	67	54	319
Emergency admissions with clinical management issues	46 (73)	43 (69)	53 (73)	53 (79)	41 (76)	236 (74)
Elective admissions with clinical management issues	17 (27)	19 (31)	20 (27)	14 (21)	13 (24)	83 (26)

Note: All percentages relate to completed cases with clinical management issues.
Refer to Appendix A.3 for further information on data.

Comment:

In public hospitals the proportion of cases with clinical management issues increased from 72% (47/65) in 2011, to 87% (59/68) in 2014, as shown in Figure 14. Between 2011 (73%; 46/63) and 2014 (79%; 53/67) there was a 6% increase in the proportion of cases associated with a clinical management issue in emergency admissions (see Table 19). Due to a time lag in reporting, some of the 2015 cases are still under review and therefore the figures for that year are not complete.

Table 20 Clinical management issues by hospital status in operative cases

	Number of Cases (%)			
	Public	Private	Co-location	Total
Number of operative cases	1,103	210	62	1,375
Number of operative cases with clinical management issues	214 (19)	46 (22)	14 (23)	274 (20)

Note: All percentages relate to number of operative cases.
Refer to Appendix A.3 for further information on data.

Table 21 Clinical management issues by admission type in operative cases

	Number of Cases (%)		
	Emergency	Elective	Total
Number of operative cases	1,118	263	1,381
Number of operative cases with clinical management issues	197 (18)	79 (30)	276 (20)

Note: All percentages relate to number of operative cases.
Refer to Appendix A.3 for further information on data.

Comment:

The largest proportion of clinical management issues in operative cases was observed in co-location hospitals (23%; 14/62), as shown in Table 20. There was a greater proportion of operative cases associated with clinical management issues in elective admissions (30%; 79/263) compared with emergency admissions (18%; 197/1,118), as outlined in Table 21.

4.5.2 Clinical management issues as reported by assessors

Table 22 Cases with clinical management issues, as reported by assessors

	Number of cases (%)					
	2011	2012	2013	2014	2015	Total
Completed cases	429	456	491	499	346	2,221
Completed cases with clinical management issues	81 (19)	75 (16)	84 (17)	80 (16)	50 (14)	370 (17)

Note: All percentages relate to number of completed cases.
Refer to Appendix A.3 for further information on data.

Table 23 Categories of clinical management issues, as reported by assessors

	Number of cases (%)					
	2011	2012	2013	2014	2015	Total
Clinical management issues	114	111	123	123	72	543
Area for consideration	65 (57)	69 (62)	75 (61)	69 (56)	38 (53)	316 (58)
Area for concern	28 (25)	28 (25)	35 (28)	35 (28)	25 (35)	151 (28)
Adverse event	21 (18)	14 (13)	13 (11)	19 (15)	9 (13)	76 (14)

Note: All percentages relate to number of clinical management issues.
Refer to Appendix A.2 for definitions of clinical management issues.
Refer to Appendix A.3 for further information on data.

Table 24 Adverse events, as reported by assessors

	Number of cases (%)					
	2011	2012	2013	2014	2015	Total
Adverse events	21	14	13	19	9	76
Adverse events that may have contributed to death [a]	9 (43)	4 (29)	8 (62)	6 (32)	3 (33)	30 (39)
Adverse events that caused death [b]	12 (57)	8 (57)	5 (38)	12 (63)	6 (67)	43 (57)
Adverse events that caused death, considered probably preventable [c]	2 (17)	3 (38)	2 (40)	3 (25)	2 (33)	12 (28)
Adverse events that caused death, considered definitely preventable [d]	7 (58)	4 (50)	1 (20)	4 (33)	1 (17)	17 (40)

[a,b] All percentages relate to number of adverse events
[c,d] All percentages relate to number of adverse events that caused death.
Refer to Appendix A.3 for further information on data.

Comment:

Between 2011 and 2015, 370 and 319 cases were identified by assessors and treating surgeons respectively as having clinical management issues (see Table 22 and Table 19). This shows a 3% difference in the proportion of clinical management issues identified by assessors (17%; 370/2,221) and treating surgeons (14%; 319/2,221). Table 23 shows a total of 543 reported clinical management issues for these 370 cases. Of these, reported clinical management issues, adverse events comprised 14% (76/543). Of the 57% (43/76) of adverse events that caused death, assessors considered 40% (17/43) were definitely preventable (see Table 24).

Table 25 Most common clinical management issues in emergency admissions, as reported by assessors

Top 5 clinical management issues	
Read Code Description	**n (%)**
Delay to surgery (i.e. earlier operation desirable)	37 (10)
Decision to operate	36 (10)
Better to have done different operation or procedure	28 (8)
Care unsatisfactory (not otherwise specified)	14 (4)
Delay in diagnosis	14 (4)

Note: All percentages relate to total number of clinical management issues in emergency admissions (n= 359)
Refer to Appendix A.3 for further information on data.

Table 26 Most common clinical management issues in elective admissions, as reported by assessors

Top 5 clinical management issues	
Read Code Description	**n (%)**
Decision to operate	16 (9)
Better to have done different operation or procedure	15 (9)
Preoperative assessment inadequate	11 (6)
Care unsatisfactory (not otherwise specified)	8 (5)
Delay in diagnosis	8 (5)

Note: All percentages relate to total number of clinical management issues in elective admissions (n= 176)
Refer to Appendix A.3 for further information on data.

5. A CLOSER LOOK: AUDIT DATA QUALITY

The WAASM, in collaboration with the Centre for Safety at the UWA, is currently examining the impact of process and regulatory changes to surgical audit data quality. This research will utilise data collected nationally through the ANZASM. Below is an overview, as provided by the UWA researchers.

Understanding surgical audit data quality: examining the impact of process and regulatory changes
(Joseph Carpini, Irene Chua, Sharon Parker & Mark Griffin)

Background

Ensuring patient safety and the quality of clinical care is of primary concern in Australia[6]. Over the years, advances have been made in understanding factors influencing surgical outcome[7]. While it is known that the primacy of patient risk factors and surgical skills[8] are important in delivering high-quality and safe care, other factors including ergonomic factors[9], team coordination and leadership[10], organizational culture[11] and the quality of decision making[12] have also been identified as critical factors, but remain poorly understood[13].

The ANZASM is a national audit of surgical mortality designed to inform, educate, facilitate change, and improve the quality of practice in surgical settings[14]. To achieve these ends, the audit must face the challenging task of ensuring the quality of its data[14]. This begets the question of data quality. Several studies have recently investigated the quality of the data collected by the ANZASM[15,16,17]. While these studies have supported the overall quality of the data, the transition from paper- to electronic-based system may have had profound implications for the quality of the data collected by the ANZASM.

State of the literature

The majority of the existing literature focuses on individual perceptions of electronic information systems (e.g. ease of use or speed)[18], and does not consider the quality of data captured by electronic systems versus traditional paper-based systems. Several issues have also been noted in terms of quality of data capture. Firstly, as noted by Raju et al.[14], due to the format of the SCFs, it is difficult to capture all issues arising from all surgical deaths across different specialties using one SCF. Next, most studies have also failed to consider potential moderators of the relationship, such as experience of the individual completing the form. Finally, a hallmark of an audit is to provide valuable information and actions to be taken. As such, turnaround time is important in a surgical audit context. The implications of the shift from paper to electronic case forms may also have had an appreciable impact on turnaround times.

Objectives

In a collaborative effort to address the current gaps in the literature, the ANZASM and the UWA research team, led by Winthrop Professors Parker and Griffin, aim to address the following objectives: first, investigate whether the transition from paper to electronic forms had an impact on the quality of audit data and second, the impact of the transition on the total amount of time a case is open.

Methods

As there is little theory and existing research to guide the present study, we have adopted a mixed methods approach to answering our research questions. We begin with semi-structured interviews (N ~ 10) with surgeons from WA to understand the impact of the shift on their experiences with the audit, as well as gain an understanding of their motivations for selecting one submission method over another. In the second stage we leverage advanced qualitative data analytic techniques to analyse the content of a stratified sample of SCFs. A stratified sample of cases has been extracted from the national database. The SCFs will then be coded by a medical student or research assistant using unique standardised coding agenda developed by the UWA research team with the assistance of the WAASM team. The coding agenda integrates insights from high quality research in organisational behaviour/applied psychology, safety science, and medicine.

Potential implications

There is an ever growing shift in medicine towards the use of electronic systems. With this said, there is very little research that has examined the impact of this shift in recording mode on data quality. This study will provide valuable insights into the impact of such a shift on data captured through paper and electronic modes. Specifically, the results of this study can inform policy as well as best practice in recording surgical mortality data, as well as in other dynamic healthcare settings (e.g. wards, emergency departments).

6. PERFORMANCE REVIEW

This section reviews progress relating to each of the recommendations in the 2015 WAASM Report.

Audit management

Actively pursue consultant recruitment to the online system (Fellows Interface) such that 60% of WA Fellows will consistently be using Fellows Interface by the end of 2015. Recruitment strategies will include mail outs, electronic and telephone communications.

As at the end of 2015, the WAASM achieved recruitment of 56% of WA Fellows to the online system (Fellows Interface). The team is continuing to promote this online system to all Fellows, particularly as a number of new enhancements have been put in place to make the system more user-friendly.

Facilitate ANZASM processes to test and develop the Fellows Interface to include capabilities for surgeon-reported notifications of death and the ability to delegate cases to a third party (such as a trainee or registrar) for completion.

The development and testing process for the new Fellows Interface capabilities has been completed. Fellows now have the capacity to self-report notifications of death. This function enables surgeons to complete an SCF immediately, whilst the details are still clear and the medical records are easily accessible. Fellows can also delegate the completion of an SCF to a third party. The Fellow still retains full responsibility for completion of the form and reviews it prior to submission to the WAASM office.

Reporting and audit data

Undertake data cleaning exercises on a monthly basis to ensure that data quality is maintained as surgical case and assessment forms are modified and upgraded.

Monthly data cleaning exercises have been, and continue to be, undertaken to ensure that the quality of data is maintained.

Rollout hospital site level reports for private hospitals in second half of 2015.

Private hospital site level reports have been developed, reviewed and subsequently distributed to private hospitals in WA.

Amalgamate feedback on hospital site level reports from safety and quality representatives to improve the level of targeted information required by accreditation bodies.

To date, no critical feedback has been received by the WAASM office.

Clinical management

Investigate and highlight communication and handover issues during inter- and intra-hospital transfers. The information obtained will be collated and a symposium will be held on clinical handover and transfers in the second half of 2015. Feedback from the evaluation forms will be analysed.

On 31 August 2015 the WAASM held an evening symposium at the Harry Perkins Institute of Medical Research (North), titled ‘Transferring Surgical Patients: better organisation is required’. There were four speakers from both medical and non-medical backgrounds (see Appendix B.1). Of the 50 symposium attendees, 28 returned evaluation forms (a return rate of 56%). Responses from attendees regarding key aspects of the symposium are given in Appendix B.2.

7. ACKNOWLEDGEMENTS

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- participating surgeons
- first-line assessors
- second-line assessors
- hospital medical records departments
- Western Australian Department of Health for funding the project
- Patient Safety Surveillance Unit, Clinical Services and Research Division, at the Western Australian Department of Health for their continual commitment and support to the WAASM
- RACS for their infrastructure and oversight of this project
- RACS ANZASM Steering Committee

- RACS WAASM Management Committee:

Mr James Aitken	Clinical Director, WAASM Chair and general surgical representative
Mr Tom Bowles	Consultant General Surgeon, rural surgical representative
Mr Ian Gollow	Consultant Paediatric Surgeon, paediatric surgical representative
Mr Stuart Salfinger	Consultant Obstetrician and Gynaecologist, obstetrics & gynaecology representative
Mr Rasa Subramaniam	Consumer representative

- WAASM staff:

Dr Franca Itotoh	WAASM Project Manager
Ms Natalie Zorbas-Connell	WAASM Senior Project Officer
Ms Sonya Furneyvall	WAASM Project Officer

- RACS RAAS division staff, particularly:

Professor Guy Maddern	Chair ANZASM Steering Committee
A/Prof Wendy Babidge	Director, RAAS Division
Ms Pip Coleman	Business and Development Manager, RAAS Division
Mr Gordon Guy	ANZASM Manager

APPENDIX A: Data definitions

Appendix A.1 Definitions of ASA Physical Status Classifications

ASA classification	Characteristics
1	A normal healthy patient
2	A patient with mild systemic disease and no functional limitation
3	A patient with moderate systemic disease and definite functional limitation
4	A patient with severe systemic disease that is a constant threat to life
5	A moribund patient unlikely to survive 24 hours, with or without an operation
6	A brain dead patient for organ donation

Appendix A.2 Definitions of clinical management issues

Term	Definition
Clinical management issue	Issues of patient management that may have contributed to the death of the patient that have been identified by an independent assessor. Clinical management issues are classified as 'areas of consideration', 'areas of concern' and or 'adverse events'
Area of consideration	An area of consideration is defined as an area of care that could have been improved or different, but that may be a current area of peer debate.
Area of concern	An area of concern is defined as an area of care that should have been better managed.
Adverse event	An adverse event is defined as an unintended injury or event that was caused by the medical management of the patient rather than by the disease process, and which was sufficiently serious to lead to prolonged hospitalisation or to temporary or permanent impairment or disability of the patient at the time of discharge, or which contributed to or caused death.

Appendix A.3 List of tables

Table 1: Deaths reported to the WAASM	
Definition:	Count of deaths reported to the WAASM.
Data notes:	Total number of deaths reported to WAASM, including 'excluded error' cases.
Data included:	All data collected between 2011 and 2015.
Data excluded:	No exclusions.

Table 2: Number of deaths under a surgeon per 100,000 population	
Definition:	Number of deaths reported to the WAASM per year as a function of surgical mortality rates per 100,000 population.
Data notes:	Population data compiled from the Australian Bureau of Statistics (based on projected data as population data was only available for up until September 2015).
Data included:	All data collected between 2011 and 2015.
Data excluded:	No exclusions.

Table 3: Reported deaths and surgeon involvement	
Definition:	Counts of surgical mortality data in relation to surgeon involvement in cases.
Data notes:	Table 3 is made up of composite data collected by the WAASM in SCFs.
Data included:	Data used in Table 1 on reported deaths and SCFs returned. Counts of surgeons associated with deaths reported. Terminal care cases included in counts of SCFs returned.
Data excluded:	No exclusions.

Table 4: Case statistics of surgeons associated with three or more deaths	
Definition:	Counts of surgeons associated with three or more deaths.
Data notes:	Table 4 is made up of composite data.
Data included:	All data collected between 2011 and 2015.
Data excluded:	No exclusions.

Table 5: Audit case status	
Definition:	Deaths falling within the WAASM criteria and SCF status.
Data included:	All data collected between 2011 and 2015.
Data excluded:	No exclusions.

Table 6: First-line assessments (FLAs)	
Definition:	All cases are referred for FLA. Provides counts and percentages of FLAs that have been returned ('first-line complete', 'first-line incomplete', 'second-line pending' and 'closed'), or are pending.
Data included:	All data collected between 2011 and 2015.
Data excluded:	No exclusions.

Table 7: Second-line assessments (SLAs)	
Definition:	Counts and percentages of cases referred for SLA, and SLAs pending.
Data included:	All data collected between 2011 and 2015, where the first-line assessor recommended an SLA.
Data excluded:	No exclusions.

Table 8: Median age by gender	
Definition:	Median age by gender for all cases from 2011 to 2015.
Data included:	All data collected between 2011 and 2015.
Data excluded:	No exclusions; in 4 cases age was unknown.

Table 9: Surgeon-reported use of DVT prophylaxis	
Definition:	Counts and percentages of cases of DVT prophylaxis use/non-use in surgical case forms.
Data included:	Completed cases in which use (n= 1,509) and non-use (n= 431) of DVT prophylaxis was reported.
Data excluded:	Data missing for 281 cases.

Table 10: Assessors' opinions of appropriateness of DVT prophylaxis decision	
Definition:	Counts and percentages of appropriateness of DVT prophylaxis decision as reported by assessors.
Data included:	Highest level of assessment in completed cases where appropriateness of DVT prophylaxis decision was reported (n=1,646).
Data excluded:	Neurosurgery cases. Data missing for 131 cases.

Table 11: Surgeon-reported use of critical care units	
Definition:	Counts and percentages of use of critical care units (consisting of ICUs and HDUs).
Data included:	Completed cases where use of critical care units was reported between 2011 and 2015 (n=1,889).
Data excluded:	Data missing for 332 cases.

Table 12: Assessors' opinions of non-use of critical care units	
Definition:	Counts of non-use of critical care units (consisting of ICUs and HDUs). Counts and percentages where use of critical care units would have been beneficial.
Data included:	Highest level of assessment in completed cases where non-use of critical care units was reported between 2011 and 2015 (n=780).
Data excluded:	Neurosurgery cases.

Table 13: Most common causes of death	
Definition:	Counts and percentages of most common causes of death.
Data notes:	Only the ten most common causes of death are displayed in table.
Data included:	Completed cases between 2011 and 2015 (n=2,221).
Data excluded:	No exclusions.

Table 14: Admission type	
Definition:	Counts and percentages of emergency and elective admissions.
Data included:	Completed cases between 2011 and 2015 (n=2,221).
Data excluded:	No exclusions.

Table 15: Operative cases by admission type and year	
Definition:	Counts and percentages of emergency and elective admissions that involved an operation.
Data included:	Completed cases between 2011 and 2015 where admission type was stated (n=1,381).
Data excluded:	Non-operative cases (n=817). Data missing for 23 cases.

Table 16: Operations abandoned	
Definition:	Counts and percentages of operations abandoned on the finding of a terminal situation.
Data included:	Completed cases between 2011 and 2015 in which operations were performed (n=1,404).
Data excluded:	Non-operative cases (n=817).

Table 17: Unplanned returns to theatre	
Definition:	Counts and percentages of unplanned returns to theatre.
Data included:	Completed cases between 2011 and 2015 in which operations were performed (n=1,404).
Data excluded:	Non-operative cases (n=817).

Table 18: Consultant involvement in operative cases	
Definition:	Counts and percentages of consultants making decisions, operating, assisting and supervising in theatre.
Data included:	Completed cases between 2011 and 2015 in which operations were performed (n=1,404).
Data excluded:	Non-operative cases (n=817).

Table 19: Clinical management issues by admission type, as reported by treating surgeons	
Definition:	Counts and percentages of clinical management issues by admission type.
Data included:	Completed cases between 2011 and 2015 (n=319).
Data excluded:	Cases with no clinical management issues. Data missing for 8 cases.

Table 20: Clinical management issues by hospital status in operative cases	
Definition:	Counts and percentages of clinical management issues by hospital status.
Data included:	Completed cases between 2011 and 2015 in which an operation was performed (n=1,375).
Data excluded:	Non-operative cases and cases with no clinical management issues. Data missing for 29 cases.

Table 21: Clinical management issues by admission type in operative cases	
Definition:	Counts and percentages of clinical management issues by admission type.
Data included:	Completed cases between 2011 and 2015 in which operations were performed (n=1,381).
Data excluded:	Non-operative cases and cases with no clinical management issues. Data missing for 23 cases.

Table 22: Cases with clinical management issues, as reported by assessors	
Definition:	Counts and percentages of cases with clinical management issues.
Data included:	Highest level of assessment in completed cases between 2011 and 2015.
Data excluded:	Neurosurgery cases and cases with no clinical management issues. Data missing for 32 cases.

Table 23: Categories of clinical management issues, as reported by assessors	
Definition:	Counts and percentages of categories of clinical management issues.
Data included:	Highest level of assessment in completed cases between 2011 and 2015.
Data excluded:	Neurosurgery cases and cases with no clinical management issues. Data missing for 5 cases.

Table 24: Adverse events, as reported by assessors	
Definition:	Counts and percentages of adverse events.
Data included:	Highest level of assessment in completed cases between 2011 and 2015.
Data excluded:	Neurosurgery cases and cases with no clinical management issues. Data missing for 2 cases.

Table 25: Most common clinical management issues in emergency admissions, as reported by assessors	
Definition:	Counts, percentages and descriptions of the five most common clinical management issues in emergency admissions.
Data included:	Completed cases between 2011 and 2015 with emergency admissions.
Data excluded:	Elective admissions and Neurosurgery cases.

Table 26: Most common clinical management issues in elective admissions, as reported by assessors	
Definition:	Counts, percentages and descriptions of the five most common clinical management issues in elective admissions.
Data included:	Completed cases between 2011 and 2015 with elective admissions.
Data excluded:	Emergency admissions and Neurosurgery cases. Data missing for 1 case.

Appendix A.4 List of figures

Figure 2: Surgical case form completion rates in WA hospitals	
Definition:	Percentages of case completion rates as allocated by case status and participating hospital.
Data notes:	'Returned' includes surgical case form (SCF) and first-line complete, SCF and first-line incomplete, closed and terminal care cases. 'Not returned' includes SCF, first- and second-line pending as well as surgical case rejected. 'No response' includes lost to follow-up and no response extended. 'Refused' indicates a non-participating surgeon.
Data included:	All data collected between 2011 and 2015.
Data excluded:	'Excluded error' cases.

Figure 3: Case completion rates by year	
Definition:	Percentages of case completion rates as allocated by case status.
Data notes:	'Returned' includes surgical case form (SCF) and first-line complete, SCF and first-line incomplete as well as closed and terminal care cases. 'Not returned' includes SCF, first- and second-line pending as well as surgical case rejected. 'No response' includes lost to follow-up and no response extended. 'Refused' indicates a non-participating surgeon.
Data included:	All data collected between 2011 and 2015.
Data excluded:	'Excluded error' cases.

Figure 4: Case completion rates by specialty	
Definition:	Percentages of case completion rates as allocated by case status and surgical specialty.
Data notes:	Surgical specialty 'Other' includes Otolaryngology, Head and Neck, Ophthalmology, Paediatric Surgery, Plastic Surgery, and Obstetrics and Gynaecology.
Data included:	All data collected between 2011 and 2015.
Data excluded:	Data missing for 27 cases.

Figure 5: Cases by age group and gender	
Definition:	Counts of cases allocated by age groups and gender.
Data included:	All data collected between 2011 and 2015.
Data excluded:	No exclusions.

Figure 6: Median age by surgical specialty	
Definition:	Median age sorted by surgical specialty
Data included:	All data collected between 2011 and 2015.
Data excluded:	Data missing for 3 cases.

Figure 7: Frequency of comorbidities by type and year	
Definition:	Percentage of cases associated with comorbidities.
Data notes:	Total number of cases for each year is as follows: 2015 (n=299); 2014 (n=430); 2013 (n=372); 2012 (n=343) and 2011 (n=336).
Data included:	Completed cases between 2011 and 2015 in which comorbidity was indicated.
Data excluded:	Completed cases between 2011 and 2015 in which no comorbidity was indicated.

Figure 8: Frequency of ASA classifications	
Definition:	Counts of ASA classifications.
Data included:	Completed cases between 2011 and 2015 (n=1,816).
Data excluded:	Data missing for 405 cases.

Figure 9: Hospital admissions by year	
Definition:	Counts of cases admitted to public, private or co-location hospitals as allocated by year.
Data notes:	'Co-location' indicates hospitals with both public and private health services.
Data included:	Completed cases between 2011 and 2015 (n=2,157).
Data excluded:	Data missing for 64 cases.

Figure 10: Operative cases by hospital type and year	
Definition:	Counts of cases admitted to public, private or co-location hospitals that involved operations as allocated by year.
Data notes:	'Co-location' indicates hospitals with both public and private health services.
Data included:	Completed cases that involved operations between 2011 and 2015 (n=1,375).
Data excluded:	Non-operative cases (n=817). Data missing for 29 cases.

Figure 11: Patient transfers by year	
Definition:	Counts of cases involving a patient transfer.
Data included:	Completed cases between 2011 and 2015 where question on transfer was answered (n=1,916).
Data excluded:	Data missing for 305 cases.

Figure 12: Operative status by specialty	
Definition:	Percentages of non-operative and operative cases allocated by surgical specialty.
Data notes:	Surgical specialty 'Other' includes Otolaryngology, Head and Neck, Ophthalmology, Paediatric Surgery, Plastic Surgery, and Obstetrics and Gynaecology. Cardiothoracic Surgery (n=154), General Surgery (n=915), Neurosurgery (n=436), Orthopaedic Surgery (n=382), Others (n=74), Urology (n=62), Vascular Surgery (n=181).
Data included:	Completed cases between 2011 and 2015 (n=2,204).
Data excluded:	Data missing for 17 cases.

Figure 13: Reasons for no operation	
Definition:	Percentages of audited cases in which no operation was performed.
Data included:	Completed cases between 2011 and 2015 (n=803).
Data excluded:	Operative cases (n=1,404). Data missing for 14 cases.

Figure 14: Clinical management issues by hospital type, as reported by treating surgeons	
Definition:	Counts of clinical management issues by hospital status.
Data included:	Completed cases between 2011 and 2015 (n=316).
Data excluded:	Cases with no clinical management issues. Data missing for 11 cases.

APPENDIX B: WAASM SYMPOSIUM 2015

Appendix B.1 WAASM symposium flyer 2015

A Symposium by the Western Australian Audit of Surgical Mortality (Royal Australasian College of Surgeons)

The aim of this symposium is to raise awareness of the issues surrounding inter-hospital transfers of surgical patients. It will also illustrate how other safety-critical industries address similar concerns.

Surgeons, physicians, senior nursing staff, junior doctors and other health professionals are invited to attend. Registration is free.

Programme

- **The role of eHealth in maintaining the chain of care.**
  Professor Peter Sprivulis *– Professor of Emergency Medicine & Health Informatician, UWA & Fiona Stanley Hospital.*
- **Inter-hospital transfer of ICU patients.**
  Dr Paul Woods *– Intensive Care Specialist, SCGH.*
- **Anticipating the unexpected: Common safety challenges across hazardous industries.**
  Professor Mark Griffin *– Professor of Organisational Psychology and Director of the Centre for Safety at UWA.*
- **Lessons from Queensland.**
  Dr John North – *Orthopaedic Surgeon and Clinical Director QASM/NTASM.*
- **Question Time**
- **Wine and Canapés**

For more information or to register:
Email waasm@surgeons.org or call WAASM on 08 6389 8650.

Places are limited - please register your interest as soon as possible.
CPD points have been approved at one point per hour.

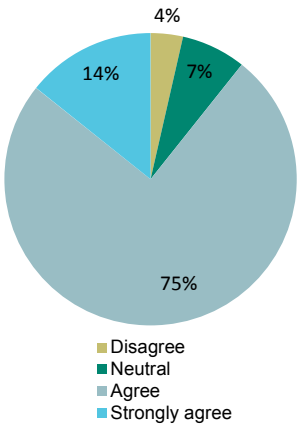
ROYAL AUSTRALASIAN COLLEGE OF SURGEONS

WAASM Western Australian Audit of Surgical Mortality

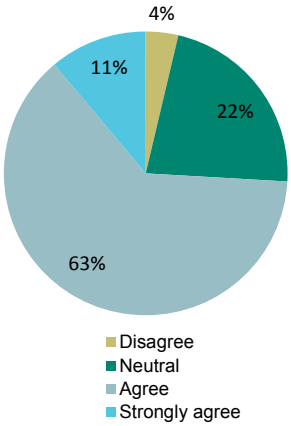
Appendix B.2 Responses from WAASM symposium evaluation forms

Responses from attendees regarding key aspects of the symposium are given below:

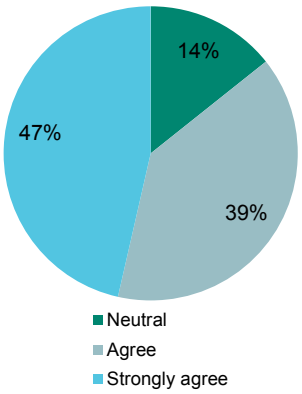
I found the symposium informative



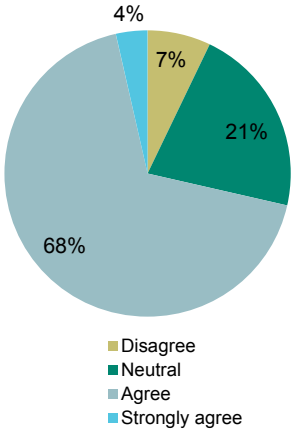
Better understanding of transfer issues



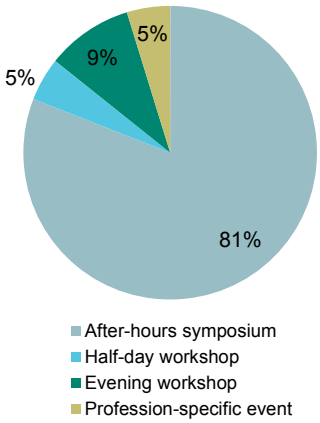
Better understanding of importance of communication



Gained transferrable knowledge



Format for future WAASM events



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