AUSTRALIAN AND NEW ZEALAND AUDIT OF SURGICAL MORTALITY

NATIONAL REPORT 2014

Royal Australasian College of Surgeons

The Royal Australian and New Zealand College of Obstetricians and Gynaecologists

ANZASM
Australian and New Zealand Audit of Surgical Mortality

CONTACT
Royal Australasian College of Surgeons
Australian and New Zealand Audit of Surgical Mortality
199 Ward Street
North Adelaide SA 5006
Australia

Telephone: +61 8 8219 0900
Facsimile: +61 8 8219 0999
Email: mortality.audits@surgeons.org
Website: www.surgeons.org

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CHAIRMAN'S REPORT

Over the last twelve months the Audit of Surgical Mortality, which covers all states and territories within Australia, has continued to consolidate its position.

There is almost 99% compliance from the surgical community. The audit is extending into gynaecology and there are current discussions regarding the addition of obstetric deaths. The uptake has been improved largely because of the wider requirements for continuing professional development to include the audit, where approved. A lack of compliance could potentially lead to deregistration of the practitioner. It would seem that participating in conscientious, and appropriately designed and protected mortality audits should be a basic requirement for all practitioners and fits in well with the privileged role we have in society of being a surgeon.

Another initiative that has occurred is the introduction of the ANZASM App that downloads relevant and educational case studies. This type of technology clearly has great appeal to both the young and the old within the surgical community and we will continue to enhance this into the future. Of a more tangible note also has been the outstanding number of publications that have occurred over the last twelve months.

There has also been a growing uptake of the hospital-specific Clinical Governance Reports that benchmark appropriately sized hospitals against peer hospitals and how they perform against those in other states, as well as within their own jurisdiction. This requires us to be careful not to in any way breach the Qualified Privilege we have for the audit, but at the same time to disseminate the important trends and educational information to those participating institutions and individuals.

The cost of running such a comprehensive national audit is considerable and the ongoing support from all state and territory jurisdictions is absolutely vital if it is to continue. At present, there seems to be a growing realisation of its value and it may, in part, be explaining the overall trend of reduced surgical mortality occurring within Australia. Indeed, the performance of the audit is gaining international attention and a number of jurisdictions are making enquiries as to how they may be able to replicate what we have achieved within Australia.

Professor Guy Maddern
Chairman
Australian and New Zealand Audit of Surgical Mortality (ANZASM)

SHORTENED FORMS

ACT	Australian Capital Territory
ACTASM	Australian Capital Territory Audit of Surgical Mortality
ANZASM	Australian and New Zealand Audit of Surgical Mortality
ASA	American Society of Anesthesiologists
CHASM	Collaborating Hospitals Audit of Surgical Mortality
CT	computed tomography
DVT	deep vein thrombosis
FLA	first-line assessment
ICU	intensive care unit
NSW	New South Wales
NT	Northern Territory
NTASM	Northern Territory Audit of Surgical Mortality
QASM	Queensland Audit of Surgical Mortality
QLD	Queensland
RANZCOG	The Royal Australian and New Zealand College of Obstetricians and Gynaecologists
SA	South Australia
SAAPM	South Australian Audit of Perioperative Mortality
SCF	surgical case form
SD	standard deviation
SLA	second-line assessment
TAS	Tasmania
TASM	Tasmanian Audit of Surgical Mortality
TED	thromboembolic deterrent
VASM	Victorian Audit of Surgical Mortality
VIC	Victoria
WA	Western Australia
WAASM	Western Australian Audit of Surgical Mortality

EXECUTIVE SUMMARY

The Australian and New Zealand Audit of Surgical Mortality (ANZASM) is an independent, external peer review of surgical mortality in all states and territories of Australia.

Each audit of surgical mortality is funded by its state or territory department of health (Australian Capital Territory, Northern Territory, Queensland, South Australia, Tasmania, Victoria and Western Australia). The Collaborating Hospitals Audit of Surgical Mortality (CHASM) in New South Wales provides comparable data to ANZASM but is independently managed by the Clinical Excellence Commission of New South Wales.

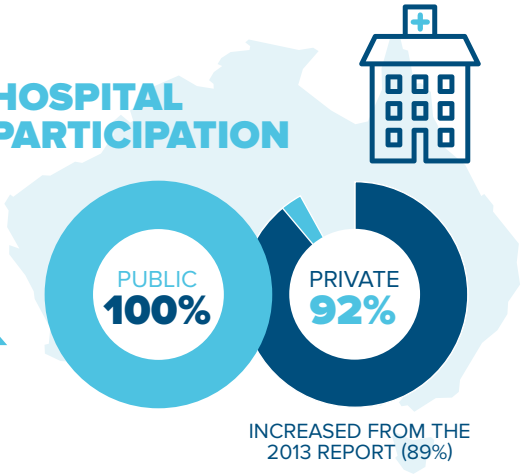
SURGEON PARTICIPATION

IN THE AUDIT HAS RISEN

2009 – **60%**

2014 – **97%**

HOSPITAL PARTICIPATION



INCREASED FROM THE 2013 REPORT (89%)

ANALYSIS & AUDIT NUMBERS

DURING 1/1/2009 TO 31/12/2014 A **TOTAL OF 30,196 DEATHS** WERE REPORTED TO ANZASM.

77%
AUDITED
(23,292)

23%
EXCLUDED
(6,904)

RISK PROFILE

OF DEATHS OCCURRING IN PATIENTS ADMITTED AS EMERGENCIES

89%
OF PATIENTS HAD SIGNIFICANT COEXISTING ILLNESS

85%
OF PATIENTS PRESENTED WITH ACUTE LIFE-THREATENING CONDITIONS

DEMOGRAPHIC PROFILE

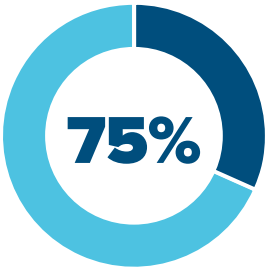
FOR THE 23,292 AUDITED CASES...

AGES VARIED FROM ONE DAY TO 105 YEARS

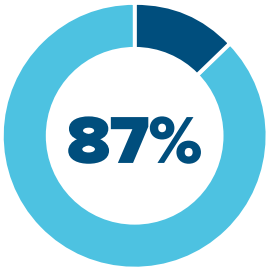
MEAN AGE **74**

(STANDARD DEVIATION (SD) 17)

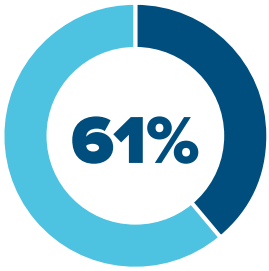
PROFILE OF OPERATIVE INTERVENTION



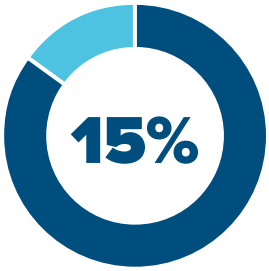
PATIENTS UNDERWENT A SURGICAL PROCEDURE



DECISION TO OPERATE WAS MADE BY THE CONSULTANT SURGEON



CONSULTANT SURGEON PERFORMED THE SURGERY

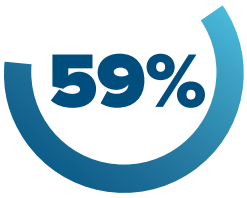


RETURN TO THE OPERATING THEATRE BECAUSE OF COMPLICATIONS

RISK MANAGEMENT

DVT PROPHYLAXIS MANAGEMENT WAS APPROPRIATE (15,974/19,967)

PATIENTS RECEIVED APPROPRIATE CRITICAL CARE (23,059/23,292)



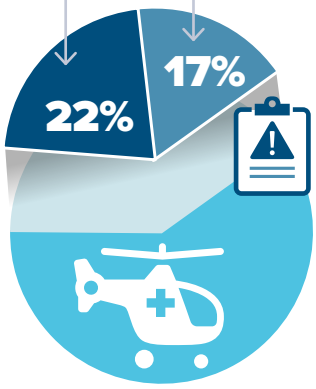
CRITICAL CARE SUPPORT NECESSARY (13,755/23,292)

PATIENT TRANSFERS

40% (497/1,231) OF TRANSFER ISSUES RAISED RELATED TO TRANSFER DELAYS AND OF THOSE, THE DELAY WAS DUE TO:

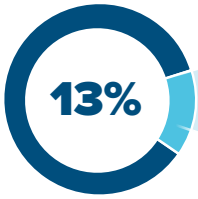
INAPPROPRIATENESS OF TRANSFER (269/1,231)

INSUFFICIENT CLINICAL DOCUMENTATION (209/1,231)



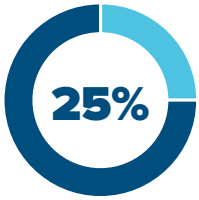
PEER REVIEW OUTCOMES

13% (2,990/23,292) OF AUDITED CASES WERE **REFERRED FOR SECOND-LINE ASSESSMENT** (SLA)

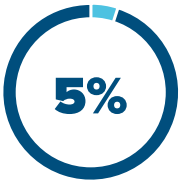


65% INADEQUATE INFORMATION (1,948/2,990)

CLINICAL ISSUES DESCRIBED (5,804/23,292)



ADVERSE EVENTS IN PATIENT CARE (2014) (1,276/23,292)



THE MOST COMMON CRITICISM MADE BY ASSESSORS WAS **DELAY IN DELIVERING DEFINITIVE TREATMENT**

69%

(3,756/6,008) DELAYS WERE ATTRIBUTED TO THE SURGICAL TEAM

This finding has led the regional audits of surgical mortality to develop and deliver a series of educational programs aimed at surgeons, as well as junior and senior hospital staff, which address the various facets of delay and communication.

COMPARISON OF DATA BETWEEN THE 2012 TO 2014 AUDIT PERIODS

Table 1: National comparison – 2012-2014 audit periods

Areas for national comparison	2012	2013	2014
Surgeon participation	94%	96%	97%
Hospital participation: Public Private	 100% 76%	 100% 89%	 100% 92%
Closed cases	14,031	18,583	23,292
Emergency: elective admissions	86%:14%	85%:15%	85%:15%
Male:female ratio	54%:46%	54%:46%	55%:45%
Median age for males and females	76 & 81	75 & 82	76 & 81
ASA* ≥4	46%	54%	54%
Admitted with one or more comorbidities	90%	88%	89%
Cases with perceived risk of death considerable or expected as perceived by the surgeon	62%	62%	62%
DVT^ prophylaxis use assessed as inappropriate by assessor	2%	3%	2%
Issues with fluid balance	10%	7%	6%
Patients who had one procedure	78%	74%	75%
Patients who had more than one procedure	22%	26%	25%
Consultant deciding	86%	87%	87%
Patients with unplanned return to theatre	16%	15%	15%
Patients with postoperative complications	33%	34%	32%
Patients with anaesthetic-related issues	7%	7%	7%
Procedures abandoned	6%	5%	5%
Patients transferred	28%	27%	26%
Issues related to interhospital transfers	20%	22%	27%
Total number of infections acquired before admission†	42% (353/841)	41% (388/957)	41% (328/807)
Infections acquired during admission†	58% (488/841)	59% (569/957)	59% (479/807)
Hospital acquired infection†	75% (343/456)	74% (386/523)	75% (339/451)
Traumatic events associated with falls in care home or hospital‡	36% (144/395)	40% (176/444)	41% (178/432)
Request for second-line assessment	12%	12%	13%
Areas of concern and adverse events (total)	8% & 4% (12%)	7% & 4% (11%)	6% & 3% (9%)

* American Society of Anesthesiologists status
^ Deep vein thrombosis
† Excludes NSW data; WA started collecting data in 2013.
‡ Data from Queensland, Western Australia, Victoria and Northern Territory (from July 2013).
* Include*: Inclusion of numerator/denominator when denominator <1000

RECOMMENDATIONS AND KEY POINTS

The recommendations and key points are as follows:

- The ANZASM regional audit staff continue to encourage active participation of surgeons and hospitals, which is now close to 100%.
- The ANZASM regional audit staff continue to identify emerging trends in mortality and address them where possible through ongoing educative and interactive seminars.
- Clinical information on handover, delays in transfer, and procedure-related sepsis are ongoing issues that need to be addressed.
- The audit revealed that surgical emergencies are greater risks for patients where care is shared, for example where a patient is transferred from a nursing home to a public hospital. All health professionals should increase their awareness of these risks, especially in transfer delays and clinical handover between teams, to improve the quality of care and patient safety.
- Communication is one of the key elements to good patient care. This includes communication between surgeons and their junior staff, between disciplines, and between nursing and medical staff to avoid functioning in isolation.
- Delays in the decision to operate remain an ongoing issue. In complex cases there needs to be clear demonstrable leadership in patient management. There should be regular team meetings with all disciplines involved to ensure the treatment plan is understood by all. Consultants should continue to be actively involved in the care of their patients, especially in the decision-making process.
- Improved postoperative management is important. The patient should be discharged to the ward with comprehensive orders, including preventative measures for reducing complications. Instructions must be given regarding further management when a patient is discharged from a clinical or surgical team. The potential outcomes from the probable clinical diagnosis must be considered when developing a treatment plan. The patient should be transferred to a medical unit if elderly, high risk and if medical issues are assessed as being the prominent clinical factor during the admission episode, providing that the surgical postoperative care can be performed appropriately in that setting.
- Surgical patients, particularly those with certain comorbidities, can be exposed to developing infection and stringent infection control care should be considered. Improvements can be achieved by focusing on flexibility of patient transfers to adequate control facilities, strengthening of current guidelines of infection control procedures, especially hand washing, and revision of stringent training and adherence to patient care protocols.
- Periodic review of the surgical case forms (SCF) to reduce ‘form fatigue’ without detracting from the value of the data collection.
- Closer collaboration with respective regional departments of health following the release of the ANZASM Clinical Governance Report. The report uses audit data and provides departments of health, and public and private hospitals with a trending analysis of clinical management events both within their hospitals and compared to state and national data.
- Delivery of themed national case note review booklets on current topical issues, such as the impact of obesity on surgery issues around anticoagulation, delay in patient care and transfer issues.
- The audit should continue to review falling surgical mortality rates to ascertain whether the audit process has contributed to the reduction of surgical mortality across the country. This could identify trends in which further perioperative improvements can be made in collaboration with the departments of health.

1 INTRODUCTION

KEY POINTS

- ANZASM is an external peer review audit by surgeons of deaths that occur under their care who may or may not have had surgery.
- This report is a review of all deaths notified during the period 1 January 2009 to 31 December 2014.
- This report is an analysis of the 23,292 cases that have completed the full audit process.

1.1 BACKGROUND

The Royal Australasian College of Surgeons (RACS) became responsible for the management of the Western Australian Audit of Surgical Mortality (WAASM) in 2005. WAASM was modeled on the Scottish Audit of Surgical Mortality, which has operated since 1988. The RACS has expanded the program to all other states and territories under the umbrella of ANZASM.

Completed data for the period 1 January 2009 to 31 December 2014 are included in this report from Western Australia, South Australia, Tasmania, Victoria, New South Wales and Queensland. The Australian Capital Territory and Northern Territory joined the program during 2010.

1.2 OBJECTIVES

The principal aims of the audit are to inform, educate, facilitate change and improve quality of practice within surgery. The primary mechanism is peer review of all deaths associated with surgical care. The audit process is designed to highlight system and process errors, and to identify trends in surgical mortality. It is intended as an educational rather than punitive process.

1.3 STRUCTURE AND GOVERNANCE

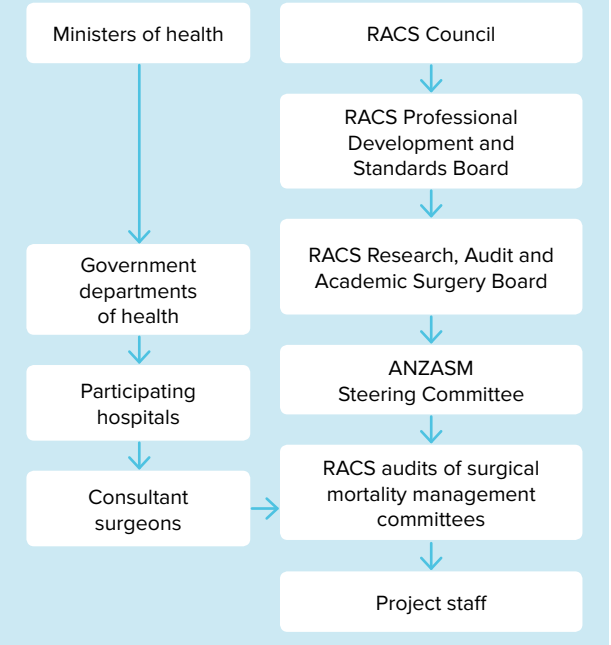
ANZASM is managed by the Research, Audit and Academic Surgery Division of RACS. ANZASM oversees the implementation and standardisation of each regional audit, to ensure consistency in audit processes and governance structure across all jurisdictions (see Figure 1).

The individual regional audits are funded by their respective departments of health. The RACS provides infrastructure support and oversight to the project.

Participation by surgeons has been mandated as part of the RACS' Continuing Professional Development program since January 2010.

ANZASM receives protection under the Commonwealth Qualified Privilege Scheme, part VC of the *Health Insurance Act 1973* (gazetted 23 August 2011).

Figure 1: Governance structure of the Australian and New Zealand Audit of Surgical Mortality (ANZASM)



1.4 METHODOLOGY

Individual regional audits of surgical mortality are notified of in-hospital deaths associated with surgical care. The method of notification varies by region. In some regions this notification comes from the hospitals or another source that is independent of the surgeon. All cases in which a surgeon was responsible for, or had significant involvement in, the care of a patient are included in the audit, whether or not the patient underwent a surgical procedure.

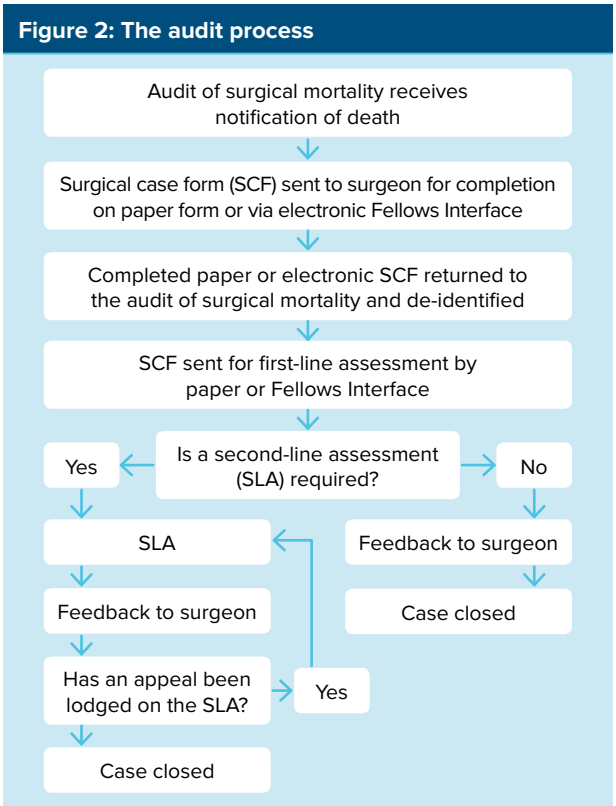
The clinical details pertaining to the management of each case are recorded on a standard, structured SCF completed by the consultant or treating surgeon associated with the case. The completed SCF is returned to the appropriate audit of surgical mortality office, where it is de-identified and sent for first-line assessment (FLA) by a surgeon of the same surgical specialty but from a different hospital. De-identification means the first-line assessor is unaware of the name of the deceased, the treating surgeon or the hospital in which the death occurred.

There are two possible outcomes of a FLA:

- The information provided by the treating surgeon is adequate to reach a conclusion about the case and to identify any issues of management, if present.
- A further in-depth assessment (second-line assessment or SLA) is necessary either:
  - for clarification of issues of patient management identified or suspected by the first-line assessor, or
  - because the information provided by the treating surgeon was inadequate to reach a conclusion.

Where an SLA is deemed necessary the assessor is selected using the same criteria as for first-line assessors. The audit process is outlined in Figure 2.

Figure 2: The audit process



1.5 PROVIDING FEEDBACK

One of the primary aims of ANZASM is education as a component of a surgeon's continuing professional development. This is achieved by providing commentary obtained during the audit process directly to the treating surgeon, as well as highlighting lessons learned from de-identified cases in a national case note review booklet. The individual regional audits also produce their own yearly reports and Case Note Review Booklet series, which highlight important issues in patient management.

There are a number of case reviews within this report and these form part of the feedback process that is seen as essential in the quality improvement processes of the audits of surgical mortality. The cases in this report are from a variety of specialties and a variety of authors. Some have been edited to focus on a few points in a complex story or to reduce the length of the report. 2009 and 2010 data have been grouped in figures and tables for the purpose of clarity.

1.6 REPORTING CONVENTIONS

1.6.1 Reporting clinical incidents

In the structured SCF the surgeon is asked to document whether there were any clinical incidents during the care of the patient. If a clinical incident or event took place the surgeon is asked to provide more information on the incident. The surgeon is asked to provide information on the following:

- Report on the perceived impact of the incident on the outcome by stating whether the incident:
  - 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.
- Provide their perception as to preventability, using the following categories:
  - definitely preventable;
  - probably preventable;
  - probably not preventable;
  - definitely not preventable.
- Indicate which clinical area was most responsible for the incident or event:
  - audited surgical team;
  - another clinical team;
  - hospital;
  - other.

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

1.6.2 Analysis of clinical incidents

A primary objective of the audit of surgical mortality peer review process is ascertaining whether death was a direct result of the disease process alone, or if aspects of management of the patient might have contributed to that outcome. Where there is a perception that the clinical management may have contributed to death, ANZASM specifies the following spectrum of criticism for use by assessors:

- **Area for consideration.** The assessor believes an area of care could have been improved or different, but recognises that the issue is perhaps debatable.
- **Area of concern.** The assessor believes that an area of care should have been better.
- **Adverse event.** 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 which contributed to or caused death. Specific complications (e.g. pulmonary embolus, anastomotic leak) are by definition always adverse events but may not be preventable.

1.6.3 Data analysis

The 2014 Report covers deaths reported to ANZASM from 1 January 2009 to 31 December 2014, censored on 31 March 2015. The full audit process takes an average of two months from notification of death to completion. Some cases were still under review as at the census date, and the case outcomes were not available for this report. These cases will be featured in the next report. Patients admitted for terminal care are excluded from the full audit process.

For the purposes of collating data for the national report, data are encrypted, sent to and stored in a central Structured Query Language server database with a reporting engine. All transactions are time-stamped. All changes to audit data are recorded in an archive table enabling a complete audit trail for each case. An integrated workflow rules engine supports the creation of letters, reminders and management reports.

The 2014 report data were analysed using the Statistical Package for Social Sciences, version 15.0, statistical package STATA version 10.1, and Microsoft Office Excel (2010). Numbers in parentheses in the text (n) represent the number of cases analysed. As not all data points were completed, the total number of cases used in the analyses varies. The total numbers of cases (n) included in individual analyses are provided in all tables and figures in the report.

It should be noted that where no comparative data are given, there was no significant difference for the 2009 to 2014 audit periods.

2 AUDIT PARTICIPATION

KEY POINTS

- Nationally, 97% (4,704/4,823) of surgeons participated in the audit. This may underestimate the true intent to participate, as not all hospitals are participating, some Fellows have retired from clinical practice and some Fellows have temporarily relocated overseas. Participation in ANZASM became a mandatory component of the RACS Surgeons Continuing Professional Development Program in January 2010.
- The SCF return rate at census date for participating surgeons was 84%.
- 100% of all public and 92% of all private hospitals are currently participating in the audit program.

2.1 AUDIT NUMBERS

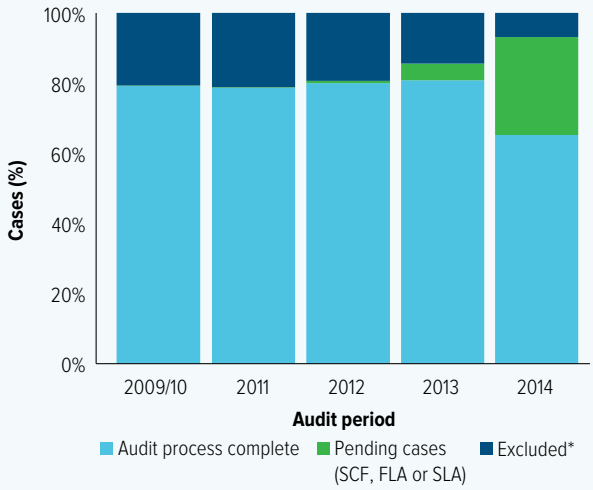
During the period January 2009 to December 2014 ANZASM received 30,196 notifications of death associated with surgical care:

- Of these, 77% (23,292) of cases that had finalised the audit process by the census date. The clinical information from these deaths provides the patient profiles described in this report and is the denominator in all analyses pertaining to outcomes from the audit, unless stated otherwise.
- The remaining 23% (6,904) of cases were not included in the audit for the following reasons:
  - The case was admitted for terminal care, inappropriately attributed to surgery, lost to follow-up or treated by surgeons not participating in the audit (5,129).
  - The case had not completed the full audit process at the census date (1,775).

Figure 3 shows the proportion of cases with completed forms over the different audit periods. While the 2014 audit period has a higher number of pending cases, it is expected that this number will decrease to become more in line with the earlier years as additional cases are finalised. The audit process relies not only on surgeons agreeing to participate, but also on their timely completion of surgical case and assessment forms.

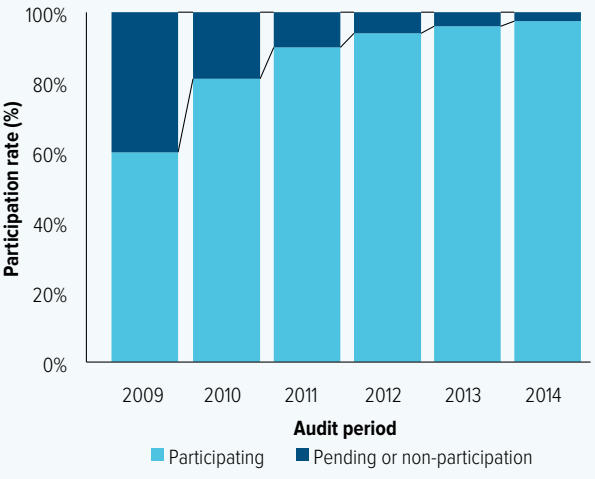
Figure 4 shows the increase in surgeon participation in Australia from 2009 to 2014. Pending participation indicates that a Fellow has not responded to the invitation to participate in the audit.

Figure 3: Audit status at census date per year (n=23,292)



** Excluded cases comprise non-surgical, non-participant, lost to follow-up or terminal care cases.*
^ SCF: surgical case form; FLA: first-line assessment; SLA: second-line assessment.

Figure 4: Participation by Fellows (n=4,823 as at the end of 2014)



Nationally, 97% (4,704/4,823) of surgeons participated in the audit. This may underestimate the true intent to participate, as not all hospitals are participating, some Fellows have retired from clinical practice and some Fellows have temporarily relocated overseas. Participation in ANZASM became a mandatory component of the RACS Surgeons Continuing Professional Development Program in January 2010. The percentage of Fellows per region who participated in the audit, as well as the percentage of Fellows who acted as first- or second-line assessors, is shown in Tables 2 and 3 (as at the end of 2014), respectively.

Table 2: Current regional participation by Fellows (n=4,704)

Surgeon participation status	Region							
	SA	QLD	WA	TAS	VIC	ACT	NT	NSW
Participating	100%	99%	99%	100%	97%	99%	96%	96%
Not participating	0%	1%	1%	0%	3%	1%	4%	4%

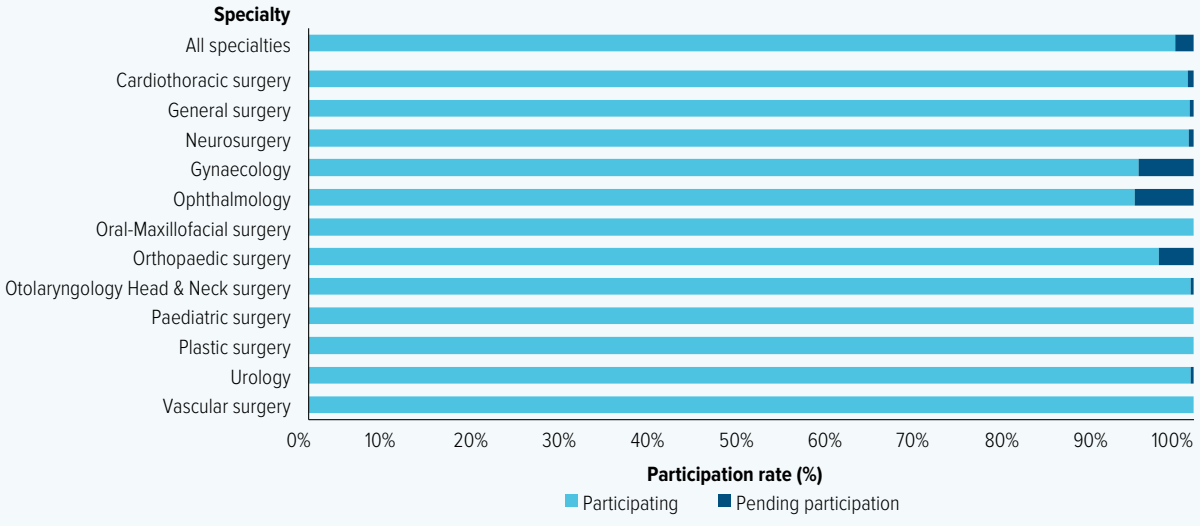
Table 3: Current regional participation by Fellows as assessors (N=4,704)

Assessor type	Region							
	SA	QLD	WA	TAS	VIC	ACT	NT	NSW
First-line assessor	57%	55%	97%	61%	59%	75%	70%	37%
Second-line assessor	54%	48%	97%	59%	59%	57%	42%	28%

Comment:

- At the end of 2014, 98% (4,704/4,823) of eligible Fellows had agreed to participate. This increase can be largely attributed to the ongoing rollout of the program, Fellows appreciating the value of the audit, and the RACS mandating participation in the mortality audit process in January 2010. Participation is an essential component of the RACS's Continuing Professional Development Program and is necessary for recertification. ANZASM aims for 100% participation of surgeons and hospitals nationally.
- Reasons given for surgeons' non-participation included refusing to participate in the audit and surgeons working in a private hospital that, as at the end of 2014, were not as yet participating in the audit. Surgeons who had gone overseas to continue their Fellowship or who were not in clinical practice were also excluded from the audit.
- There is increasing use of the ANZASM electronic interface (Fellows Interface) in which surgeons enter the data directly. Of participating surgeons, 50% (2,350/4,704) are now using the Fellows Interface, compared with 46% (2,150/4,722) in the previous report.[1] Use of the Fellows Interface is encouraged as it is easy to use and provides both time and process efficiencies. It should be noted that it is not currently available in NSW.

Figure 5: Current surgeon participation by specialty as at the end of 2014 (n=4,704)



Note: gynaecologists formally started participating in the audit process in December 2011.

Comment:

- Participation rates vary amongst the different specialties. Pending participation means that a letter has been sent inviting the individual to participate in the audit, but that a response has not yet been received (see Figure 5).
- A total of 556 gynaecologists have agreed to participate in the ANZASM audit process. Participation for the Royal Australian and New Zealand College of Obstetricians and Gynaecologists (RANZCOG) surgeons is voluntary under their continuing professional development program.

2.2 HOSPITAL PARTICIPATION

All public hospitals in which surgery is performed have agreed to take part in the audit program.

Figure 6: Hospital sector participation by region

Comment:

- Ongoing recruitment drives targeting the private sector continued during the course of 2014. In general, the private sector's response to the opportunity to participate in the audit has been positive. There has been an encouraging expansion in private hospital participation in NSW, from 8% in 2013 to 47% in 2014 with the aim for 100% by the end of 2015. Overall, private hospital participation rose from 89% in 2013 to 92% in 2014.

3 DEMOGRAPHIC PROFILE OF AUDITED CASES

KEY POINTS

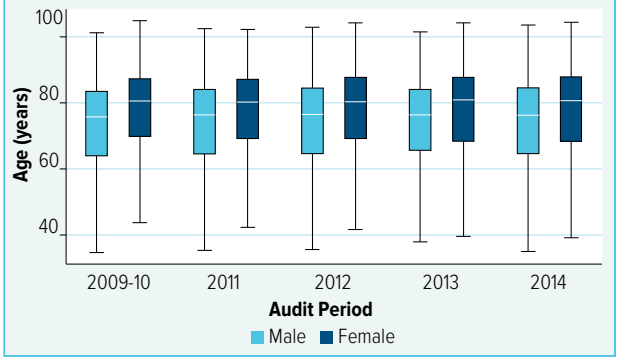
- In 85% (19,757/23,292) of audited deaths occurred in patients admitted as emergencies with acute conditions.
- The mean age and spectrum of comorbidity in audited deaths indicates that surgical mortality predominantly occurs in the sick and elderly with major pre-existing comorbidities.
- One or more pre-existing medical conditions or comorbidities were reported for 89% (20,620 of 23,292 patients) of patients in this audited series.
- Patients admitted as emergencies for acute life-threatening conditions comprised 85% (19,757/23,292) of audited deaths.
- In 84% (19,617/23,292) of patients there was an ASA grade greater than or equal to 3.

Figures 7, 8, 9, and 11 are box-and-whisker plots in which:
- the central box represents the values from the lower to upper quartile (25th to 75th percentiles);
- the middle line represents the median value;
- the vertical line extends from the minimum value to the maximum value, excluding extreme values.

3.1 AGE AND GENDER

The age distribution of deaths by gender and year, gender and region, and surgical specialty are shown in Figures 7, 8 and 9 respectively.

Figure 7: Age distribution of deaths by gender and year (n=23,292)

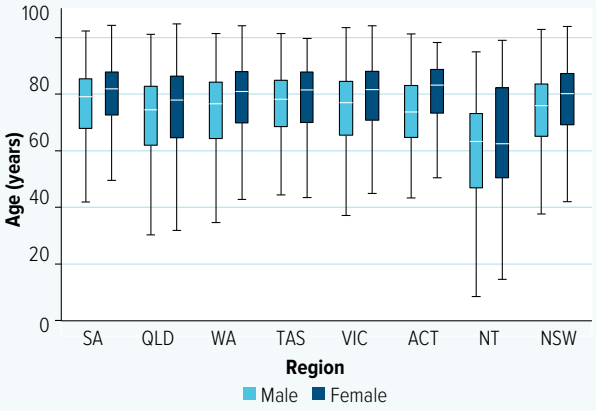


Note: excludes extreme values

Comment:

- The age and gender distribution of the audited deaths was similar over the audit reporting periods.
- The stable distribution of age and gender across the five years of the audit means that any trends identified are not due to a change in the demographics of the population.

Figure 8: Age distribution of deaths by gender and region (n=23,292)

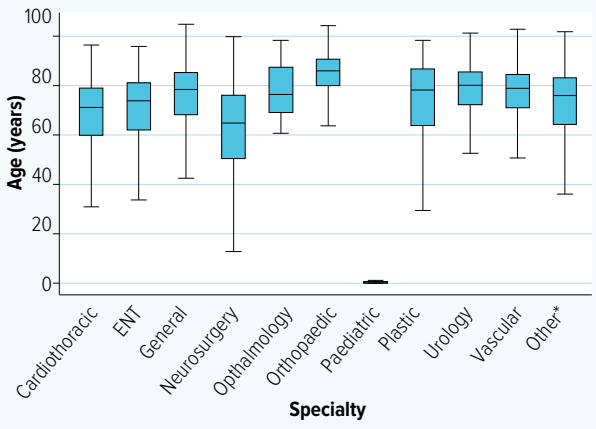


Note: excludes extreme values

Comment:

- The gender distribution of audited deaths was similar across all regions with the exception of the Northern Territory. The Northern Territory had a lower median age of death for males and females compared with the other regions, reflecting the younger population in that region.

Figure 9: Age distribution of deaths by surgical specialty (n=23,292)



*Other specialties listed by the treating surgeon include Trauma and Transplant, Otology, General Practitioners and Gynaecology. ENT: ear, nose and throat.

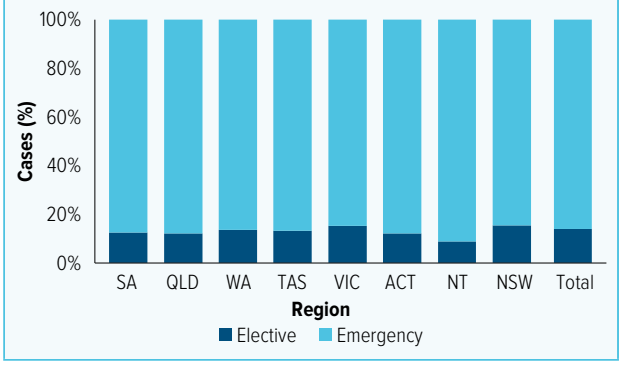
Comment:

- The mean age at death may relate to the underlying disease process in the individual specialties (such as young head injury patients in Neurosurgery).
- This plot excludes extreme values to avoid skewing the majority of the data. This means that all very young cases have not been included, with the exception of those relating to Paediatric Surgery.

3.2 ADMISSION STATUS OF AUDITED CASES

The admission status of audited cases indicates whether patients were admitted electively or as emergencies (see Figures 10 and 11).

Figure 10: Admission status of cases by region (n=23,292)

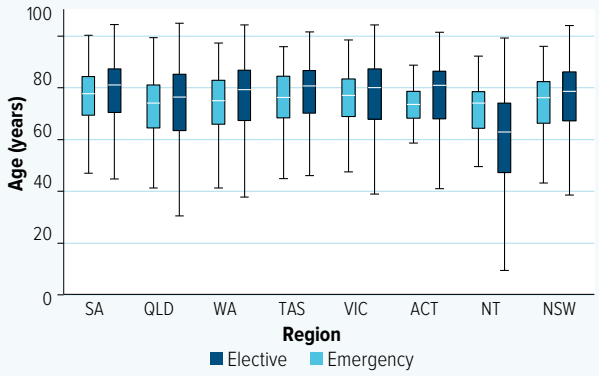


Data not available: n=321 (1%).

Comment:

- Patients admitted as emergencies for acute life-threatening conditions comprised 85% (19,757/23,292) of audited deaths.

Figure 11: Age distribution of deaths by admission status and region (n=23,292)

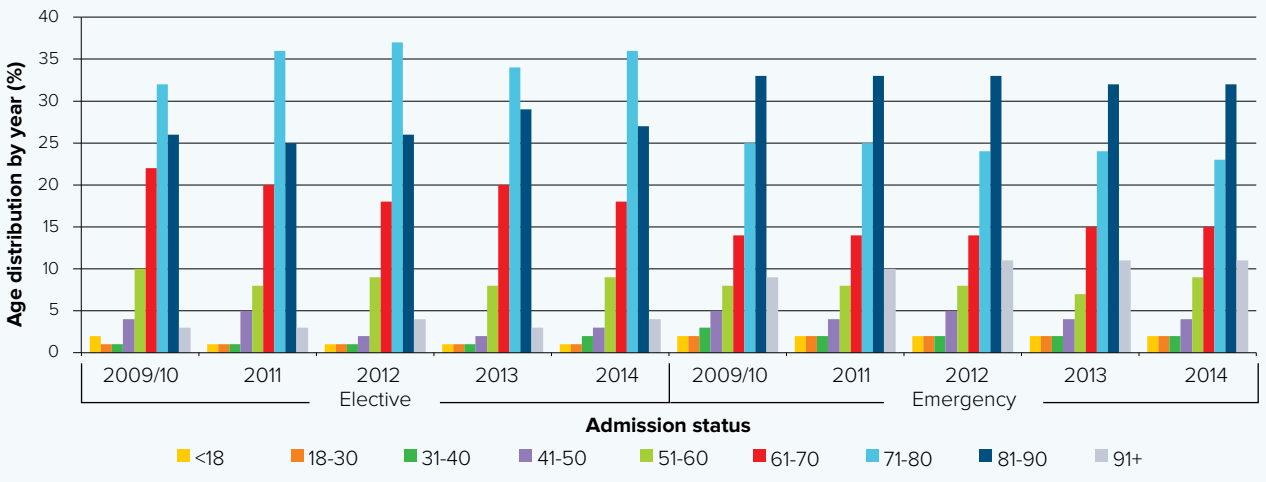


Data not available: n=321 (1%). Note: excludes extreme values.
Elec: elective; Emerg: emergency.

Comment:

- Between 2009 and 2014, patients who died following an emergency admission were generally (with the exception of patients within the Northern Territory) older than those who died following an elective admission ($p < 0.001$) (data not shown). The median age of death was 74 years for elective admissions and 80 years for emergency admissions (data not shown).
- The admission status distribution of audited deaths was similar across all regions, with the exception of the Northern Territory. Within the Northern Territory elective cases were older than emergency cases.

Figure 12: Age range distribution by year and admission status (n=23,292)



Data not available: n=321 (1%).

Comment:

- The age distribution of emergency and elective deaths has remained similar over time.
- In elective surgery deaths the decade 71-80 years contributed more than any other decade but in emergency deaths it is the decade 81-90 years which was highest.

3.3 RISK PROFILE OF AUDITED CASES

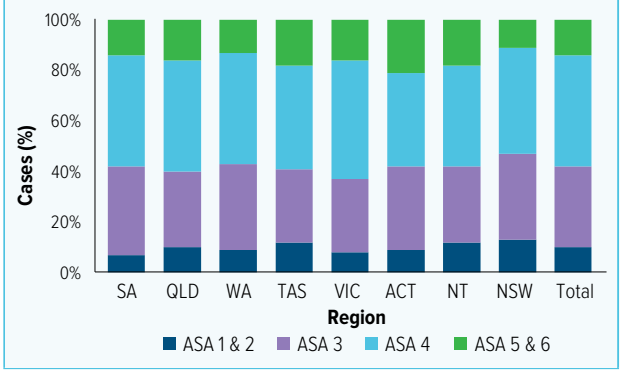
3.3.1 American Society of Anesthesiologists status

The American Society of Anesthesiologists (ASA) status is an international measure of patient risk used by anaesthetists. The ASA grades and their characteristics are:

1. A normal healthy patient.
2. A patient with mild systemic disease.
3. A patient with moderate systemic disease.
4. A patient with severe systemic disease that is a constant threat to life.
5. A moribund patient unlikely to survive 24 hours, who is not expected to survive without an operation.
6. A declared brain-dead patient whose organs are being removed for donor purpose.

The frequency of ASA grades according to region, year, specialty and admission status are provided in Figures 13, 14, 15 and 16 respectively.

Figure 13: Frequency of ASA grades by region (n=23,292)

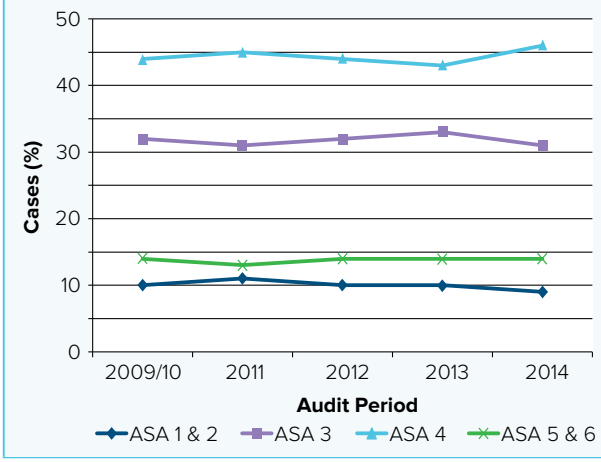


Data not available: n=321 (1%).
ASA: American Society of Anesthesiologists.

Comment:

- 54% (12,637/23,292) of patients had an ASA grade greater than or equal to 4. This indicates that a moderate to severe degree of systemic disease was present in the majority of patients at the time of treatment.
- The risk status as indicated by the ASA grade was similar in all regions.

Figure 14: Distribution of ASA grades by year (n=23,292)

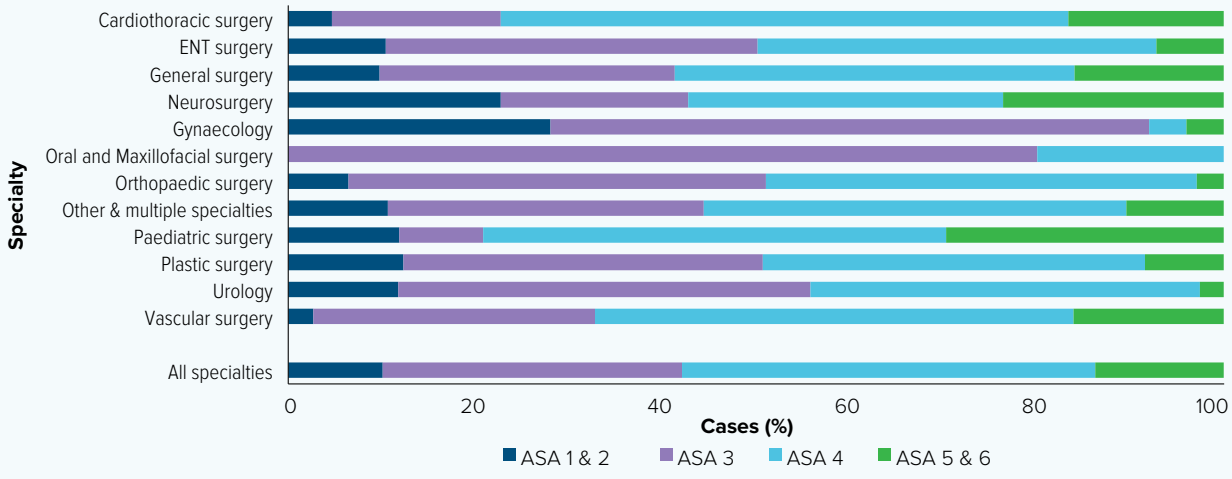


Data not available: n=321 (1%).
ASA: American Society of Anesthesiologists.

Comment:

- There were no major differences across the five audit periods. The number of patients with an ASA grade greater than or equal to 4 was similar across the years.

Figure 15: Frequency of ASA grades by surgical specialty (n=23,292)

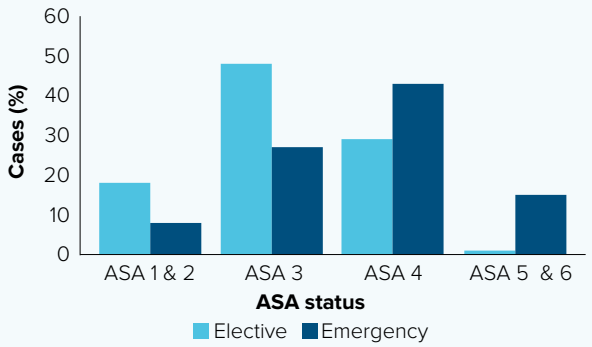


Data not available: n=321 (1%).
Other & multiple specialties: other specialties listed by the treating surgeon include Anaesthesia, Intensive Care Unit, Oncology, Thoracic medicine, Ophthalmology and Trauma. Includes cases in which multiple specialties were involved in a single case.
ASA: American Society of Anesthesiologists; ENT: Ear, Nose and Throat.

Comment:

- There was some variation in ASA grades that reflects the casemix of the different specialties. The larger number of ASA 1 and 2 cases seen in Neurosurgery is a reflection of the population of young patients with head injuries, while in Gynaecology this reflects the fact that the patients tend to be younger.
- Some distortion of the data is seen in low volume areas such as Oral and Maxillofacial, and Gynaecology.

Figure 16: Frequency of ASA grades by admission status (n=23,292)



Data not available: n=321 (1%).
ASA: American Society of Anesthesiologists.

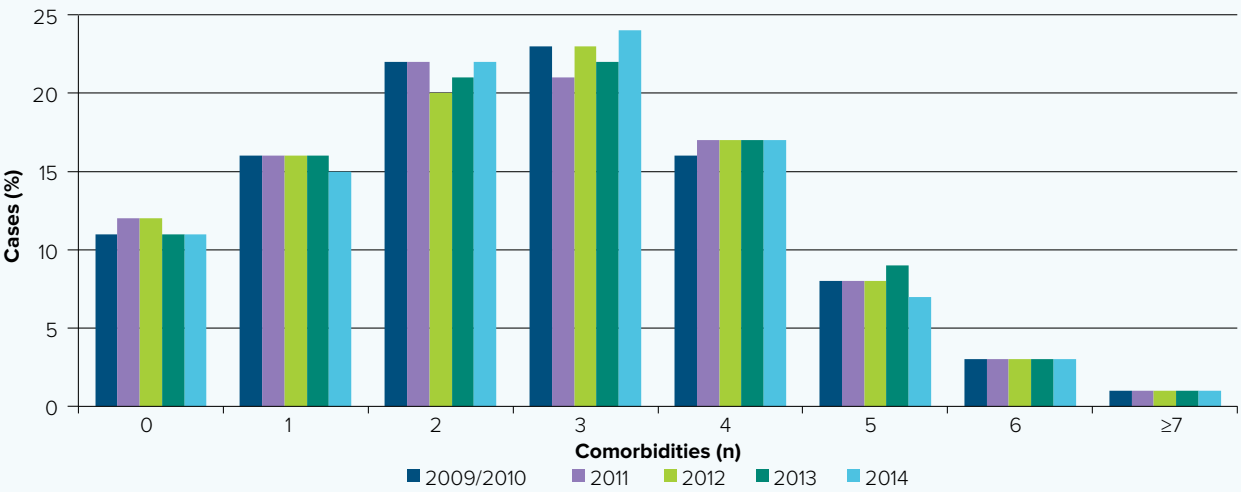
Comment:

- The majority of emergency, 85% (16,859/19,757), and elective, 79% (2,525/ 3,214), patients were described as having an ASA grade greater than or equal to 3. This is a decrease for elective surgery from the previous report in which 85% of cases were elective patients (data not shown) with an ASA score greater than or equal to 3.[1]

3.3.2 Comorbidity

Surgeons were asked to record all known comorbidities (coexisting medical conditions) in addition to the primary medical (presenting) problem. The frequency of multiple comorbidities in patients is provided in Figure 17 by audit period.

Figure 17: Number of comorbidities in individual patients across audit years (n=23,292)

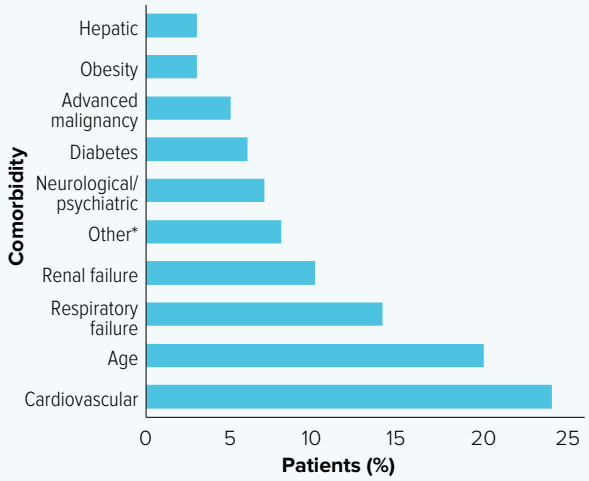


Data not available: n=525 (2%).

Comment:

- One or more comorbidities were reported in 89% (20,620/23,292) of audited cases between 2009 and 2014.
- 73% (16,985/23,292) had at least two comorbidities, emphasising the high risk profile of this group of patients.
- The pattern of comorbidities is reasonably consistent across the audit years.
- Information on the specific types of comorbidities present in audit patients is provided in Figure 18.

Figure 18: Frequency of specific comorbidities (n=60,398 comorbidities in 23,292 patients)



Data not available: n=525 (2%).
Other comorbidities covered a wide range and included alcohol abuse, anaemia, anticoagulation, bowel ischaemia, cachexia, cellulitis, coagulopathy, dementia, human immunodeficiency virus/acquired immunodeficiency syndrome, malnutrition, motor neurone disease, polymyalgia rheumatica, rheumatoid arthritis, sepsis and systemic lupus erythematosus.

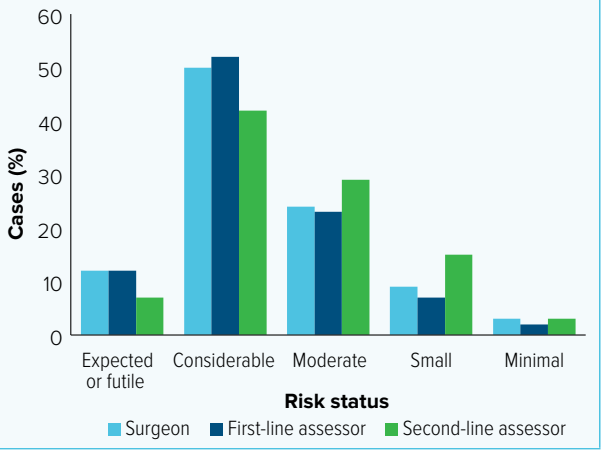
Comment:

- The most common comorbidities (cardiovascular, age and respiratory failure) were similar in terms of incidence in both male and female patients (data not shown).
- The number of cases involving obesity has increased, and has now overtaken hepatic in terms of frequency since the last report.[1]
- There were no major differences in the distribution of comorbidities between the five audit periods (data not shown).

3.3.3 Surgeon perception of risk status

The treating surgeon and assessors were asked to record the patient's perceived risk of death at the time of treatment (Figure 19).

Figure 19: Risk of death as perceived by the treating surgeon and assessors (n=17,431)



Data not available: n=429 (2%).

Comment:

- The perceived risk of death, as reported by surgeons, was considerable or expected in 62% (10,765/17,431) of cases, and small or minimal in 11% of cases (1,976/17,431). This is further evidence of the high-risk profile of this patient group suggested by the mean age, ASA score and associated comorbidity.
- There was a reasonable correlation between the treating surgeon, the first-line assessor and the second-line assessor in regard to the risk of death, with the exception of cases perceived to have a small risk of death where the treating surgeon tended to underestimate the risk.
- The patient's risk of death was perceived to be considerable or expected by the surgeon in 62% (10,765/17,431) of cases; by the first-line assessor in 64% of cases (11,155/17,415); and by the second-line assessor in 49% of cases (1,249/2,552).

4 RISK MANAGEMENT STRATEGIES

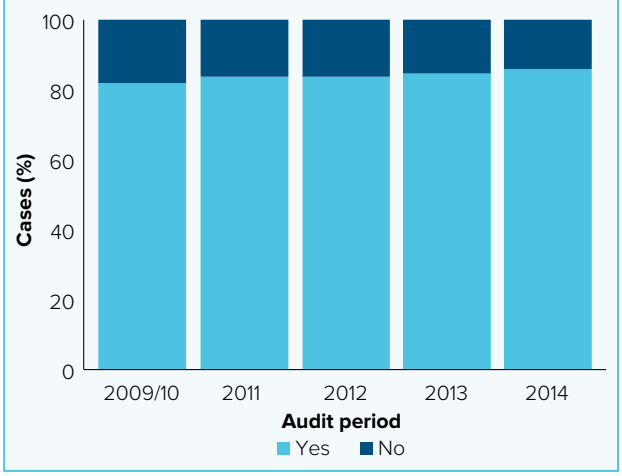
KEY POINTS

- The use of deep vein thrombosis (DVT) prophylaxis was recorded for 81% (14,144/17,431) of cases in which patients underwent a surgical procedure. Across the regions DVT prophylaxis was used in 76% to 87% of cases.
- In only 2% (449/19,967) of cases did the assessors conclude that the DVT prophylaxis management was not appropriate.
- In the majority of instances the patients who required critical care support, received it. The review process suggested that 1% of patients who did not receive treatment in a critical care unit would most likely have benefited from it.
- Fluid balance in the surgical patient is an ongoing challenge and 6% of patients were perceived to have had poor management of their fluid balance.

4.1 PROPHYLAXIS FOR DEEP VEIN THROMBOSIS

The treating surgeon was asked to record whether DVT prophylaxis was given and if it was, the type of prophylaxis used (see Figures 20 and 21). If DVT prophylaxis was not given, the treating surgeon was asked to record why it was withheld. Assessors were asked to review the appropriateness of the use, or non-use, of DVT prophylaxis.

Figure 20: DVT prophylaxis use during the audit period (n=17,431)

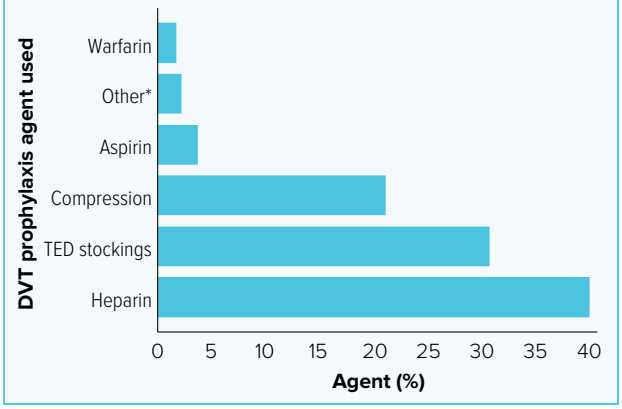


Data not available: n=526 (3%).
DVT: Deep vein thrombosis.

Comment:

- Over the entire audit period, DVT prophylaxis was used in 81% (14,144/17,431) of cases that underwent an operation. Usage has remained steady across the audit periods.

Figure 21: Type of DVT prophylaxis used (n=26,385 instances in 14,144 cases)



Data not available: n=526 (3%).
*Includes Clexane, Clopidogrel, Danaparoid, Enocaprin, Enoxaparin, early mobilisation, Fragmin, inferior vena cava filter, Lepirudin and Plavix. TED: thromboembolic deterrent; DVT: Deep vein thrombosis.

Comment:

- Over the entire audit period, DVT prophylaxis was used in 81% (14,144/17,431) of cases that underwent an operation. The most frequently used prophylaxis agents were heparin (40%) and thromboembolic deterrent (TED) stockings (31%).

Table 4: Distribution of DVT prophylaxis use by region (n=26,685 instances in 14,144 patients)

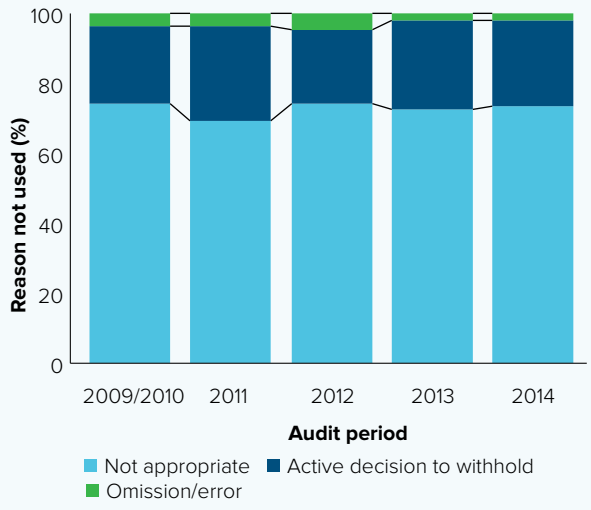
DVT prophylaxis agent	Region							
	SA	QLD	WA	TAS	VIC	ACT	NT	NSW
Heparin	1,302 (46.1%)	2,239 (34.9%)	926 (43.3%)	323 (41.2%)	2,600 (45.9%)	194 (43.6%)	86 (38.9%)	2,933 (37.2%)
TED stockings	774 (27.4%)	2,131 (33.2)%	691 (32.3%)	216 (27.5%)	1,678 (29.6%)	119 (26.7%)	72 (32.6%)	2,469 (31.3%)
Compression	492 (17.4%)	1,475 (23%)	352 (16.5%)	192 (24.4%)	886 (15.6%)	92 (20.7%)	47 (21.3%)	2,067 (26.2%)
Aspirin	117 (4.1%)	318 (4.9%)	79 (3.7%)	31 (4%)	222 (3.9%)	12 (2.7%)	7 (3.1%)	202 (2.6%)
Other*	73 (2.6 %)	139 (2.1%)	55 (2.6%)	14 (1.8%)	190 (3.4%)	18 (4%)	4 (1.8%)	88 (1.1%)
Warfarin	66 (2.4%)	120 (1.9 %)	32 (1.6%)	9 (1.1%)	90 (1.6%)	10 (2.3%)	5 (2.3%)	128 (1.6%)

Data not available: n=526 (3%).
*Includes Clexane, Clopidogrel, Danaparoid, Enocaprin, Enoxaparin, early mobilisation, Fragmin, inferior vena cava filter, Lipirudin and Plavix. TED: thromboembolic deterrent; DVT: Deep vein thrombosis.

Comment:

- DVT prophylaxis use varied across the regions, ranging from 76% of cases to 87% of cases (data not shown).
- There were variations in the use of certain forms of prophylaxis across the regions. Compression and heparin had the greatest proportionate difference.

Figure 22: Stated reasons for non-use of DVT prophylaxis (n=2,761)

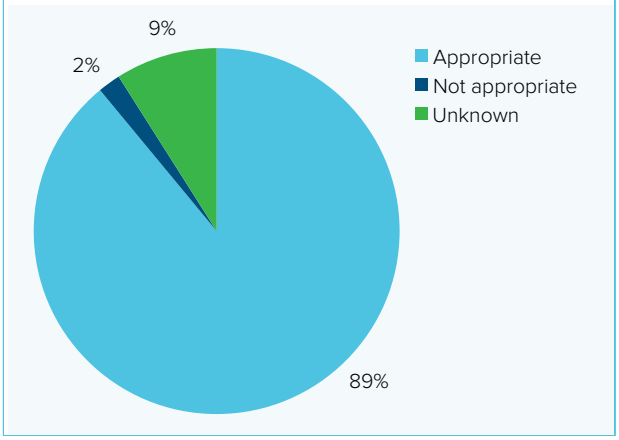


Data not available: n=345 (13%).
DVT: Deep vein thrombosis.

Comment:

- Over the entire audit period, non-use of DVT prophylaxis was due to error or omission in only 3% (80/2,761) of cases. In the majority of instances prophylaxis was withheld for clinical reasons.
- The assessors' perception of the appropriateness of DVT prophylaxis management is shown in Figure 23.

Figure 23: Appropriateness of DVT prophylaxis management as perceived by the first- and second-line assessors across the entire audit period (n=19,976)



Data not available: n=1,465 (7%).

Comment:

- Assessors concluded that DVT prophylaxis usage was not appropriate in 2% of cases (449/19,967), and unknown in 8% of cases (1,646/19,967), in which the patient underwent a surgical procedure.

Case study #1: DVT and pulmonary embolism

Case summary

An elderly patient died from a fatal pulmonary embolus nearly two weeks after a radical cystectomy and right nephroureterectomy with ileal conduit formation. There was always at least a moderate risk of perioperative death as the patient had pre-existing comorbidities of ischaemic heart disease and renal impairment (American Society of Anesthesiologists Level 3) as well as being of advanced age.

The patient was at high risk of postoperative deep vein thrombosis/ pulmonary embolism (DVT/PE) and may probably have received more aggressive prophylaxis. A month prior to the operation the patient had undergone a transurethral bladder tumour resection and insertion of ureteric stents in a private hospital. This procedure was covered by subcutaneous (s/c) heparin for around three days. The notes provided are brief but it would seem the patient had difficulty walking after that operation (unstated reasons) and did not leave hospital between that operation and the cystectomy. It is unclear as to whether the patient received ongoing heparin during that time.

On the day before the cystectomy the resident medical officer's admission notes state the patient had a past history of DVT and PE. This was not recorded at the pre-admission clinic or by the consultant anaesthetist at the same clinic, nor was it entered on the surgeon's admission/consent form.

The patient received an average dose of s/c heparin the night before the cystectomy, but no heparin at all on the day of surgery. Calf-compressions were used during the operation and for the first 24 hours. Thereafter, the patient wore thrombo-embolism deterrent (TED) stockings and received a further average dose of s/c heparin twice daily until death. Postoperatively, the patient had a prolonged ileus requiring total parenteral nutrition support. The physiotherapists clearly had considerable problems mobilising the patient, partly due to the clinical condition of the patient.

Comment

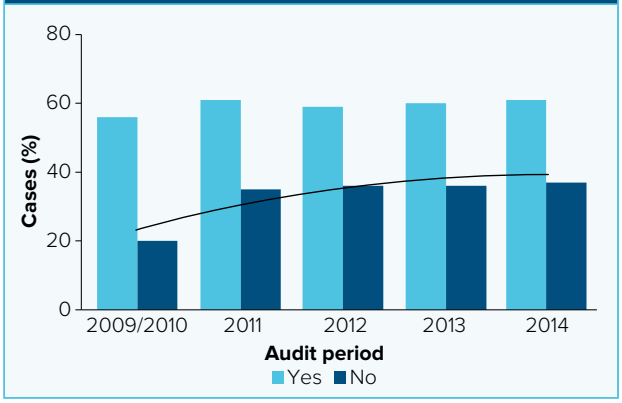
This patient was at considerable risk of DVT/PE, yet, for unstated reasons, did not receive heparin on the day of surgery, these doses arguably being the most important. Consideration could have been given to more aggressive prophylaxis both pre- and postoperatively e.g. Clexane 40 mg s/c daily or even a higher dose.

4.2 PROVISION OF CRITICAL CARE SUPPORT TO PATIENTS

The treating surgeon was asked to record whether or not a patient received critical care support in an intensive care or high dependency unit before or after surgery (see Figure 24). The first- and second-line assessors reviewed the appropriateness of the use, or non-use, of critical care support. It is recognised that this is a subjective assessment of needs and potential benefit.

The SCF was revised in early 2014 to collect data on the reasons why patients did not receive critical care support and to rectify the large amount of unavailable data in this section. It is hoped that this revised question will encourage surgeons to fully complete the questions, thus ensuring that this area of care can be appropriately analysed.

Figure 24: Provision of critical care support during audit period (n= 23,292)



Data not available: n=2,283 cases (10%).

The trend line is a visual representation of a trend over a period of time and is the average based on the highs and lows. The trend line indicates that there has been an increasing requirement for critical care unit support between 2009 and 2014.

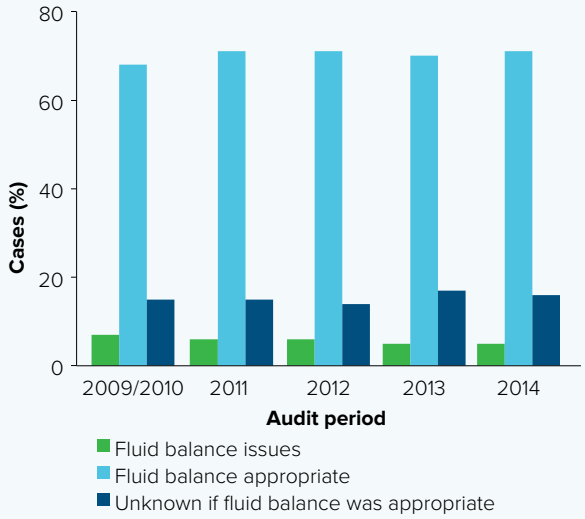
Comment:

- Over the entire audit period, 59% (13,755/23,292) of audit patients received critical care support.
- It should be noted that a patient not receiving critical care does not necessarily indicate a lack of critical care facilities.
- The assessors perceived that 1% (252/23,292) of patients who did not receive critical care support might have benefited from it (data not shown).
- Between 2009 and 2014, there has been a high proportion of unavailable data (10%) regarding the provision of critical care support. As a result, ANZASM has revised the question in 2014 to improve the reporting for this question. It is hoped that there will be less unavailable data to allow for more meaningful analysis in the future.

4.3 FLUID MANAGEMENT

This section looks at the appropriateness of fluid balance management in the audited cases.

Figure 25: Appropriateness of fluid management (n= 23,292)



Data not available: n=2,182 cases (9%).

Comment:

- In 6% (1,341/23,292) of cases the assessors felt that there was an issue with fluid balance. In a further 15% (3,551/23,292) of cases the assessors indicated that the evidence provided was inadequate to support a conclusion regarding fluid balance.
- The percentage of unavailable data (9%) in this section prevents further identification of trends and hinders analysis of the data.

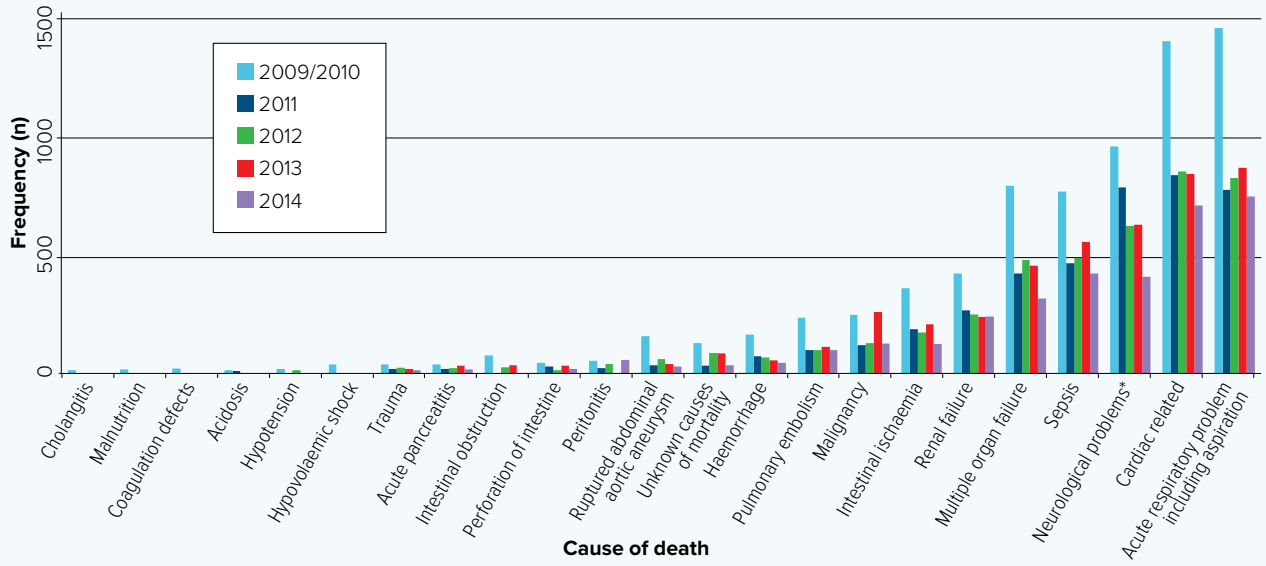
5 CAUSE OF DEATH

KEY POINTS

- The most frequent causes of death were acute respiratory problems, cardiac-related issues, neurological problems and multiorgan failure.
- Causes of death were consistent over the entire audit period.

5.1 FREQUENCY OF CAUSES OF DEATH REPORTED IN AUDITED CASES

Figure 26: Causes of death where n≥10 (n=28,941 causes of death recorded for 23,292 patients)



Data not available: n=347 cases (2%).
*Neurological problems include diffuse brain injury, head injury, intracerebral haemorrhage, subarachnoid haemorrhage and subdural haematoma.

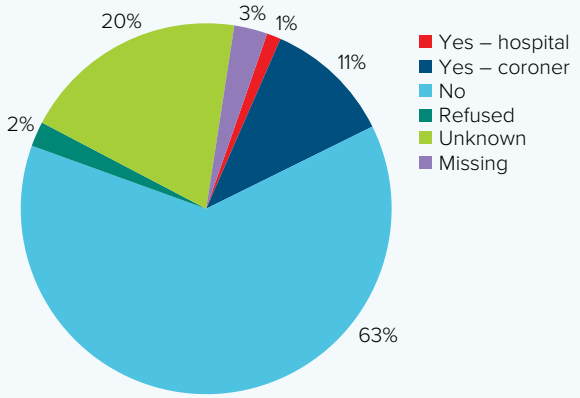
Comment:

- There has been a decrease in cases relating to acute respiratory problems compared with the 2013 report.[1]

5.2 ESTABLISHING CAUSE OF DEATH

The cause of death recorded by the treating surgeon is based on the clinical course of the patient and any relevant supporting evidence from investigations. Where doubt exists around the circumstances leading to death the case may be referred to the coroner. In other instances, where the cause of death is not clear, a postmortem examination may be requested. This latter method of confirming the cause of death is being requested with decreasing frequency (data not shown). An overview of postmortems performed is shown in Figure 27 and Table 5.

Figure 27: Overview of postmortems performed (n=23,292)



Data not available: n=676 cases (3%).

Table 5: Overview of postmortems performed by region (n=23,292)

Postmortem status	Region							
	SA	QLD	WA	TAS	VIC	ACT	NT	NSW
No	1,687 (57.7%)	3,529 (69.8%)	1,414 (68.9%)	495 (66%)	2,991 (59.8%)	136 (39.9%)	164 (68.6%)	4,217 (67.5%)
Unknown	857 (29.3%)	905 (17.9%)	338 (16.5%)	159 (21.2%)	997 (19.9%)	83 (24.2%)	29 (12.1%)	1,231 (19.7%)
Yes – coroner	356 (12.2%)	443 (8.8%)	233 (11.4%)	68 (9.1%)	794 (15.9%)	111 (32.6%)	38 (15.9%)	549 (8.8%)
Yes – hospital	9 (0.3%)	80 (1.6%)	21 (1%)	13 (1.7%)	54 (1.1%)	6 (1.8%)	4 (1.7%)	100 (1.6%)
Refused	14 (0.5%)	101 (1.9%)	45 (2.2%)	15 (2%)	168 (3.3%)	5 (1.5%)	4 (1.7%)	153 (2.4%)

Data not available: n=676 cases (3%).

Comment:

- The majority of postmortems were coronial. The need for coronial input varied amongst regions, with the highest percentage of cases recorded in the Australian Capital Territory.
- A coronial postmortem was reported to have been performed in only 11% (2,592/23,292) of audited cases between 2009 and 2014. In some of the regions the numbers were low, and this could impact the interpretation of the data.
- In 85% (19,737/23,292) of cases a postmortem was either not performed, refused or it is unknown whether one was conducted.
- The low rate of postmortems limits confirmation of the cause of death.
- There were no significant changes in trends during the audit period (data not shown).

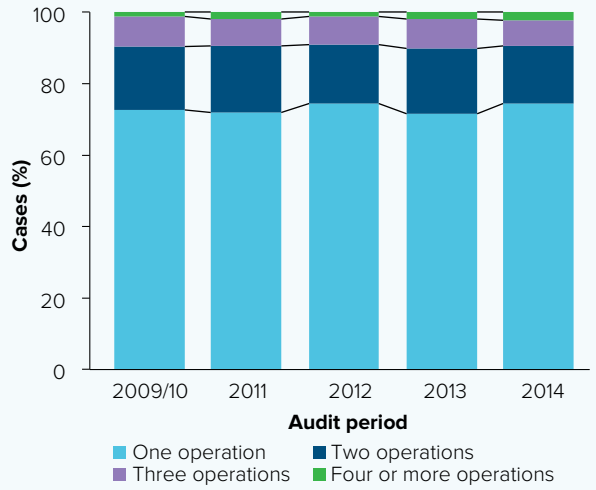
6 PROFILE OF OPERATIVE INTERVENTION

KEY POINTS

- A surgical procedure was performed on 75% of patients (17,431/23,292). More than one visit to the operating room was required for 27% (4,718/17,431) of patients during their hospital stay.
- A consultant surgeon made the decision to operate in 87% of instances (21,347/24,421) and performed 61% of the operations (14,968/24,421).
- The rate of subsequent (unplanned) returns to theatre was 15% (2,580/17,431), with some patients requiring multiple episodes of surgery.
- The most common postoperative complications were postoperative bleeding, procedure-related sepsis and tissue ischaemia.

6.1 OPERATIVE RATE

Figure 28: Frequency of operations on individual patients (n=17,431)

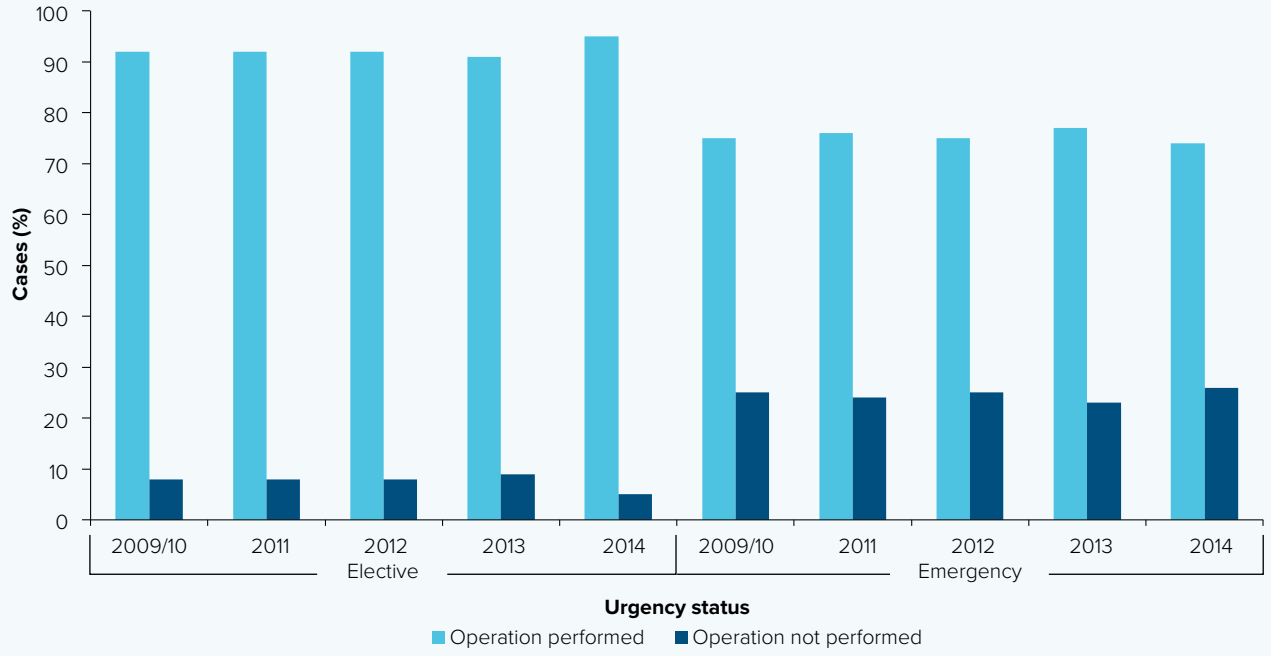


Data not available: n=829 cases (4%).

Comment:

- 75% (17,431/23,292) of audit patients underwent an episode of surgery either during their last admission or within 30 days prior to death.
- 25% (5,861/23,292) of patients had no surgery during their final admission.
- A total of 28,097 operative episodes were undertaken on the 17,431 patients who had surgery, reflecting the fact that an individual patient can have more than one episode of surgery during their admission.
- 73% (12,697/17,431) of patients had just one operation.
- 27% (4,718/17,431) of patients had more than one operation.
- There has been relatively little change in the frequency of multiple operations between 2009 and 2014.

Figure 29: Operative and nonoperative cases by admission status (n=17,431 patients)
Data not available data: n=829 (4%).



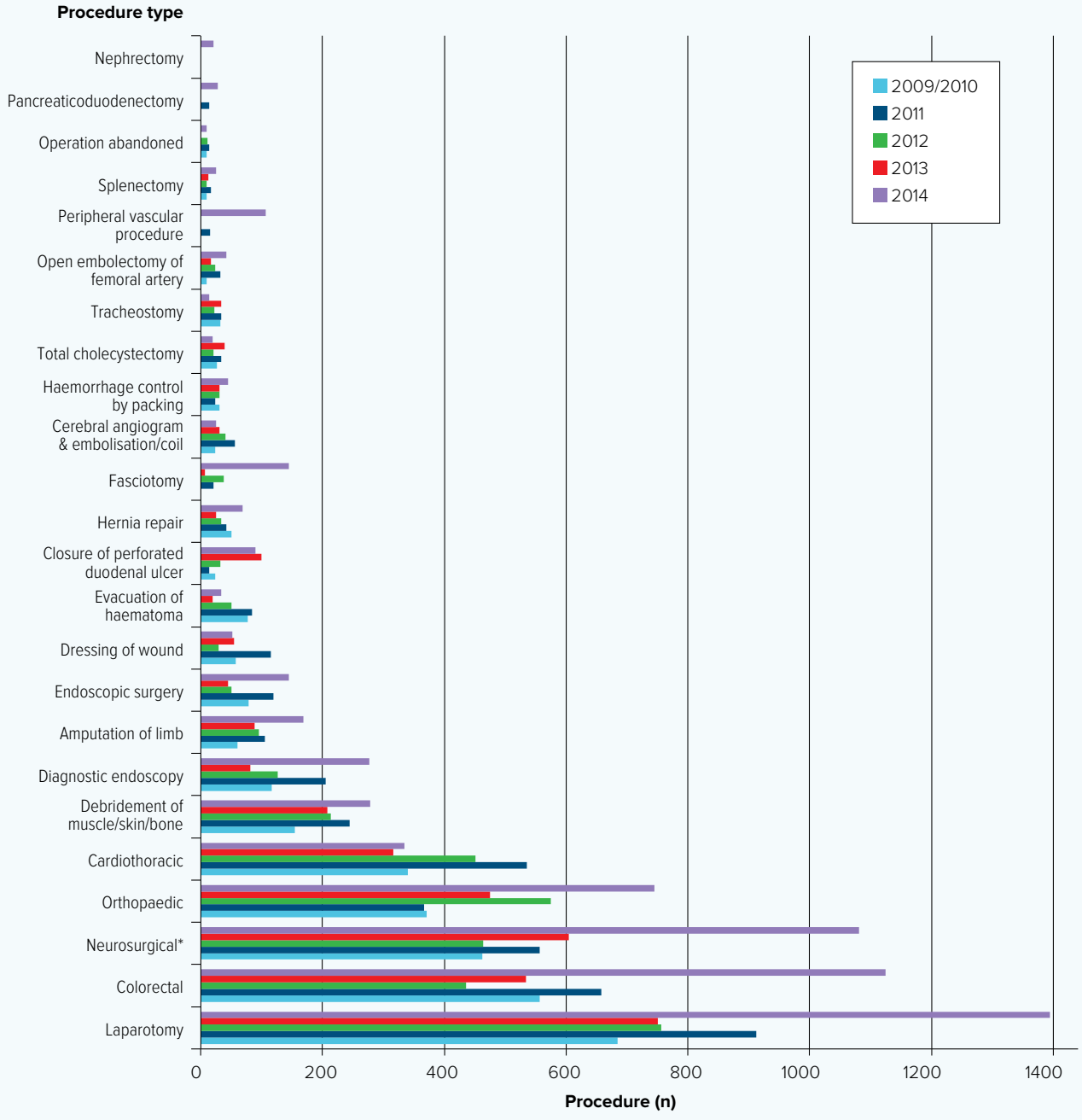
Comment:

- Between 2009 and 2014, deaths where no operation was performed occurred in 8% (249/3,214) of elective admissions and 24% (4,714/19,757) of emergency admissions (data not shown). The decision not to operate was generally an active decision to palliate an irretrievable situation.

6.2 FREQUENCY OF OPERATIVE PROCEDURES

The frequency of operative procedures in audit patients is shown in Figure 30. A patient can undergo multiple procedures during the same admission and during the same surgical episode.

Figure 30: Types of procedure, where the number of procedures >10 (n=28,097 procedures in 17,431 patients)



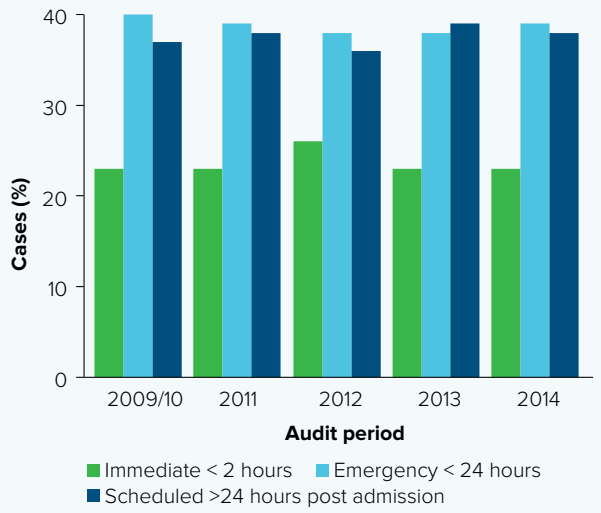
Data not available: n=52 cases (<1%).
*Neurosurgical procedures include: clipping of aneurysm of cerebral artery, craniotomy (evacuation of non-trauma injuries, tumour resection and excision or drainage of abscess) and posterior fossa craniotomy for infarct. The laparotomy group includes all abdominal procedures not specified in other sections (e.g. colorectal procedures).

Comment:

- A laparotomy, laparoscopy and upper GI operations were the likely patient group with multiple procedures. Colorectal pathologies was the other operative category with the highest number of recorded procedures.
- There were 75% (17,431/ 23,292) of patients who underwent operative treatment.

6.3 TIMING OF EMERGENCY EPISODES

Figure 31: Timing of emergency surgical episodes (n=18,223)



Data not available: n=1,160 cases (6%).

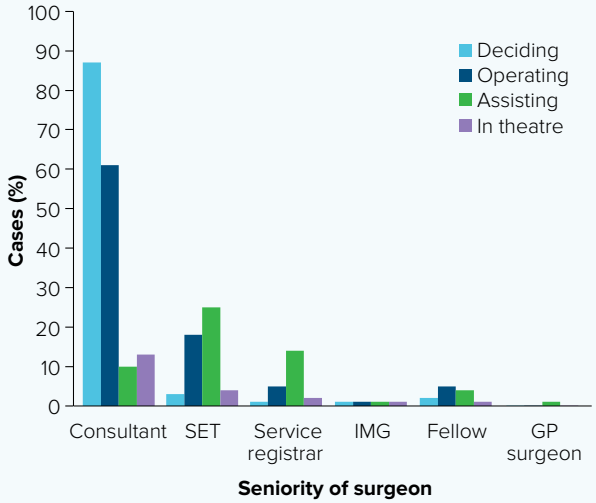
Comment:

- The timing and urgency of operations has been relatively consistent across the audit periods.
- The urgency (time criticality) of a patient's condition predicts the timing of any surgery.
- In total, 58% (10,653/18,223) of audited series were classified as emergency or immediate surgical admissions.
- Between 2009 and 2014, 36% (6,647/18,223) of the total number emergency admissions to a surgical unit went to surgery within 24 hours of admission.
- The majority of emergency surgery was performed in the public sector (data not shown).

6.3.1 Seniority of surgeon performing surgery

The surgeon completing the SCF was asked to record the seniority of the surgeon who made the clinical decision to operate as well as the seniority of the surgeon who performed the surgery (see Figure 32).

Figure 32: Seniority of the surgeon making the decision to operate and performing the surgery (n=28,097 operations in 17,431 patients)

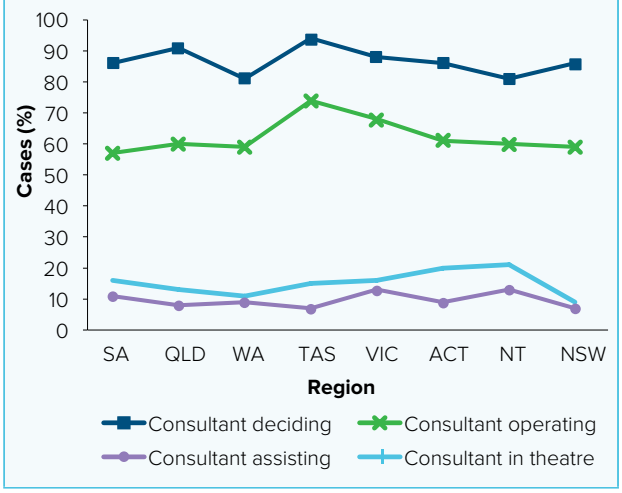


Data not available: n=16 cases (<1%).
IMG: International Medical Graduate; SET: surgical education and training; GP: general practitioner

Comment:

- The data in Figure 32 refers to the full audit period (2009 to 2014). Between 2009 and 2014 there has been little change in the proportion of surgical episodes in which consultant surgeons made the decision to operate and performed the operation (data not shown).
- The input from consultant surgeons was high. In 87% (21,347/ 22,677) of cases the consultant surgeon made the decision to operate.
- For each surgical episode there may have been more than one grade of surgeon deciding, operating, assisting or in theatre.

Figure 33: Consultant involvement performing surgery by region (n=28,097 operations in 17,431 patients)



Data not available data: n=16 (<1%).

Comment:

There was some variation across regions in terms of consultant involvement in surgery although similar trends were seen. These differences may reflect local approaches to surgical training and staffing levels.

6.4 UNPLANNED RETURN TO THEATRE

The treating surgeon was asked to indicate whether there was an unplanned return to the operating theatre following the initial operative procedure (see Table 6).

Table 6: Percentage of patients with an unplanned return to theatre (n=17,431)

Return to theatre status	2009/10	2011	2012	2013	2014
No return to theatre	4,221 (84.3%)	2,483 (84.5%)	2,507 (84.2%)	2,700 (84%)	2,135 (85%)
Return to theatre	775 (15.5%)	454 (15.4%)	470 (15.8%)	507 (15.8%)	374 (14.9%)
Don't know	10 (0.2%)	3 (0.1%)	2 (<1%)	9 (0.2%)	2 (0.1%)

Data not available: n=779 (4%).

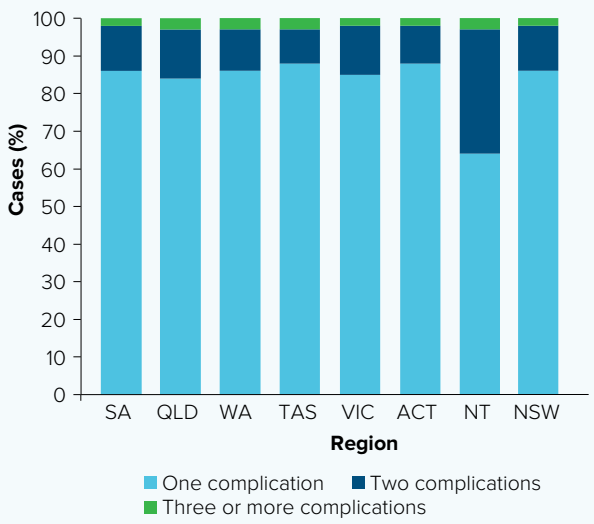
Comment:

- Patients who underwent a surgical procedure had an unplanned return to theatre in 15% (2,580/17,431) of the audited cases.
- The proportion of patients requiring a return to theatre was relatively unchanged during the audit periods.

6.5 POSTOPERATIVE COMPLICATIONS

The treating surgeon was asked to record any complications that occurred following a surgical procedure (Figure 34).

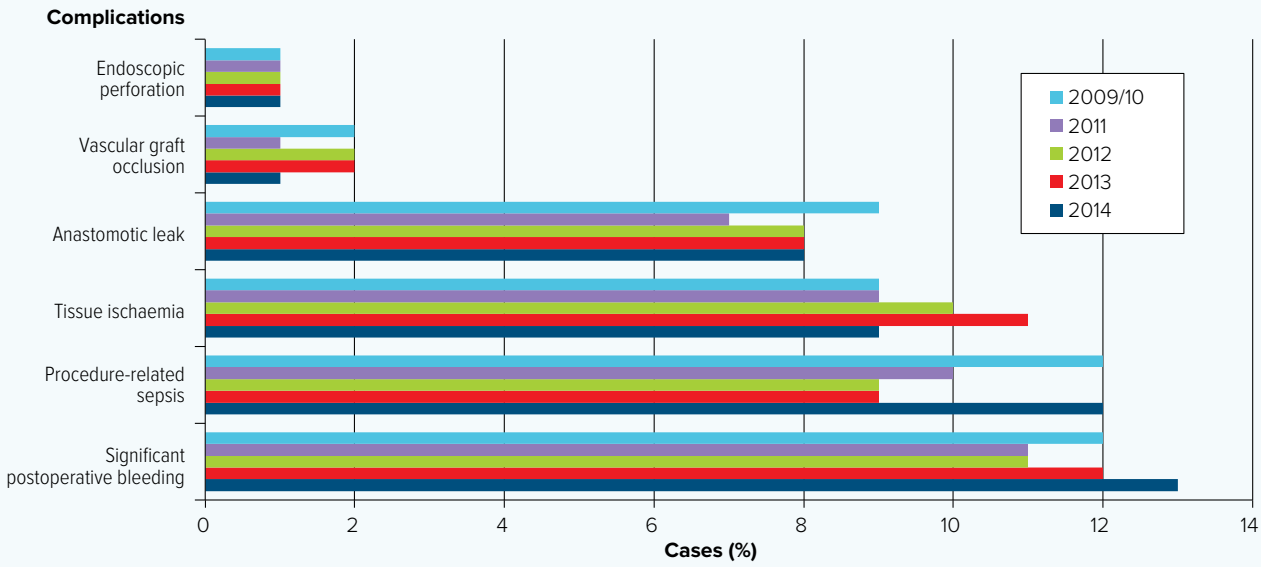
Figure 34: Patients developing postoperative complications (n=5,619 patients with one or more complication in 17,431 patients)



Comment:

- Between 2009 and 2014, postoperative complications were reported in 32% (5,619/17,431) of audit patients who underwent a surgical procedure.
- The significance of these complications in relation to the eventual outcome was unknown. Significance varies from minor (no effect on outcome) to major (led to death).
- Compared to other regions, there was some variation in the number of complications in the Northern Territory, where patients tend to present with a larger number of pre-existing comorbidities.

Figure 35: Distribution of types of postoperative complications (n=6,603)



Comment:

- Other complications were identified including cardiac failure, intrapulmonary haemorrhage, intracerebral bleeding, postoperative hypoxia, acute or chronic renal failure, paraplegia, liver failure, pneumonia, perforated viscus, pulmonary embolism, pyelonephritis, renal failure, respiratory failure, seizures, stroke and wound haematoma.
- Between 2009 and 2014, the most common postoperative complications were postoperative bleeding, procedure-related sepsis and tissue ischaemia.
- There has been a decrease in some of the more common postoperative complications between 2009 and 2014 (e.g. anastomotic leaks).

6.6 ANAESTHETIC PROBLEMS

A general anaesthetic in a critically ill elderly patient with comorbidities is a dangerous event, even more so in the emergency situation where there is not enough time to optimise the patient's state. Drug reactions, cardiac and respiratory complications may occur. According to the surgeons' assessments as to whether anaesthetic problems played a role in the death, only 7% (1,276/17,421) of cases were thought to have an anaesthetic component to the death.

Anaesthesia was suggested as a significant factor in the death of 1% (246/17,431) of patients who had a surgical procedure. Anaesthesia was possibly involved in the outcome in 6% (1,030/17,431) of cases (data not shown).

The proportion of deaths for which anaesthetic issues were raised was relatively unchanged between 2009 and 2014 (data not shown).

Cases where anaesthesia appeared to play a major role are referred to the appropriate regional Anaesthetic Death Review Committee, where available. These cases have often already been detected by the anaesthetic group.

6.7 OPERATIVE PROCEDURE ABANDONED

The treating surgeon was asked to record whether they abandoned any surgical procedure. If the surgeon finds during surgery that the patient is suffering from an incurable and untreatable disease they may decide to abandon the operative procedure. Such a decision was made in 5% (1,187/24,292) of operations. The proportion of abandoned operations was largely unchanged between 2009 and 2014.

7 PATIENT TRANSFER ISSUES

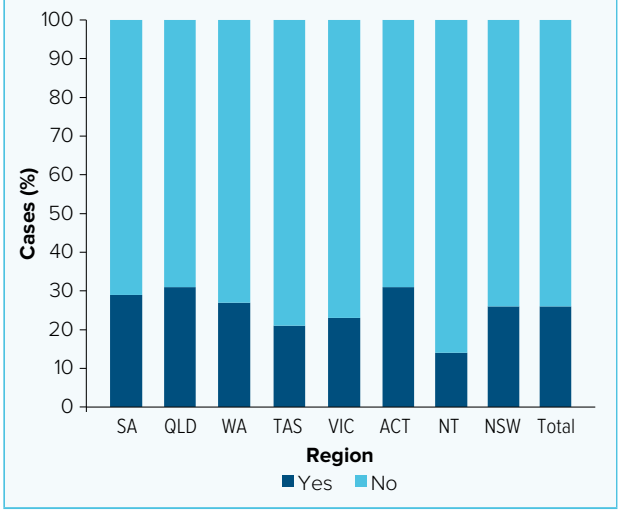
KEY POINTS

- A transfer between hospitals was required in 26% (4,523/17,431) of audited cases.
- Issues related to transfer were raised by treating surgeons in 11% (497/4,523) of cases in which a transfer took place.
- Between 2099 and 2014, 40% (497/1,231) of issues raised related to transfer delays, 22% (269/1,231) for inappropriateness of transfer and 17% (209/1,231) for insufficient clinical documentation.

7.1 FREQUENCY OF NEED FOR TRANSFER

The audit process examines transfers between hospitals. A transfer typically occurs because of the need for a higher level of care or specific expertise. See Figure 36 for a regional breakdown of the percentage of cases in which a transfer occurred.

Figure 36: Frequency of need for transfer to another hospital, by region (n=17,431)



Data not available: n=394 cases (2%).

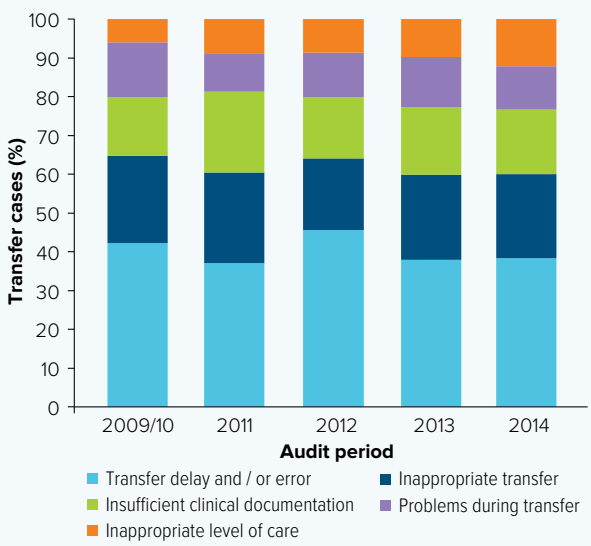
Comment:

- The need for transfer varied amongst the regions, probably reflecting the geographical distribution of available healthcare facilities, particularly in Queensland, the Australian Capital Territory and South Australia.
- Between 2009 and 2014, 26% (4,523/17,431) of audited cases involved a transfer between hospitals.

7.2 ISSUES ASSOCIATED WITH PATIENT TRANSFER

The treating surgeon was asked to record any issues associated with the transfer of a patient between hospitals (see Figure 37).

Figure 37: Types of issues associated with patient transfer (n=1,231 issues in 4,523 patients)



Data not available: n=237 cases (5%).

Comment:

- Issues related to transfer were raised by the treating surgeon in 11% (497/4,523) of cases involving a patient transfer. Under the audit's current legal framework, specific case information cannot be provided to the ambulance service or referring hospital.
- Insufficient clinical documentation is a concern that could be readily improved. Good communication ensures that all clinicians involved have full knowledge of the patient's health status.
- According to a peer review article by the Queensland Audit of Surgical Mortality (QASM), surgeons indicated there was a need for improvement in a number of areas in the hospital service. Better preoperative assessment with precise radiology and preparation of patients is essential to achieve earlier diagnosis. Improvement in communication at the consultant level may reduce time to appropriate surgery without inappropriate delays. In the opinion of the surgeons, 40% of delayed patients had poor pre-operative management.[3]

Case study #2 *Interhospital transfer (comprehensive medical records must accompany the patient)*

An elderly patient presented with a flu-like illness to the general practitioner where the initial diagnosis was anaemia and pneumonia. The patient was referred to a specialist physician at a private hospital. Shortly after admission the patient became tachycardic and hypotensive, and was transferred to the intensive care unit (ICU). The patient was considered to have septic shock and commenced on inotropes. Four hours after admission to the ICU a surgeon became involved when the patient was pale, tachycardic and diaphoretic with a distended abdomen.

Septicaemia (source unknown) was considered the cause of the patient's difficulties. An aortic abdominal aneurysm could not be ruled out. A blood pressure of 80 mmHg systolic was maintained and ultrasound abdomen showed a normal aorta but a large mesenteric mass (possible haematoma). The patient responded to further fluid resuscitation and computed tomography (CT) was performed. This CT showed a large mesenteric haematoma. The patient had been on warfarin for atrial fibrillation for several years.

At six hours post-admission to the private hospital the patient's pain was controlled, the patient was anuric, and the patient's blood pressure was above 100 mmHg systolic with a heart rate of 100 beats per minute. The surgeon considered that transfer to a larger ICU was necessary and arrangements were made to move the patient to a nearby public hospital ICU. Initially no bed was available but the public hospital (despite its heavy load) did arrange a bed within several hours.

While waiting for transfer, the surgeon ordered fresh frozen plasma and closely monitored the patient. It took over an hour to access the fresh frozen plasma. As the fresh frozen plasma arrived in the hospital the patient again became tachycardic and hypotensive. The surgeon decided that urgent laparotomy was indicated and a large mesenteric haematoma was confirmed. The site of the bleeding could not be found. The abdomen was packed, the patient warmed and finally transferred to the public hospital shortly after surgery. The patient remained stable overnight. The following day a re-look laparotomy revealed viable small bowel but no further bleeding. The patient remained stable in ICU but unfortunately suffered an ischaemic event six days later and died. Intensivists and staff surgeons in the public hospital, who had the responsibility for dealing with this very ill patient, were also disadvantaged by the fact that the medical record did not accompany the patient.

8 INFECTION AND TRAUMA

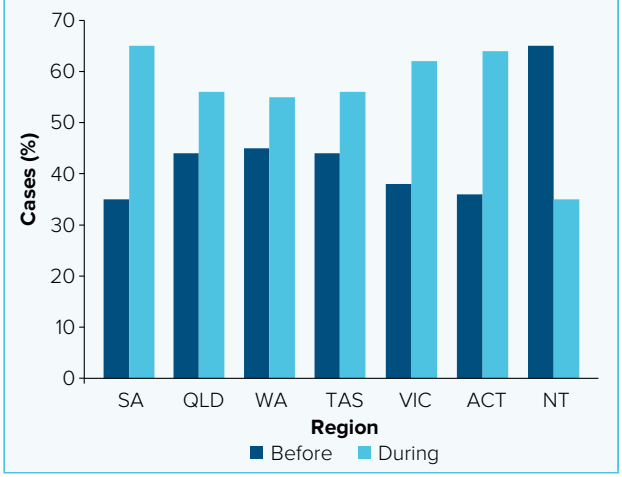
KEY POINTS

- ANZASM started collecting data on infection and trauma cases in 2012. All regions except New South Wales collect data on infection cases occurring in patients who require surgery. Data on trauma cases is currently collected in four regions: Queensland, Western Australia, Victoria and the Northern Territory.
- A clinically significant hospital-acquired infection was present in 34% (2,944/8,698) of the audited cases reported between 2012 and 2014.
- Of the 1,758 traumatic events, 81% (1,419) were caused by falls, 12% (218) were caused by traffic accidents (Figure 43); and 7% (121) were associated with domestic, public or self-inflicted violence (data not shown).

8.1 INFECTIONS

In 2012 ANZASM started collecting data on infection in patients undergoing surgery. ANZASM is keen to monitor trends in infection, primarily to ensure that strategies are implemented to prevent and minimise infections contracted both prior to and during surgery. All regions except New South Wales collect this data (see Figure 38). Western Australia started collecting this data in July 2013.

Figure 38: Infections acquired before or during the admission by region (n=2,944)

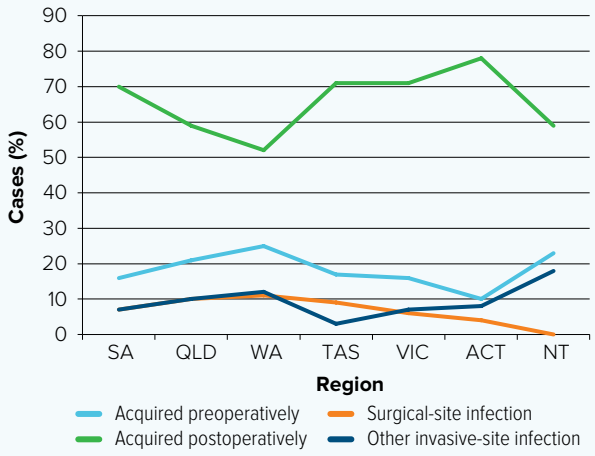


Data not available: n=112 cases (4%).

Comments:

- Of the 8,698 audited cases reported between 2012 and 2014 a clinically significant infection was present in 34% (2,944) of cases during admission prior to surgery (data not shown).
- Infections occurred during the patients' admission in 57% of cases (1,674/2,944).
- The different distribution of infection within the Northern Territory may result from late presentations of patients living in remote communities.

Figure 39: Regional breakdown of infections acquired during the admission (n=1,674)

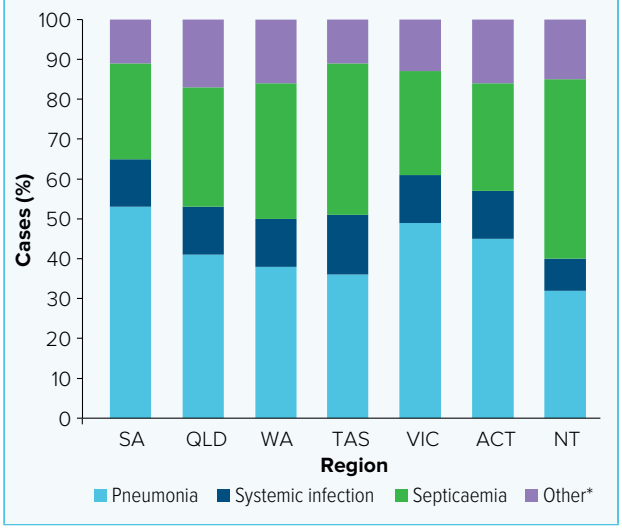


Data not available: n=112 cases (7%).

Comments:

- Since 2012 when infection data was collected, the cases of infection acquired during admission 62% (1,032/1,674) were acquired postoperatively, 18% (282) were acquired preoperatively, 8% (122) were as a result of other invasive-site infections, and 8% (126) were surgical-site infections (data not shown).

Figure 40: Types of infections acquired either before or during the admission by region (n=2,944)

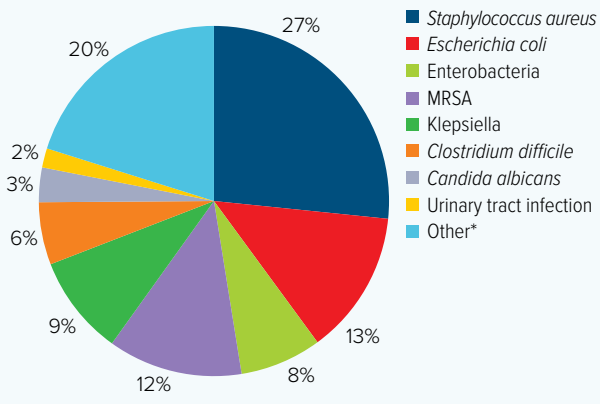


Data not available n=32 cases (1%).
*Other category includes: *Klebsiella, Clostridium difficile, Escherichia coli* and methicillin-resistant *Staphylococcus aureus*.

Comments:

- Of all the 2,944 cases of infection acquired prior to or during admission over the three year period, pneumonia was responsible for 45% of cases (1,316), septicaemia for 28% of cases (824), other infections were responsible in 14% of cases (417), and systemic infection in 12% of cases (355).

Figure 41: Types of infections, where positively identified (n=1,127)



Data not available: n=235 cases (8%).
Other infections include: *Moraxella*, multiple organisms, human immunodeficiency virus, pneumonia, *Pseudomonas aeruginosa*
MRSA: methicillin-resistant *Staphylococcus aureus*.

Comments:

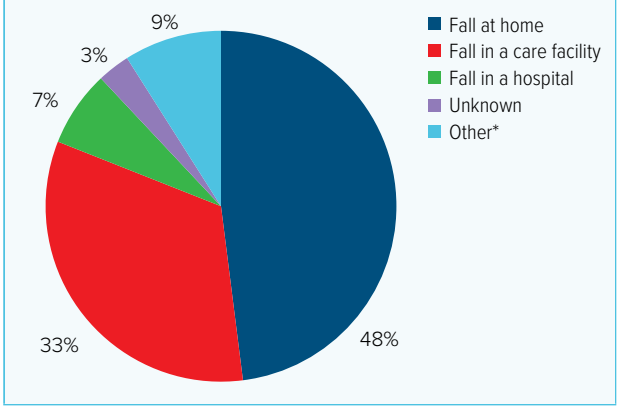
- Over the 3-year period the infection was positively identified in 38% (1,127/2,944) of cases where the infection was acquired prior to or during admission (data not shown).
- *Staphylococcus aureus* and *Escherichia coli* accounted for 39% (440/1,127) of all cases of infection.

8.2 TRAUMA

In 2012 ANZASM started collecting data on trauma cases in which severe bodily injury or shock occurred in patients requiring surgery. The types of traumatic events leading to injury or shock vary, but may include falls, accidents or violence. This data is currently collected by four regions: Queensland, Western Australia (from July 2013), Victoria and the Northern Territory.

During the period January 2012 to the end of December 2014, a traumatic event was attributed to 28% (1,758/6,173) of cases (data not shown). Of the 1,758 traumatic events, 81% (1,419) were caused by falls (Figure 42) and 12% (218) were caused by traffic accidents (Figure 43). Domestic, public or self-inflicted violence was associated with 7% (121/1,758) of trauma cases (data not shown).

Figure 42: Locations associated with falls (n=1,419)

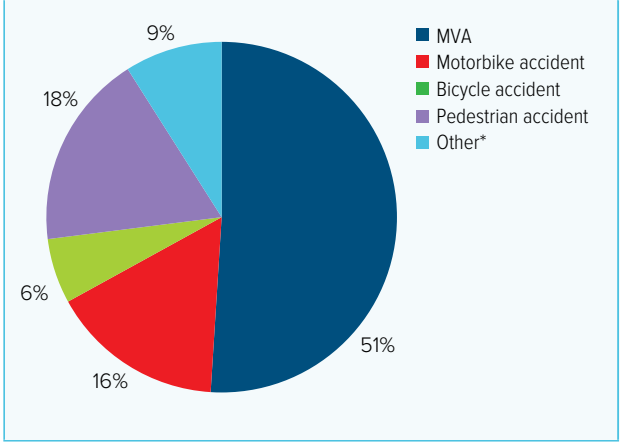


Data not available: n=17 (1%).
*Other category includes roads, workplace related and public venues.

Comments:

- Falls were associated with 81% (1,419/1,758) of recorded traumatic events.
- Of the 1,419 falls, 48% (678) were at home, 39% (556) occurred in a hospital or care facility and 12% (168) were unknown or elsewhere.

Figure 43: Types of traffic accidents associated with trauma cases (n=218)



Data not available: n=1 (1%)
Other category includes: quad bike, ultralight aircraft and workplace related.
MVA: motor vehicle accident.

Comments:

- Of the 218 traumatic events, accidents related to motor vehicles were associated with 51% (110) of cases. Due to the small amount of current data this should be interpreted with caution.

Case study #3 *Death in hospital following a fall*

An elderly person fell at home after walking into a glass door. The patient had apparent rib injuries and had also injured their left knee. The patient was admitted to an orthopaedic ward. No abdominal signs were apparent on admission. The patient was treated with analgesia and physiotherapy and there were no complaints from the patient.

Several days after admission the patient's general condition caused the nurses to report to the patient's medical officer and a physician's assessment was arranged. Further investigations suggested that there were some other medical problems and intravenous fluids were initiated.

Later in the week after the fall a general surgeon saw the patient and abdominal signs were obvious. Plain x-ray showed gas under the diaphragm but by this time the patient's condition was poor. Resuscitation did not improve the situation and the decision was made not to operate. Death followed rapidly.

This patient should have had daily medical assessments with a full clinical examination and careful history about any symptoms. A possible abdominal viscus perforation would have been suspected much earlier if a reasonable history by the resident or registrar had been taken, and failure to obtain an early surgical consultation almost certainly resulted in this man's death.

Having the patient in an orthopaedic ward did not help, and it is possible but unfortunate that previous questions about abdominal pain were not forthcoming from the junior medical officer on the orthopaedic team.

This case highlights the difficulty of diagnosis in the elderly, especially if the individual is rather stoical. It also highlights the necessity for repeated examinations in patients following any trauma.

Comment

- Perhaps if the patient had not been placed in an orthopaedic bed the focus of attention might have been much broader.
- In such circumstances where these things occur, perhaps a general surgical assessment within 24 hours of admission might have been prudent. Daily clinical examinations with a careful history of all symptom complexes may have brought an earlier diagnosis.

9 PEER REVIEW OUTCOMES

KEY POINTS

- Between 2009 and 2014, an SLA was requested in 13% (2,990/23,292) of audited cases. Of these cases, the most frequent cause of referral for SLA, accounting for 65% (1,948/2,990) was a lack of information provided by the treating surgeon.
- There were less than 4% (959/23,292) of audited cases were sent for SLA due to concerns over clinical issues.
- The most common criticism by both first- and second-line assessors was delay in the delivery of definitive treatment.
- From 1 January 2009 to 31 December 2014 a total of 5,939 clinical management issues were identified.
- In 5% (1,053/23,292) of all patients audited were issues of clinical management perceived to have contributed to the death of the patient.

9.1 SECOND-LINE ASSESSMENTS

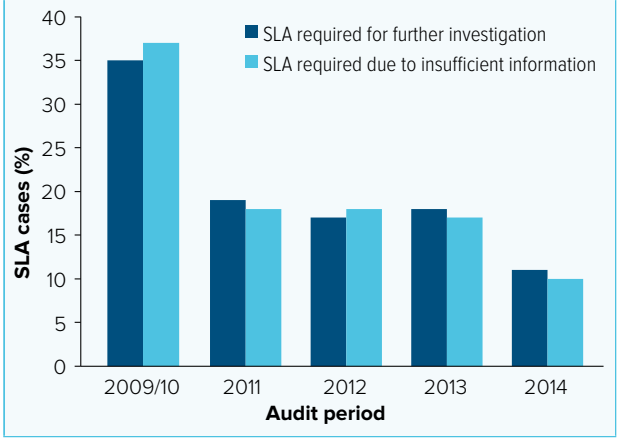
The peer review process comprises a retrospective examination of the clinical management of patients who died while under the care of a surgeon. All assessors (first- and second-line) must decide whether the death was a direct result of the disease process alone, or if aspects of the management of the patient may have contributed to the outcome.

A total of 23,292 cases underwent FLA. The first-line assessor decides whether the treating surgeon has provided enough information to allow them to reach an informed decision on the appropriateness of the management of the case. If inadequate information was provided then the first-line assessor requests a SLA. Other triggers for requesting a SLA are:

- instances where a more detailed review of the case could better clarify events leading up to death and any lessons arising;
- an unexpected death, such as the death of a young and fit patient with benign disease, or a day surgery case.

The number of SLAs required due to a lack of clinical information has decreased from 14% in 2009/10 to 10% in 2014. This is an indirect measure of true surgeon compliance with the audit process, with surgeons providing more detailed and more accurate information in the SCFs. There have also been educative training sessions on how to be an assessor which has also proved to be beneficial in reducing the numbers of SLAs due to a lack of information. An SLA was requested due to concerns regarding clinical management in 4% of cases (959/23,292), and this has not altered over the five surveyed years. The reasons given for referral for SLA are shown in Figure 44.

Figure 44: Reason for referral for second-line assessment (SLA) (n=2,990 SLAs in 23,292 audited cases)



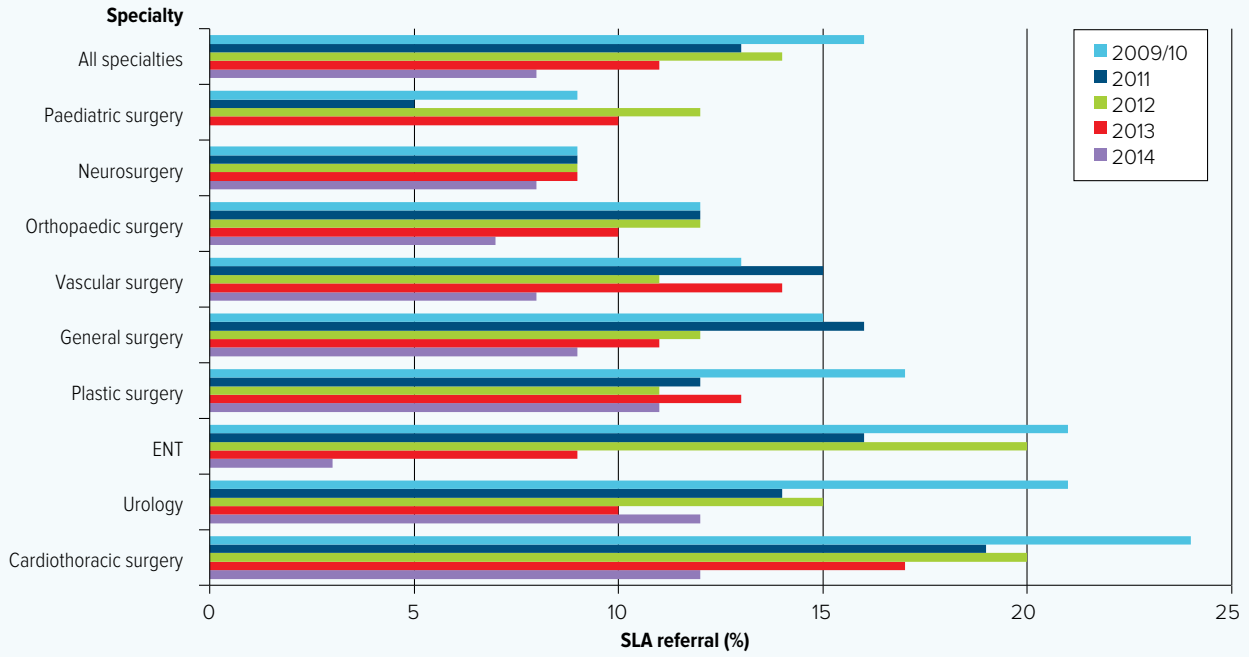
Data not available: n=101 (1%).
SLA: Second-line assessment.

Comment:

- Between 2009 and 2014, a SLA was requested in 13% (2,990/23,292) of audited cases. Of all the cases referred for SLA, a lack of adequate information in the SCF was the trigger in 65% of audited cases (1,948/2,990).
- The need for a SLA can often be avoided if the surgeon completes the SCF properly and provides adequate information.
- The number of SLAs required due to a lack of clinical information has decreased to 10% in 2014 (data not shown).

The frequency with which cases were referred for SLA, by surgical specialty, is provided in Figure 45.

Figure 45: Frequency of second-line assessment (SLA) referral amongst surgical specialties (n=2,990 SLAs)



Data not available: n=11 cases (1%).
ENT: ear, nose and throat.

Comment:

- There was some variation in the SLA rate among specialties, and across the audit periods. There was an overall drop in the need for SLA in most specialties in 2014. The exception was Urology for which there has been an increase in the SLA referral rate since the last report.[1]

9.2 CLINICAL MANAGEMENT ISSUES

A primary objective of the peer review process is to determine whether death was a direct result of the disease process alone, or if aspects of patient management might have contributed to that outcome.

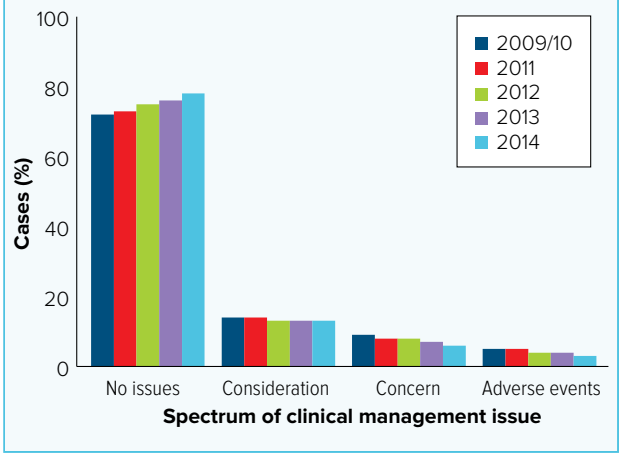
There are two possible outcomes for the peer review process. The first is that the death of the patient was a direct outcome of the disease process, with clinical management having no impact on the outcome. The second is a perception that aspects of patient management may have contributed to the death of the patient.

In making an assessment of contributing factors the assessor can identify an:

- **Area of consideration:** the assessor believes an area of care could have been improved or different, but recognises the issue is perhaps debatable. It represents a suggestion regarding treatment options or a minor criticism.
- **Area of concern:** the assessor believes that an area of care should have been better.
- **Adverse event:** an unintended injury or event that was caused by the medical management of the patient rather than by the disease process. The injury or event was sufficiently serious that it led to prolonged hospitalisation; temporary or permanent impairment or disability; or contributed to or caused the death of the patient. In addition, there are predetermined outcomes classified as an adverse event (e.g. anastomotic leak or pulmonary embolus). It must be emphasised that an adverse event does not imply negligence. Some adverse events will occur even with the best of care, for example a fatal pulmonary embolism despite the use of the best DVT prophylaxis available. An adverse event is not necessarily preventable and may not contribute to the death of the patient (see 9.2.1).

Figure 46 demonstrates the degree of criticism of clinical management recorded per patient. Where a number of criticisms were made in any one case, the most severe degree of criticism has been attributed. ANZASM primarily focuses on areas of concern and adverse events, although data is collected on areas of consideration.

Figure 46: Frequency and spectrum of clinical management issues recorded per patient over time (n=23,292)



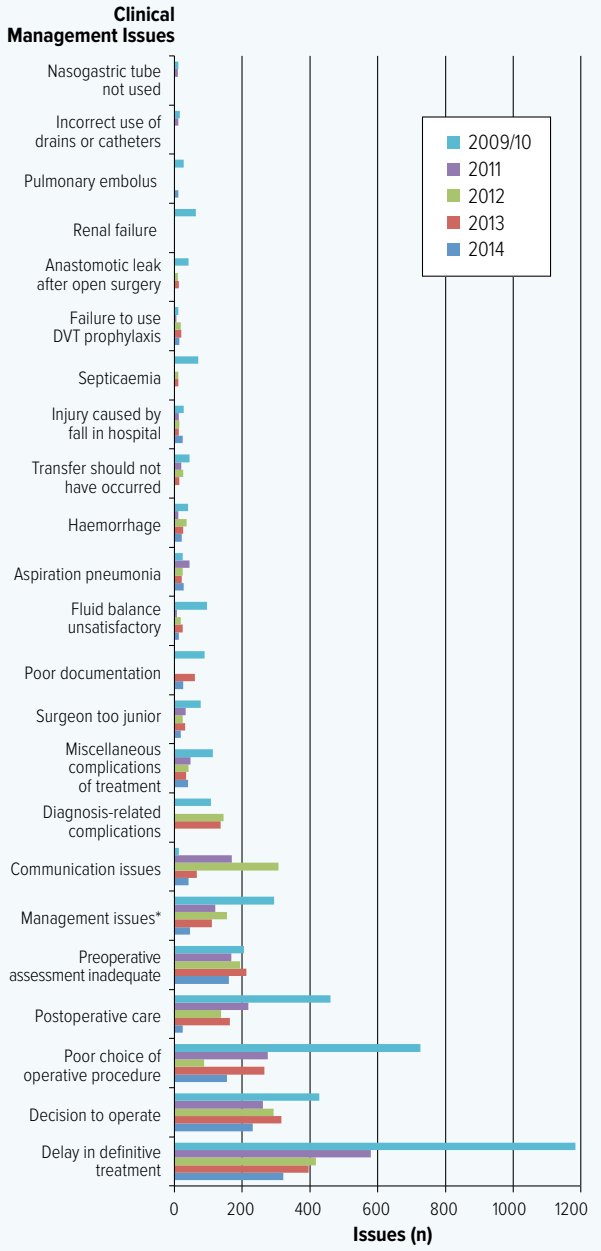
Data not available: n=69 (<1%).

Comment:

- In 74% (17,284/23,292) of audited cases the assessors felt that there were no clinical management issues. When combined with areas of consideration (12% of cases; 3,085), the total number of cases with no or minor criticism was 86% (20,369).
- The proportion of cases with no clinical management issues increased from 72% in 2009 to 74% in 2014.
- The identification of an area of concern or adverse event by an assessor denotes a greater degree of criticism of clinical management. In this report an area of concern or adverse event occurred in 12% (2,854/23,292) of audited deaths (data not shown).
- Cases in which patients experience an adverse event are a key focus of the audit if there is a perception by assessors that the treatment provided may have not been preventable. The proportion of cases with adverse events was 5% (1,053/23,292) over the entire audit period.

The frequency of specific clinical management issues is shown in Figure 47. This chart includes all clinical management issues (areas of consideration, concern and adverse events). In some patients more than one issue was identified.

Figure 47: Frequency of specific clinical management issues where there were more than 10 cases in a group (n=11,254 instances)



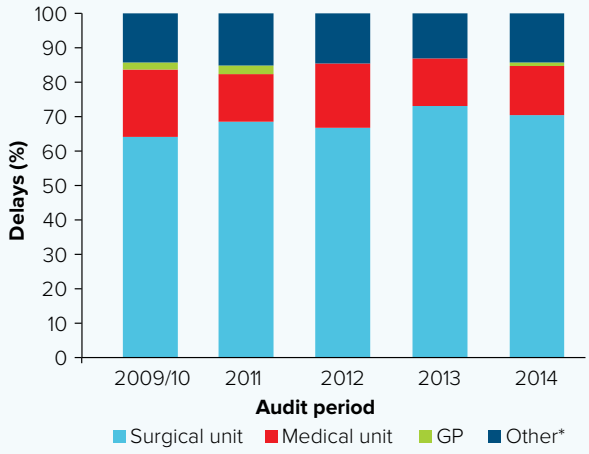
Data not available: n=205 (2%).
*Management issues: adverse events related to treatment guidelines or protocols, unsatisfactory medical management and treatment not conforming to guidelines.
DVT: deep vein thrombosis.

Comment:

- Delay in implementing definitive treatment is still the most frequent clinical management issue. These delays can be due to a number of factors and not all are the responsibility of the treating surgeon. Reasons for delay include geographical issues, diagnostic problems in the emergency department, inappropriate diagnosis, need for transfer, availability of theatre and communication issues.
- The decision to operate and the choice of operative procedure are also high on the list of clinical management issues.
- Good communication amongst those involved in patient care is essential to ensure the treatment plan is properly understood and coordinated. Poor communication accounted for 5% (597/11,254) of the specific issues identified between 2009 and 2014 (data not shown).

Between 2009 and 2014, a delay in the implementation of definitive treatment was perceived in 26% (2,896/11,254) of audited patients. The attribution of responsibility for treatment delays is shown in Figure 48. This data is derived from the SCF and reflects the view of the treating surgeon.

Figure 48: Attribution of responsibility for treatment delays (n=3,068)



Data not available: n=205 (2%).
*Other category includes emergency departments, radiology departments, other hospitals and patient-related factors.
GP: General practioner

Comment:

- The surgical unit was deemed responsible for 64% (696/1,085) of treatment delays in 2009/10 and 70% (226/321) in 2014. Not all cases for 2014 have gone through the full audit process and are still under review, therefore the full extent of any variances will only be fully known in the next report.
- Other clinical areas, medical units or general practitioners were deemed responsible for 18% (554/3,068) of delays over the entire audit period.
- More than one team may be responsible for any perceived delays in treatment.

Case study #4 *Delay in diagnosis of perineal sepsis after penectomy*

Clinical detail

This case involves an elderly man with a carcinoma of the penis. Initially he underwent a biopsy to confirm the diagnosis, then had a partial penectomy. Nine days later he underwent total penectomy and perineal urethrostomy. Despite seeming to make satisfactory progress after this procedure, however, progress notes and pathology suggest increasing sepsis from day three postoperatively through to the patient's death on the 10th postoperative day. The white cell count was slowly increasing from 11.2 x109/L on postoperative day three, to 21 x 109/L on day 10 postoperatively. C-reactive protein showed a similar increase. The patient's renal function slowly deteriorated over the same time period, with creatinine increasing from approximately 120 to 170 µmol/L. Blood cultures on day four postoperatively grew both *Enterococcus faecalis* and *Bacteroides fragilis*. This should have been cause for alarm.

Either a special surgical cover or a night surgical resident, who were asked to observe the patient, completed the progress notes from day four to day seven postoperatively. There is no comment made by medical staff from the attending unit. During this time the patient was showing significant evidence of sepsis. Little comment is made with regard to the appearance of the surgical wound. The patient had a catheter removed and replaced, and there is comment of cloudy urine and infection within the urine. There is no comment about the wound and no comment from the clinical unit responsible for the patient.

The antibiotics that the patient was administered, ceftriaxone and ampicillin, were probably inappropriate given the blood culture results. A CT scan was obtained at approximately 1500 on the day of death showed gas in the perineal wound. The progress notes make no comment with regard to the appearance of the wound leading up to this. At 1700 a medical emergency team call was made and the patient was diagnosed with septic shock. A code blue was called and it was after this that the patient was taken to the operating room.

The patient survived the procedure to debride the wound and was moved into intensive care. The patient was acidotic, had dilated pupils and only had a blood pressure because of the adrenergic support that he was being given. He had a cardiac arrest and was declared dead at approximately 2040. In summary, there appeared to be evidence of significant sepsis which was under diagnosed and under treated, which appeared to directly lead to the death of the patient.

Comments

In retrospect, drainage should have been started earlier and been more aggressive. Antibiotic therapy was not given as early or effectively as it might have been. It seems from the notes that the attending surgical unit was insufficiently 'hands on', specifically from day four postoperatively onwards. The possibility of a symbiotic infection does not seem to have been considered. Appropriate investigations were carried out with regard to the chest and urine, but not enough attention was paid to the actual wound which seems to have been underestimated as the source of sepsis.

9.2.1 PERCEIVED IMPACT OF CLINICAL MANAGEMENT ISSUES

First- and second-line assessors were asked to indicate:

1. what impact any perceived issues of patient management might have had on the clinical outcome;
2. whether or not these issues were preventable;
3. which clinical team was responsible for the issues.

Assessors were asked to select a response on these factors from a three- or four-part scale, called a Likert scale. The Likert scale was used to stratify responses to questions 1 and 2 above. The clinical teams felt to be responsible for management issues are recorded in question 3.

First- and second-line assessors may identify more than one issue of clinical management for each patient under review. It is important therefore that the impact of any of these criticisms on an individual patient's outcome is analysed and compared. Tables 7, 8, 9, 10 and 11 show data that is patient-focused rather than incident-focused.

Table 7: Clinical management issues by specialty and severity identified by the second-line assessor (n=5,939 events in 23,292 patients)

Surgical specialty	Adverse events	Concern	Consid-eration	No issues
Cardiothoracic surgery	122 (7.5%)	191 (11.9%)	319 (19.7%)	984 (60.9%)
General surgery	470 (5.1%)	835 (9.1%)	1,309 (14.3%)	6,547 (71.5%)
Neurosurgery	91 (2.6%)	172 (4.8%)	316 (8.9%)	2,975 (83.7%)
Orthopaedic surgery	129 (2.9%)	253 (5.6%)	502 (11.1%)	3,632 (80.4%)
Otolaryngology, head and neck	15 (5.8%)	21 (8%)	42 (16.1%)	183 (70.1%)
Other*	58 (6.8%)	64 (7.5%)	101 (11.9%)	627 (73.8%)
Paediatric surgery	6 (5%)	7 (5.9%)	14 (11.8%)	92 (77.3%)
Plastic surgery	14 (4.5%)	21 (6.8%)	46 (14.9%)	228 (73.8%)
Urology	45 (5.9%)	65 (8.6%)	124 (16.2%)	529 (69.3%)
Vascular surgery	99 (4.9%)	168 (8.3%)	301 (14.8%)	1,459 (72%)

Data not available: n=69 cases (<1%).
*Anaesthesia, Intensive Care Unit, Oncology, Ophthalmology, Oral and Maxillofacial, Thoracic medicine, Trauma and Transplant.

Comment:

- This analysis compares the incidence of significant criticisms of clinical care (areas of concern, adverse events) with lesser or no issues, by specialty.
- There is a difference in frequency of adverse events between the specialties. The exact reason is not readily apparent; however, it may reflect the proportion of high-risk surgical procedures. For example, there are very few minor operations in cardiothoracic surgery. Many are complex procedures with high-risk patients, and this may explain the apparently high number of adverse events.

Table 8: Degree of criticism of patient management per patient by the second-line assessor (n=23,292)

Degree of criticism of patient management	Patients (n)	%
No issue of management identified	17,284	74%
Area of consideration	3,085	13%
Area of concern	1,801	8%
Adverse event	1,053	5%
Total	**23,223**	**100%**

Data not available: n=69 cases (<1%). In instances where a patient had more than one clinical management issue the most severe has been used in this data set.

Comment:

- There was significant criticism of clinical management (area of concern or adverse event) in 13% (2,854/23,292) of cases in this audited series.
- There was minimal variation across regions in terms of the incidence of significant clinical management issues (data not shown).

Table 9: Perceived impact on clinical outcome of the areas of consideration and concern, and adverse events (n=23,292)

Perceived impact	Patients (n)	%
No issue of management identified	17,284	75%
Did not affect clinical outcome	1,315	6%
May have contributed to death	3,530	15%
Probably caused death	959	4%
Total	**23,088**	**100%**

Data not available: n=204 cases (1%).

Comment:

- In 4% of patients the perceived issues of clinical management were felt to have probably caused the death of the patient (959/23,292).

Table 10: Perceived preventability of clinical issues in the areas of consideration and concern, and adverse event groups (n=23,292)

Perceived preventability of clinical issues	Patients (n)	%
No issue of management identified	17,284	75%
Definitely preventable	1,276	6%
Probably preventable	2,406	10%
Probably not preventable	1,744	8%
Definitely not preventable	190	1%
Total	22,900	100%

Data not available: n=392 cases (2%).

Comment:

- The assessors felt that 6% of the clinical incidents were definitely preventable (1,276/23,292).

Table 11: Perception of clinical team responsible for clinical issues (n=6,008)

Clinical team felt to be responsible	Patients (n)	%
Surgical team	3,756	63%
Other clinical team	1,146	19%
Hospital issue	269	4%
Other*	272	5%
Data not available	565	9%
Total	**6,008**	**100%**

*transferring hospital, blood bank or transfusion services, emergency department, the general practitioner or referring doctor, the ambulance service, remote areas or insufficient staff.

Comment:

- In 63% of patients with perceived clinical issues the assessors indicated that the surgical team was responsible for the clinical issues (3,756/6,008).

Case study #5: *Delayed diagnosis of perforated ischaemic intestine*

Case Summary:

An elderly patient was admitted to a major metropolitan hospital with a short history of being unwell with abdominal distension and vomiting. The patient had significant comorbidities including dementia and was unable to give a history. The patient had recently been treated in the same hospital under a different unit for small bowel obstruction which was successfully managed conservatively.

The patient was noted by the registrar to have abdominal distension with right sided tenderness and guarding. Abdominal x-ray showed multiple fluid levels. The registrar diagnosed recurrent adhesional small bowel obstruction and admitted the patient for idiopathic ventricular tachycardia and nasogastric suction. The following day the patient was reviewed by the consultant of the original treating unit, who assessed the patient as being moribund due to an acute abdomen.

At operation there were extensive adhesions with a perforated ischaemic terminal ileum and gross peritonitis. A bowel resection without anastomosis was performed, leaving the abdomen open, and the patient was managed in the ICU. Several days later at a second laparotomy the small bowel was anastomosed. The patient then underwent a third laparotomy shortly thereafter so that the abdomen could be closed. The treating surgeon expressed serious concern about the patient's nutritional state and requested parenteral nutrition.

Several days later, due to concerns about wound infection, ICU staff were asked to remove skin staples. It appeared that the sheath suture also was cut, leading to abdominal dehiscence. The patient was returned to theatre for the fourth time to resuture the abdomen. Subsequent progress was poor with progressive development of multiorgan failure. Consultation with the family resulted in a decision to withdraw active treatment and the patient died nearly a month after admission.

Assessor's Comment:

Clearly this patient's prognosis was poor from the outset (elderly demented patient with other comorbidities and ischaemic gut/gross peritonitis). However, a number of management issues arise. The gravity of the patient's condition and significant overnight deterioration was not appreciated by the junior staff. When consultant review took place the following day immediate surgery was scheduled. Elderly patients with ischaemic gut may appear deceptively well however a high index of suspicion is needed. Localised tenderness and guarding in a patient with small bowel obstruction should ring an alarm bell. A CT scan might well have helped in diagnosis. The delayed diagnosis of ischaemic gut is a recurring theme in mortality reviews and needs to be emphasised to junior surgical staff.

Clearly this patient was going to have a prolonged postoperative ileus, and parenteral nutrition should have been commenced much earlier rather than at a week postoperatively after repeated requests by the surgeon. It appears that a serious error occurred in ICU when nursing staff, requested to remove skin staples, also cut the sheath suture which led to abdominal dehiscence and the need for another operation. There may have been miscommunication between medical and nursing teams here, and in a busy ICU communications need to be clear and well documented.

Main Message:

Have a high index of suspicion for ischaemic gut in an elderly patient with an acute abdomen.

10 ABORIGINAL AND TORRES STRAIT ISLANDER PERSONS REPORT

This national report, for the first time, includes a section on surgical care for Aboriginal and Torres Strait Islander persons. The findings presented here show that the people in this group were younger than the non-Indigenous surgical population. The report also shows that while younger people in this group have a much higher rate of serious comorbidities than the non-Indigenous Australian population, surgical care was the same in the two groups.

At date of reporting there are 669,881 Aboriginal and Torres Strait Islander persons living in Australia.

- 31.1% (208,476 / 669,881) lived in New South Wales
- 28.2% (188,954 / 669,881) lived in Queensland
- 13.2% (88,270 / 669,881) lived in Western Australia
- 10.3% (68,850 / 669,881) lived in Northern Territory
- 7.1% (47,333 / 669,881) lived in Victoria
- 5.6% (37,408 / 669,881) lived in South Australia
- 3.6% (24,165 / 669,881) lived in Tasmania
- 0.9% (6,160 / 669,881) lived in the Australian Capital Territory.

During the reporting period (2009 and 2014) two hundred and seventy-nine Aboriginal and Torres Strait Islander surgical deaths were identified.

Surgical deaths of Aboriginal and Torres Strait Islander persons occur in all states and territories. In this analysis, the deaths occurred within Queensland (40% – 111/279) of those who identified as Aboriginal and Torres Strait Islander), Northern Territory (37% – 102/279) and South Australia (16% – 45/279). The remaining 21 deaths relate to cases in the other regions.

- In Queensland, 4% of the population are Aboriginal and Torres Strait Islander persons. Two-thirds of the surgical Aboriginal and Torres Strait Islander deaths occurred in far north Queensland (68/111).
- In the Northern Territory, 30% of the population are Aboriginal and Torres Strait Islander persons which is the highest proportion of Aboriginal and Torres Strait Islander persons of any Australian state or territory[7].

10.1 ABORIGINAL AND TORRES STRAIT ISLANDER PERSONS AND SURGICALLY-RELATED DEATHS

During the reporting period (2009 and 2014) two hundred and seventy-nine Aboriginal and Torres Strait Islander surgical deaths were identified. These deaths of Aboriginal and Torres Strait Islander persons occurred in all the states and territories, but reporting was not uniform. Due to differences in collecting systems, there is no data from New South Wales, and limited data from Western Australia or Tasmania. However, for the other regions:

- 0.06% (111 / 188,954) in Queensland
- 0.15% (102 / 68,850) in the Northern Territory
- 0.12% (45 / 37,408) in South Australia
- 0.03% (14 /47,333) in Victoria
- 0.06% (4 / 6,160) in the Australian Capital Territory.

10.2 ABORIGINAL AND TORRES STRAIT ISLANDER PERSONS AND AGE

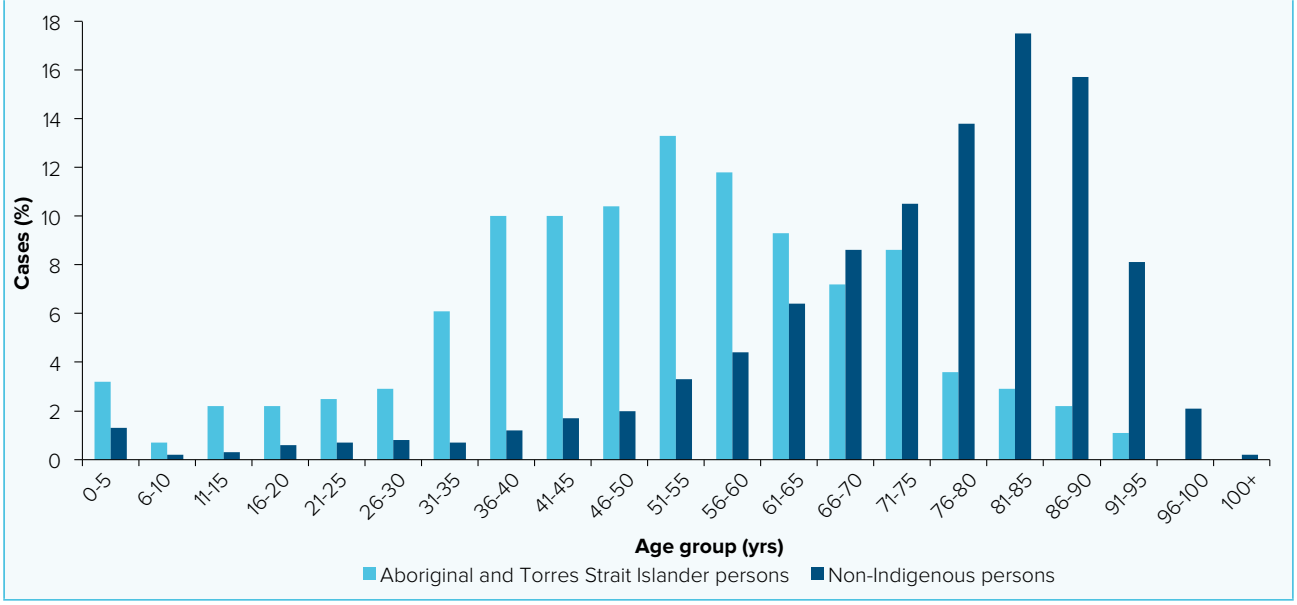
- Aboriginal and Torres Strait Islander persons who died in the perioperative period were younger than non-Indigenous persons (see Table 12 and Figure 49).
- The difference in median age of death between Aboriginal and Torres Strait Islander persons, and non-Indigenous persons, was 24 years.

Table 12: Age at death of Aboriginal and Torres Strait Islander persons and non-Indigenous persons (n=8,352)

	Age at death of Aboriginal and Torres Strait Islander persons (n=279)	Age at death of non-Indigenous persons (n=8,352)
Median (IQR)	54 years (44–66)	78 years (66–86)
Minimum	0 years	0 years
Maximum	95 years	104 years

IQR: interquartile range.

Figure 49: Age percentage distribution of Aboriginal and Torres Strait Islander persons (n=279) and non-Indigenous persons (n=8,352) in ANZASM in 5-year groups



Note: Yrs: Years.

10.3 ABORIGINAL AND TORRES STRAIT ISLANDER PERSONS AND MALIGNANCY

- Malignancy was present in 15% of Aboriginal and Torres Strait Islander persons (39/267) and 27% of non-Indigenous persons (2,157/7,965).
- The difference in the malignancy rate is most likely a reflection of the younger median age of Aboriginal and Torres Strait Islander patients compared with non-Indigenous patients.

10.4 ABORIGINAL AND TORRES STRAIT ISLANDER PERSONS AND COMORBIDITIES

The prevalence of comorbidities is a problem for the surgical care of Aboriginal and Torres Strait Islander persons, particularly in younger people:

- When patient age was capped at 50 years or younger, a considerable difference emerged between Aboriginal and Torres Strait Islander persons and non-Indigenous persons (see Table 13).
- However in the overall population (not just the people younger than 50 years), audit data shows that serious comorbidities were present at similar rates in the two populations. Comorbidities were present in 86% of Aboriginal and Torres Strait Islander persons (231/270), compared with 90% of non-Indigenous persons (7,220/8,029).

Table 13: Prevalence of comorbidities in Aboriginal and Torres Strait Islander persons (n=131) and non-Indigenous persons (n=896) aged 50 years or younger

	Comorbidities present (%)	Cases (n)
Aboriginal and Torres Strait Islander persons	75.6%	99/131
Non-Indigenous persons	61%	547/896

As shown in Table 13, younger Aboriginal and Torres Strait Islander persons are at a higher risk of comorbidities than younger non-Indigenous persons. This shows a statistically significant risk ratio of 1.24 (95% confidence interval 1.11 to 1.38) for comorbidities in younger Aboriginal and Torres Strait Islander persons compared with younger non-Indigenous persons.

10.5 ABORIGINAL AND TORRES STRAIT ISLANDER PERSONS AND OPERATIONS

The rate of performing operations in the two groups was similar, with 75% of Aboriginal and Torres Strait Islander audit patients undergoing an operation (204/271) compared with 78% of non-Indigenous audit patients (6,257/8,032).

10.6 ABORIGINAL AND TORRES STRAIT ISLANDER PERSONS AND RISK OF DEATH

Table 14: Distribution of patients at? risk of death with surgery		
Risk of death	**Aboriginal and Torres Strait Islander persons (n=201)**	**Non-Indigenous persons (n=6,201)**
Small	1.5%	2.6%
Minimal	4.5%	9.5%
Moderate	26.9%	25.9%
Considerable	51.7%	49.4%
Expected death	15.4%	12.6%

10.7 ABORIGINAL AND TORRES STRAIT ISLANDER PERSONS AND CLINICAL MANAGEMENT

There was no strong difference in patients who had an operation in any of the clinical management indicators with regards to the level of care provided to Aboriginal and Torres Strait Islander persons compared with non-Indigenous persons (see Tables 15 and 16) in most areas of care. However there were statistically significant differences in the use of DVT prophylaxis, unplanned returns to theatre and being treated in critical care units. Aboriginal and Torres Strait Islander persons were slightly less likely to receive DVT prophylaxis, more likely to have unplanned returns to theatre, be treated in critical care units.

A recent publication showed that surgical care, as measured by accepted indicators, was generally equivalent in both groups when looking at just Northern Territory patients.[8]

Table 15: Clinical management improvements needed according to assessors			
Improvement in management of surgical care	**Aboriginal and Torres Strait Islander persons (n=201)**	**Non-Indigenous persons (n=6,257)**	**Risk Ratio (95%CI)**
Preoperative management	10% (20/201)	7.2% (440/6133)	1.39 (0.90-2.12)
Choice of operation	3% (6/197)	2.2% (134/6139)	1.40 (0.62–3.12)
Timing of operation	8% (16/199)	5.6% (345/6148)	1.43 (0.88-2.32)
Improvement in decision to operate	7.5% (15/199)	5.6% (345/6148)	1.34 (0.82-2.20)
Intraoperative	3.6% (7/199)	2.9% (181/6139)	1.19 (0.57-2.50)
Postoperative care	3.6% (7/199)	5.5% (333/6101)	0.64 (0.31-1.33)

Table 16: Issues with postoperative care according to assessors			
Postoperative care	**Aboriginal and Torres Strait Islander persons (n=200)**	**Non-Indigenous persons (n=6,257)**	**Risk Ratio (95%CI)**
Postoperative complications detected	41.6% (60/144)	35.1% (2182/6217)	1.19 (0.97-1.44)
Use of DVT prophylaxis	74.4% (148/199)	83.1% (5130/6177)	0.90 (0.82-0.97)*
Unplanned return to theatre	21.6% (43/199)	15.7% (967/6147)	1.37 (1.04-1.80)*
Unplanned readmission	3.0% (6/199)	3.4% (205/6108)	0.89 (0.40-2.00)
Fluid balance problems	19.1% (19/99)	9.5% (578/6101)	1.00 (0.65-1.56)
Communication	6.6% (13/198)	5.1% (310/6102)	1.29 (0.76-2.21)
Treated in critical care unit	77. 1% (155/201)	68.2% (4255/6237)	1.13 (1.04-1.22)*
Unplanned ICU admission	20.5% (41/200)	17.3% (1049/6078)	1.19 (0.90-1.57)
Different action by surgeon	22.0% (44/200)	17.3% (1049/6078)	1.07 (0.98-1.66)

DVT: deep vein thrombosis; ICU: intensive care unit. *Statistically significant

10.8 ABORIGINAL AND TORRES STRAIT ISLANDER PERSONS AND CLINICAL INCIDENTS

There were no significant differences in the distribution of clinical incidents in Aboriginal and Torres Strait Islander persons compared with non-Indigenous persons (see Table 17). Refer to definitions in Section 9.2.

Table 17: Distribution of clinical incidents

Clinical incident	Aboriginal and Torres Strait Islander persons (n=59)	Non-Indigenous persons (n=1,636)
Area of consideration	74.6% (44/59)	67.7% (1,107/1,636)
Area of concern	11.9% (7/59)	19.3% (316/1,636)
Adverse event	13.6% (8/59)	13% (213/1,636)

11 CONCLUSIONS

The audits of surgical mortality are uniquely positioned to use the extensive information learned during the audit process to promote safer healthcare practices. There is significant value to the Australian health consumer in the audit continuing as a quality assurance activity, including the continued participation of surgeons and the opportunity to enhance and expand the existing data on surgical mortality.

There has been a significant improvement in participation amongst both surgeons and hospitals across most of the regions. As the audit continues to grow and develop, the ability to identify trends across Australia will further add to the ongoing knowledge of the participants, potentially leading to better outcomes for all surgical patients.

Achievements and future directions:

- The audit has achieved widespread acceptance, with a 98% participation rate from surgeons.
- The majority of patients in the audit were emergency admissions with at least one comorbidity.
- DVT prophylaxis use was recorded in 81% of cases (14,144/17,431) in which patients underwent a surgical procedure. Across the regions DVT prophylaxis utilisation varied from 76% to 87% of cases. In only 2% of cases did assessors conclude that the DVT prophylaxis management was not appropriate.
- In the majority of instances those patients expected to benefit from critical care support did receive it. The review process suggested that 1% of patients who did not receive treatment in a critical care unit would most likely have benefited from it.
- Fluid balance in the surgical patient is an ongoing challenge and 6% (1,341/23,292) of patients were perceived to have had poor management of their fluid balance.
- Delay in implementing definitive treatment is still the most frequent clinical management issue. These delays can be due to a number of factors and not all are the responsibility of the treating surgeon. Reasons for delay include geographical issues, diagnostic problems in the emergency department, inappropriate diagnosis, need for transfer, availability of theatre and communication issues. The decision to proceed to surgery and the choice of operative procedure are also high on the list of clinical management issues.
- Cases in which patients experience an adverse event are a key focus of the audit due to the perception by assessors that the treatment provided may have contributed to the patient's death. The proportion of cases with adverse events decreased from 196 (6%) in 2009 to 141 (4%) in 2014. While this change is statistically significant ($p<0.001$) it is only relevant once the two audit periods have a similar proportion of completed cases. A significant proportion of more recent cases are still undergoing assessment, so the figures in 2014 may increase.
- Peer review feedback has been provided directly to individual surgeons, via assessors' comments, on individual cases. This is an essential component of the audit as it provides specific targeted information on a case-by-case basis.
- The ANZASM Clinical Governance Reports are released annually to hospitals that have three or more operating surgeons (to ensure that none of the participants are identifiable). These reports use ANZASM audit data to inform hospitals and government Departments of Health of trend analysis of clinical management events within their hospitals and compared to similar hospitals using both state and national data.
- Seminars have been facilitated based on regional reports and in-depth investigations of the issues identified. These activities have increased the quantity and quality of information disseminated on issues that have greatly affected clinical governance and patient care across the country. Further workshops have been planned for Tasmania, Victoria, Queensland and South Australia during the course of 2015 and 2016.
- The audit will continue to encourage use of the Fellows Interface, the web-based portal for entering SCFs and completing FLAs. An important initiative, the Fellows Interface, minimises data entry time and the risk of errors relating to data entry, while improving turnaround time. Nationally, usage is around 50%. It is expected that a phasing out of the paper-based forms will commence in 2015, necessitating the use of the Fellows Interface. The introduction of compulsory fields will improve the quality of the data.
- The audit will continue to produce the National Case Note Review Booklets twice a year for distribution to surgeons, trainees and other clinical staff involved in patient care. Each audit of surgical mortality contributes to the National Case Note Review Booklet, and the publication continues to be very well received by the surgical community. Some regions also produce their own regional case note review booklets.
- The use of interstate assessors in some regions safeguards the independent peer review process and ensures that second-line cases remain de-identified. This is of particular importance in instances where a case may be well known in a region or where there are very small numbers of surgeons in a particular specialty or sub-specialty.

- Improvements have been made to the SCF that enable the collection of greater detail around patient mortality where infection was present.
- The quality and effectiveness of communication within the clinical team, and with other teams involved in the care of patients, was identified as an area for future improvement and education.
- The audit now includes RANZCOG Fellows. It is encouraging that within 12 months since the last report many of the regions had over 55% participation by gynaecological Fellows.

A greater national awareness and acknowledgment of the value of the audit amongst health professionals should see both increased surgical participation and a greater level of detail provided on forms. In turn, this will enable further in-depth trend analysis and informative reporting.

The RACS and the state and territory departments of health can be proud of this important initiative to promote best surgical practice across the nation.

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BIO-STATISTICAL CONSULTANTS

- Dr Nick Andrianopoulos, Senior Research Fellow, Department of Epidemiology and Preventive Medicine, School of Public Health and Preventive Medicine Monash University.

ANZASM STEERING COMMITTEE MEMBERS

- Professor Guy Maddern (Chair, ANZASM)
- Associate Professor Ian Bennett (Chair, Research, Audit and Academic Surgery)
- Mr Barry Beiles (VASM)
- Professor Peter Zelas, OAM (CHASM)
- Mr Tony Sparnon (Councilor)
- Mr James Aitken (WAASM)
- Mr Glenn McCulloch (SAAPM)
- Dr Cathy Ferguson (Perioperative Mortality Review Committee representative, NZ)
- Dr John North (QASM/ NTASM)
- Mr Rob Bohmer (TASM)
- Dr John Tharion (ACTASM)
- Dr Sue Valmadre (RANZCOG Representative)
- Reverend Anthony Taylor (Consumer Representative)

ANZASM MANAGEMENT

- Associate Professor Wendy Babidge, Research, Audit and Academic Surgery Division
- Ms Pip Coleman, Business and Development Manager, Research, Audit and Academic Surgery Division
- Mr Gordon Guy, Australian and New Zealand Audit of Surgical Mortality, ANZASM
- Ms Veronica Walker, Australian Capital Territory Audit of Surgical Mortality, ACTASM
- Ms Paula Cheng, The Collaborating Hospitals Audit of Surgical Mortality, CHASM
- Ms Therese Rey-Conde, Queensland Audit of Surgical Mortality, QASM/ NTASM
- Ms Sasha Stewart, South Australian Audit of Perioperative Mortality, SAAPM
- Ms Lisa Lynch, Tasmanian Audit of Surgical Mortality, TASM
- Ms Claudia Retegan, Victorian Audit of Surgical Mortality, VASM
- Dr Diana Azzam, Western Australian Audit of Surgical Mortality, WAASM

ANZASM REGIONAL STAFF

- Adeline Nguyen, CHASM
- Alex Oros, CHASM
- Andrew Chen, VASM
- Bruce Czerniec, CHASM
- Dylan Hansen, VASM
- Erin Gilmore, CHASM
- Franca Itotoh, WAASM
- Katie Cocivera, VASM
- Kimberley Cottell, SAAPM
- Jenny Allen, QASM
- Jessele Vinluan, VASM
- Kyrsty Webb, QASM
- Natalie Zorbas-Connell, WAASM
- Ruth Murphy, CHASM
- Sonya Faint, QASM
- Thomas Cloney, VASM

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