Royal Australasian College of Surgeons

TASM
Tasmanian Audit of Surgical Mortality

ANNUAL REPORT 2011

Tasmanian Government

UTAS
FACULTY OF HEALTH SCIENCE
School of Medicine

ROYAL AUSTRALASIAN COLLEGE OF SURGEONS

ANNUAL REPORT 2011

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The information contained in this annual report has been prepared under the auspices of the Royal Australasian College of Surgeons Tasmanian Audit of Surgical Mortality Management Committee, which is a declared quality assurance committee under the Tasmanian *Health Act 1997*.

The information contained in this annual report has been prepared by the Royal Australasian College of Surgeons, Tasmanian Audit of Surgical Mortality Management Committee. The Australian and New Zealand Audit of Surgical Mortality, including the Tasmanian Audit of Surgical Mortality, has protection under the Commonwealth Qualified Privilege Scheme under Part VC of the *Health Insurance Act 1973* (Gazetted 23 August 2011).

TASM Tasmanian Audit of Surgical Mortality

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Chairman's Report

This is the sixth annual report of the Tasmanian Audit of Perioperative Mortality (TASM), covering data from 1 July 2010 to 30 June 2011. The surgical audit is now a national process with each state running its own audit, producing individual reports and combining together to produce a national report. All hospitals and surgeons in Tasmania are participating. Tasmania has been the only state or territory to include gynaecologists from inception and now an agreement has been made to extend this to all other regions. Participation in a surgical audit is now a requirement for the ongoing College continuing education program. Similar to other years, most deaths involve the elderly with comorbidities.

As highlighted in the audit, delay in diagnosis was one of the most common causes of adverse events. Three successful seminars on delay in diagnosis have now been held around the state with over 400 participants to highlight the causes of delay and early recognition of problems. The Department of Health Quality and Safety Unit played a valuable role in enabling these seminars. Requests for second-line assessments and the number of adverse events reported seem to have decreased. The case note review booklet that combines cases with those of other regions is popular and provides valuable lessons. The combined data in the National report will provide more meaningful data.

The Fellows Interface system, providing online access for surgeons to enter their data, has been a great success in Tasmania. It has certainly streamlined the processes of data submission and assessment via electronic means. I encourage my colleagues to continue to use this system, and to consider using it if they have not yet done so. Electronic entry makes deciphering handwriting less of a problem, but as always reliable and complete data entry is essential for accurate conclusions.

I express my sincere gratitude to the participants who also act as first- and/or second-line assessors. This role is vital to the success of the audit, and furthermore average response times for assessments are very satisfactory in Tasmania. I encourage those who have not yet undertaken assessments to consider taking on this role. The more of us who participate as assessors, the lighter the load will be for all involved. I also emphasise that performing assessments is educational in itself, and this is recognised in the continuing professional development program of the College.

Thank you again to the Tasmanian Department of Heath for supporting the audit, the hospitals and surgeons participating and for Ms Lisa Lynch, our Project manager, who ensures the smooth running of the audit.

Rob Bohmer

Chairman

TASM

The Department of Health and Human Services is delighted to provide continuing support to the Tasmanian Audit of Surgical Mortality. The audit, now conducted in each state and territory, has been an important driver of improvements in surgical care across Australia. Tasmania's surgical care continues to improve, and it is to the credit of Tasmania's surgeons that 100% are contributing. Tasmania's public and private hospitals are also to be congratulated for their important contribution to this audit. The department is pleased that so many surgeons and organisations are engaged with this process, and expresses its thanks to the Royal Australasian College of Surgeons for their ongoing commitment to this important work.

The Department's Service Quality and Improvement Unit has been delighted to work closely throughout 2012 with the TASM audit in the provision of a number of workshops for clinical staff, and looks forward to collaborating on further workshops in 2013. The department remains committed to supporting TASM in 2013.

Grant Phelps

Medical Director Service Quality and Improvement

Abbreviations

ANZCA	Australian and New Zealand College of Anaesthetists
ANZASM	Australian and New Zealand Audit of Surgical Mortality
ASA	American Society of Anaesthesiologists
DHHS	Department of Health and Human Services
DVT	deep vein thrombosis
ESWL	extracorporeal shock wave lithotripsy
FRACS	Fellow of the Royal Australasian College of Surgeons
GI	gastrointestinal
HDU	high dependency unit
ICU	intensive care unit
IMG	international medical graduate
INR	International Normalized Ratio
NSW	New South Wales
Obs & Gynae	obstetrics and gynaecology
RAAS	Research, Audit and Academic Surgery Division
SCF	surgical case form
SET	Surgical Education and Training
SPSS	Statistical Package for Social Sciences
TAS	Tasmania
TASM	Tasmanian Audit of Surgical Mortality

Executive summary

Background:

The Tasmanian Audit of Surgical Mortality (TASM) is an external, independent, peer-review audit of the process of care associated with surgically related deaths in Tasmania.

TASM is funded by the Tasmanian Department of Health and Human Services (DHHS) and has statutory immunity under both state and federal legislation.

In 2005 the Royal Australasian College of Surgeons took responsibility for oversight of the Western Australian Audit of Surgical Mortality project. Subsequently the College established the Australian and New Zealand Audit of Surgical Mortality (ANZASM). Similar mortality audits have been established in South Australia, Queensland, Victoria, Australian Capital Territory and Northern Territory. New South Wales (NSW) provides comparable data to ANZASM but is independently managed by the Clinical Excellence Commission of NSW.

Audit numbers:

- There were 159 deaths in this reporting period (compared to 189 in 2010); 153 surgical case forms (SCF) were returned to TASM and six remain outstanding, awaiting completion of the audit process. The return rate is 96%.
- Twenty cases were terminal care and therefore were excluded from the audit process.
- Therefore, a total of 133 cases were assessed (these cases provide the data for this report).

Surgeons

- All consultant surgeons in Tasmania are participating in TASM. It is important to acknowledge the surgeons in Tasmania for their participation and commitment in the audit process.

Hospitals

- All 13 Tasmanian private and public hospitals currently participate in TASM.
- Of all cases, 88% were admitted as emergencies, of which 65% had an operation died within 30 days.
- All elective admission patients had an operation within 30 days of death.
- A total of 26% of all patients had no operation but died.
- After their first operation, 11% of patients were reported to have had unplanned return to theatre.
- Patients were transferred from one hospital to another in 23% of cases (refer to section 3.2.2 for further details).

Patients

- Males accounted for 48% of all cases and the median age was 76 of the total of audited cases.
- A total of 93% of cases presented with at least one significant comorbidity (refer to section 3.3.8 for further details).

- A total of 9% of cases were referred for second-line assessment (case note review). Nationally the rate is 12% (ANZASM National Report 2010).
- There were 47% of cases which had an American Society of Anesthesiologists (ASA) grade of 4 or above.

Cases with clinical incidents

- Fifteen cases (11%) were associated with areas of concern or adverse events.
- Three cases (2%) were associated with an adverse event which caused the death and was considered probably preventable.

Main messages:

- The majority of patients reported in this audit were elderly and in general:
  - > had several pre-existing comorbidities
  - > were at considerable risk with surgery
  - > had undergone emergency surgery.
- There are several recognised characteristics associated with high risk of death at surgery. Many patients in this audit had more than one high-risk factor at the time of or following surgery. For example:
  - > In 93% of cases, patients had at least one serious comorbidity.
  - > In 67% of cases, patients were at least 71 years old.
  - > In 17% of cases, patients had unplanned admissions to the intensive care unit (ICU) following surgery.
- In 39% of postoperative cases, patients experienced complications. In the 2nd National report 33% of patients experienced further complications.
- Management could have been improved in preoperative and postoperative care, according to assessors, but rarely was there a problem with intraoperative care.
- Timing in surgical management (delays in surgery, delay to diagnosis) could also be improved.
- The audit should continue to review falling surgical mortality rates to ascertain whether the audit process has contributed to the reduction of surgical mortality in Tasmania. This could identify trends in which further perioperative improvements can be made in collaboration with the Department.

1. Introduction

Key points:

- The Tasmanian Audit of Surgical Mortality (TASM) audits surgically related deaths in Tasmania.
- This report contains data from 1 July 2010 to 30 June 2011, as well as comparisons with data from earlier years for some data points.
- The TASM process involves self-reporting by surgeons and peer review by first- and second-line assessors.
- TASM exists to inform, educate, facilitate change and improve practice. It achieves this by providing expert analysis and feedback to surgeons, hospitals and the community.

1.1 Background

The Tasmanian Audit of Surgical Mortality is an external and independent peer-review audit of the process of care associated with deaths occurring during surgical admissions in Tasmania. The audit is funded by the Department of Health and Human Services (DHHS) Tasmania and its methodology is based on the Scottish Audit of Surgical Mortality.

The Royal Australasian College of Surgeons oversees, manages and provides infrastructure support to the audit. In 2005 the College formed the Australian and New Zealand Audit of Surgical Mortality (ANZASM) with the purpose of extending mortality audits to all Australian states and territories, which was achieved in 2010.

1.2 Project governance and confidentiality

The governance structure of ANZASM is illustrated in Figure 1. The regional TASM governance structure is illustrated in Figure 2.

The Royal Australasian College of Surgeons Tasmanian Audit of Surgical Mortality Management Committee has been gazetted as a Quality Assurance Committee under the Tasmanian *Health Act 1997* and also has protection under the Commonwealth Qualified Privilege Scheme under Part VC of the *Health Insurance Act 1973* (gazetted 23 August 2011).

Figure 1: Governance structure of the Royal Australasian College of Surgeons, ANZASM and TASM

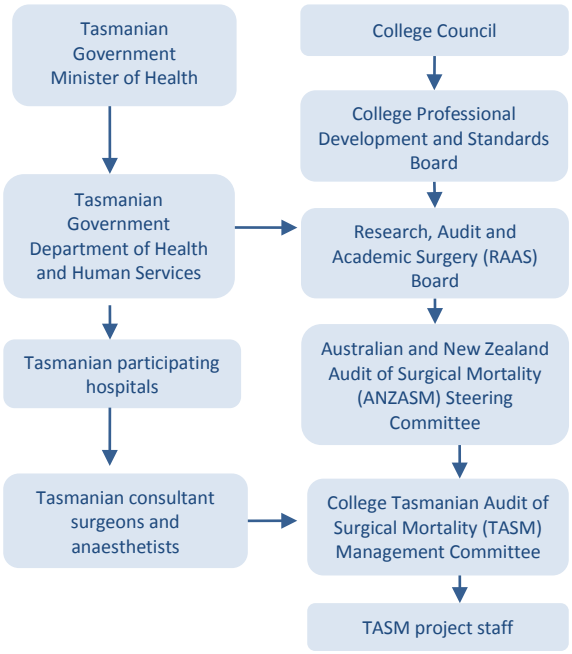
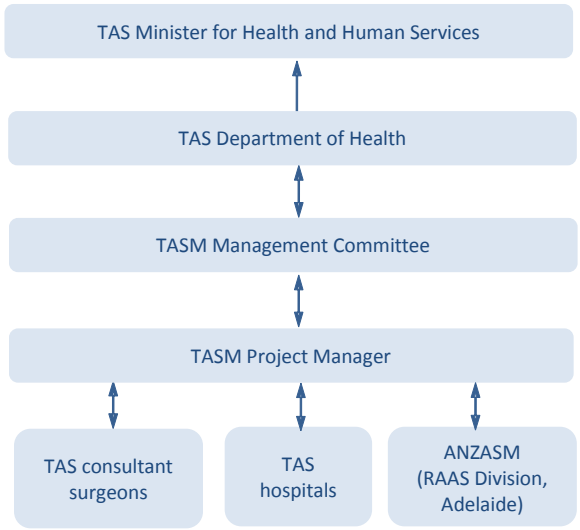


Figure 2: Regional audit governance structure



TAS: Tasmania;
TASM: Tasmanian Audit of Surgical Mortality;
ANZASM: Australian and New Zealand Audit of Surgical Mortality

1.3 The audit process

1.3.1 Notification of deaths

TASM audits public and private hospital deaths that occurred when a surgeon was involved in the management of a patient (i.e. where the patient was admitted under a surgeon or transferred to a surgeon's care during that admission), whether or not the patient underwent a surgical procedure.

The medical records departments of the participating hospitals, both public and private, notify TASM of all surgically related deaths. Each participating hospital is aware of TASM's inclusion criteria (see 1.3.4) and reports those deaths weekly or monthly (via secure email).

1.3.2 Methods

TASM receives notification, enters that data in a secure database and then sends a surgical case form (SCF) to the consultant surgeon for completion. Events associated with the death are reported by the surgeon on the SCF against the following criteria:

- *area for consideration* — where the clinician believes an area of care could have been improved or different, but recognises that there may be debate about this
- *area of concern* — where the clinician believes that an area of care should have been better
- *adverse event* — an unintended 'injury' caused by medical management, rather than by the disease process, which is sufficiently serious to:
  - > lead to prolonged hospitalisation
  - > lead to temporary or permanent impairment or disability of the patient at the time of discharge, or
  - > contribute to or cause death.

The consultant surgeon is responsible for the completion of the SCF and returns it to TASM.

The SCF is then de-identified and sent to a different surgeon for peer review or first-line assessment. The first-line assessor is a consultant surgeon of the same specialty who may be from a different hospital to the original surgeon. The audit allows for cases to be sent inter-state for review when deemed necessary in certain sub-specialties.

The first-line assessor determines whether the case should undergo further assessment (second-line assessment), which involves reviewing the medical records of the case. The first-line assessor may also close the case at this stage. The first-line assessor may find no clinical incidents, or may find clinical incidents which do not need further assessment.

Cases undergo a second-line assessment if:

- an area of concern has been identified or an adverse event is thought to have occurred during the clinical care of the patient that warrants further investigation
- there is insufficient information on the SCF for the assessor to reach a conclusion

- a report could usefully draw attention to 'lessons to be learned', either for clinicians involved in the case, or as part of the collated case note review booklet, for wider distribution within the surgical community.

The second-line assessor is a senior consultant surgeon of the same specialty but from another hospital to the original surgeon. On rare occasions, there is a lack of assessors in a particular specialty so a process of interstate assessments is practised for those cases, under the umbrella of ANZASM.

1.3.3 Providing feedback

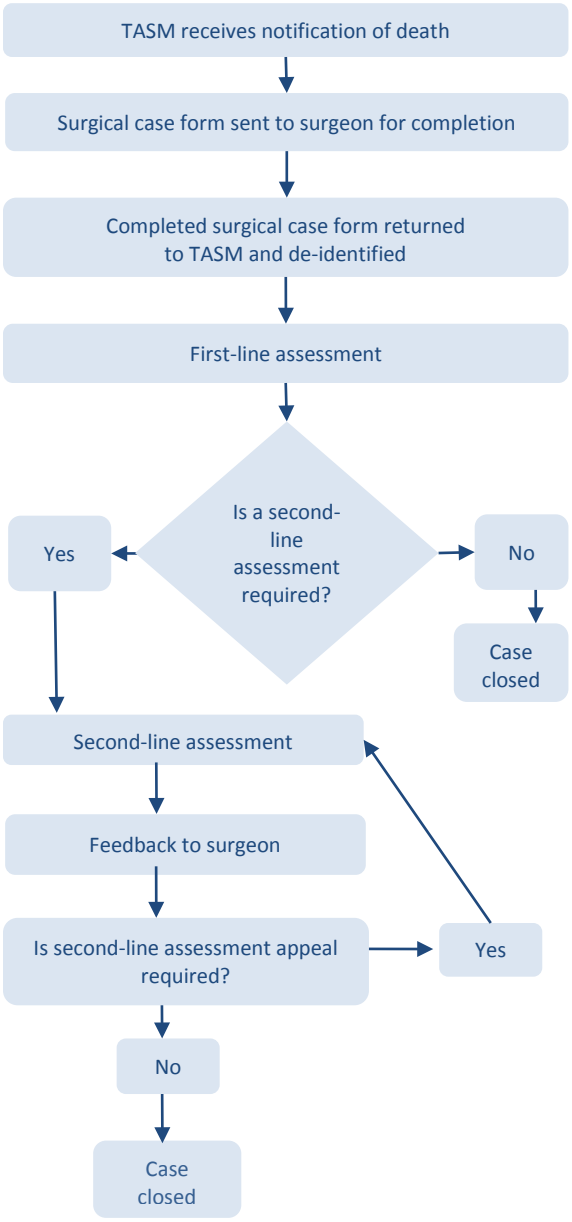
Surgeons receive feedback from first-line assessors about each of their cases through TASM. They also receive extensive reports after each second-line assessment. TASM provides guidelines for assessors when completing such forms.

In addition, aggregated feedback in the form of annual reports and case note review booklets are disseminated to all surgeons and hospitals via the College website. The public can only access the annual report via the website. This aggregated feedback and related clinical events are not linked to individual patients, surgeons or hospitals. The process is managed by the TASM Project Manager following ANZASM guidelines and is coordinated through a secure database.

TASM provides feedback in the following ways:

- Surgeons receive written feedback from first- and second-line assessors (de-identified) on their TASM cases.
- Hospitals participating in TASM may request reports on aggregated, de-identified data relating specifically to their hospitals and comparing them to the averages of other hospitals.

Figure 3: The Tasmanian Audit of Surgical Mortality (TASM) methodology



TASM: Tasmanian Audit of Surgical Mortality

Note: Alternatively, surgeons can enter surgical case forms and first-line assessments online using the Fellows Interface.

1.3.4 Audit inclusion and exclusion criteria

TASM includes all deaths that occurred in a participating hospital when:

- the patient was under the care of a surgeon (surgical admission), whether or not an operation was performed

- the patient was under the care of a physician (medical admission), and subsequently underwent a surgical procedure.

(Note: Terminal care cases are excluded from the full audit process.)

If a case does not fulfil either of the above criteria, it is excluded from the audit by the notifying hospital. If TASM is notified of a death and decides it does not fall within the inclusion criteria, the death is excluded.

TASM also includes cases that fall under the care of specialists from the following colleges:

- The Royal Australasian College of Dental Surgeons
- The Royal Australian and New Zealand College of Obstetricians & Gynaecologists
- The Australian and New Zealand College of Anaesthetists
- The Royal Australian and New Zealand College of Ophthalmologists.

1.4 Reporting conventions

1.4.1 Terminology

Surgeons and assessors are asked to:

- give their opinion as to whether the incident was preventable, under the categories:
  - > definitely
  - > probably
  - > probably not
  - > definitely not

(For this report, both the categories of 'definitely' and 'probably' are referred to as being preventable.)

- indicate who the incident was associated with, categorising this information as:
  - > audited surgical team
  - > another clinical team
  - > hospital
  - > other
- report on the impact of the incident on outcome, on whether the event:
  - > made no difference to outcome
  - > may have contributed to death
  - > caused the death of a patient who would otherwise have been expected to survive.

1.4.2 Assessor opinion

The areas for consideration, areas of concern and adverse events contained in this report were events ascribed to the case by either the first-line assessor or the second-line assessor (referred to as 'assessors').

The categorisation of the severity of the event, the effect on outcome, and the team or location the event was associated with, are the opinions of the assessors.

1.4.3 Focus of reporting

TASM reports focus primarily on areas of concern and adverse events (see 1.3.2).

Areas for consideration are excluded from this analysis because they usually make no difference to outcome and are simply an indication that there were different options. However, areas for consideration are included in the data collection process to facilitate reporting of 'less serious' events, which is important for improving overall patient care.

Some cases were associated with more than one clinical incident. In this situation, where analysis of clinical incidents was reported by case, the most serious incident was ascribed to the case.

1.4.4 Missing data

Numbers in parentheses in the text (n) represent the number of cases analysed. Not all data were complete; therefore, the total number of cases used in different sections of the analysis varies.

1.4.5 Data analysis

TASM analysed areas of concern or adverse events ascribed to each case by assessors. Data is encrypted in the database with Secure Sockets Layer certificates. This data is sent to and stored in a central Structured Query Language server database which includes a reporting engine. All transactions are time stamped. All changes to audit data are written to an archive table enabling a complete audit trail to be created for each case.

An integrated workflow rules engine supports the creation of letters, reminders and management reports. This system is designed and supported by Alcidion Corporation (Adelaide).The Project Manager enters all data from each TASM form. Alternatively, surgeons may enter the surgical case forms and first-line assessments online using the Fellows Interface.

The most frequent data-entry difficulty is found at question 9 on the SCF. Question 9 is a free-form question and contains at least a paragraph of handwritten information, which can sometimes be difficult to read and interpret.

Data are downloaded from the secure database into Microsoft Excel 2010 spread sheets and then analysed using IBM Statistical Package for Social Sciences (SPSS) Version 19. Data are cleaned using logic testing before analysis. Variables are checked for extreme or illogical values and corrections are made to the original data. Once cleaned, the data are downloaded again before analysis. Twelve tables are downloaded and copied into SPSS. A key variable is used that is common to all tables.

Generally, simple frequencies and cross tabulations are used after selecting for the correct criteria for the particular analysis. When indicated, data are checked against the original SCF and assessment forms. Medical records departments, surgeons, the Coroner's Office reports and the Chairman are all resources used by TASM to maintain data integrity.

Qualitative analysis is done using standard techniques. The Project Manager and Chairman independently classify all qualitative information into groups. These groupings are then compared and any differences discussed, until consensus is reached.

2. Audit 2011

2.1 Overview of TASM 2011

Key points:

- A total of 159 surgically related deaths were reported to TASM from 1 July 2010 to 30 June 2011.
- The number of deaths under the care of a surgeon showed a decrease from the previous report of 189 deaths.
- All 130 Tasmanian consultant surgeons (100 %) are involved in the audit process.
- The SCF return rate at census date for those participating surgeons is 96%.
- TASM's process is consistent with all ANZASM audits and allows for independent peer review of all cases.
- As all Tasmanian surgeons are participating, where possible cases were assessed by a surgeon who did not work in the hospital in which the patient died.

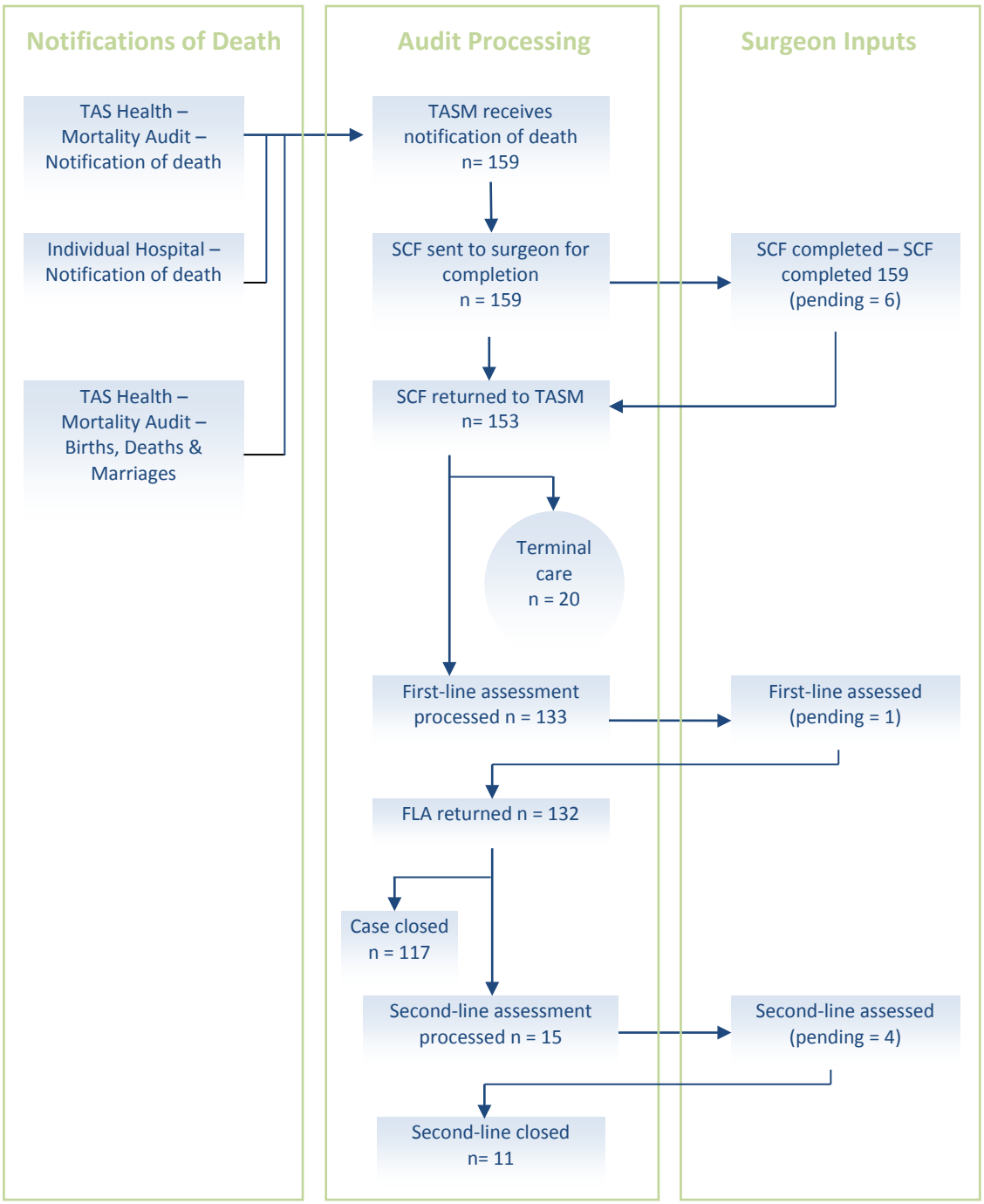
The TASM 2011 Annual Report includes data collected from 1 July 2010 to 30 June 2011. As this audit is a work in progress, some assessments from 2010 were returned to TASM during 2011. Therefore, this report also includes finalised data from the TASM 2010 Annual Report.

In addition, some cases were reported in 2011 but not completed during the audit period. At the end of the reporting period:

- Six SCFs are pending.
- One first-line assessment is pending.
- Four second-line assessments are pending.

There will always be TASM forms pending. This reflects the continuous nature of the audit with surgeons interacting with TASM on a regular basis.

Figure 4: Populated flow chart for 2011



TAS = Tasmania; SC = surgical case; SCF = surgical case form.

3. Results

3.1 Surgeons

TASM's role is to inform, educate, facilitate change and improve practice by providing feedback to surgeons.

Key points:

- All 130 Tasmanian consultant surgeons are participating in TASM.
- Agreement to be a first- and/or second-line assessor in the audit has continued to increase.
- Of the surgeons, 64% (83/130) are Fellows of the Royal Australasian College of Surgeons.
- Participation in the audit is now considered mandatory for continuing professional development recertification.
- The other 36% of surgeons (47/130) are made up of obstetricians and gynaecologists, ophthalmologists and international medical graduates (IMGs) 'area of need' specialists on short- and long-term contracts.
- Surgeon participation is now mandatory in most hospitals in Tasmania and is part of the surgeon credentialing process.

3.1.1 Surgeon participation by specialty

The specialty distribution of participating surgeons is seen below in Figure 5.

Figure 5: Specialty of participating surgeon

Comment

Surgeons are considered to be participating when they submit an SCF or submit an agreement of consultant participation form.

Many of these surgeons have never been involved with a surgical death which meets the TASM criteria. Due to the inclusion of visiting surgeons on short-term contracts or locum appointments, numbers will fluctuate. Numbers in Figure 6 only relate to the reporting period.

Figure 6: Number of deaths notification by specialty

3.1.2 Surgeon completion of surgical case forms

The proportion of SCFs returned by surgeons is high compared to the national average (74%) in 2010. For deaths reported from July 2010 to June 2011, 96% (153/159) of SCFs were returned by the end of December 2011.

3.1.3 Grade of surgeon completing the surgical case form

Table 1 outlines the grade of surgeon completing the SCF. It is pleasing to note that advanced surgical trainees are exposed to the TASM process; however, it is equally important to ensure that there is 'signoff' by the consultant surgeon involved.

Table 1: Grade of surgeon completing the SCF

Grade of surgeon completing form	%
Consultant	86%
Service registrar	6%
IMG	4%
SET trainee	4%

3.1.4 Grade of surgeon operating

Table 2 highlights the proportion of consultants operating on TASM cases.

Table 2: Grade of surgeon operating

	Deciding	Operating
Consultant	95%	74%
Service registrar	0%	5%
IMG*	0%	0%
SET** Trainee	4%	14%
Missing data	1%	7%

*IMG = international medical graduate;

**SET = Surgical Education and Training.

3.1.5 In retrospect

When surgeons were asked, 'In retrospect, would you have done anything differently?' In 13% (16/127) of surgeons answered that they would have done something differently.

Surgeons' answers were analysed using standard qualitative analysis procedures. The most common responses were:

- queried the decision to operate (5)
- admitted under a medical team (2)
- administered adequate anticoagulation (2)
- earlier operation
- changed intraoperative technique
- deferred operation
- kept patient overnight for observation
- postoperative surgical or intensive care unit (ICU) review overnight
- improved communication between surgeon and nursing staff.
- aggressive change of central venous line and catheters.

3.2 Hospitals

Staff members from patient information management services and medical records departments notify TASM of all surgically related deaths. Each participating hospital is aware of TASM's inclusion criteria (see 1.3.4) and reports those deaths weekly or monthly (via password–protected email).

3.2.1 Hospital participation

Key points:

- Four public and nine private Tasmanian hospitals participate in TASM.
- In total, 23% (30/128) of all cases were transferred from one hospital to another. (There were no data about transfers for 31 cases, which includes the pending cases.)

Participating hospitals

13 Tasmanian public and private hospitals are currently participating:

- Calvary Health Care Tasmania
  - > Lenah Valley Campus
  - > St John's Campus
  - > St Luke's Campus
  - > St Vincent's Campus
- Hobart Day Surgery
- Hobart Private Hospital
- Launceston General Hospital
- Mersey Community Hospital
- North West Private Hospital
- North West Regional Hospital
- Royal Hobart Hospital
- St Helen's Private Hospital
- The Eye Hospital.

3.2.2 Transfers

Patient transfer to centres with greater surgical capability is fundamental to good patient care in a regionalised state such as Tasmania.

During 2011:

- In total, 23% (30/128) of all cases were transferred from one hospital to another. (There were no data about transfers for 31 cases.)
- There were 70% (112/159) of all deaths in two hospitals, reflecting the high volumes of surgery that occur in these hospitals.
- The largest hospitals – The Royal Hobart Hospital and the Launceston General Hospital – have tertiary facilities.
- The median distance transferred was 200 kilometres.

3.2.3 Hospital admissions

- Of all hospital admissions, 21% of cases were admitted to private hospitals and 79% to public hospitals.
- Of all cases, 88% (135/153) were emergency admissions (see Figure 7). This is slightly down from 90% in the 2010 report. (There is no admission data on the 6 pending cases.)
- Of all emergency admissions, 85% (115/135) had operations within the audit period.
- Twelve per cent (18/153) of cases were elective admissions.

Figure 7: Emergency and elective admissions

3.2.4 Delays in main surgical diagnosis

The number of delays in the main surgical diagnosis recorded per year from 2006 to 2011 can be seen in Table 3.

Table 3: Delays in main surgical diagnosis

Year	No. delays
2006	10 cases
2007	18 cases
2008	13 cases
2009	12 cases
2010	6 cases
2011	5 cases

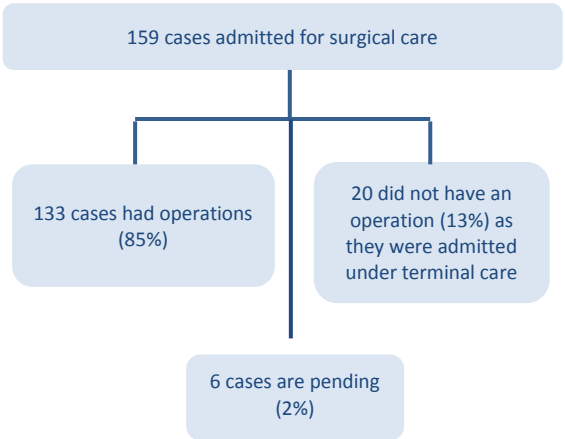
The main reasons for the delays were:

- the medical unit – transfer of the patient to ICU
- the surgical unit – misinterpretation of results
- a medical colleague – transfer of the patient for surgical review
- the medical unit – provide adequate assessment of patient and falls risk
- the emergency department – diagnose and evaluate CT (computed tomography) scans.

3.2.5 Cases with operations

Figure 8 shows the proportion of cases that had an operation. In total, 159 cases were audited by TASM. It should be noted that some had more than one operation.

Figure 8: TASM operative and non-operative cases



Emergency admissions

In total, 85% (115/135) of emergency admissions underwent operations. Of those patients:

- In 17% (19/115) of cases, patients had scheduled emergency operations (> 24 hours after admission).
- In 32% (37/115) of cases, patients had an emergency operation (< 24 hours).
- Patients in 11% (13/115) of cases had an immediate operation (< 2 hours).
- A total of 6% (7/115) of patients underwent elective operations. (There was a change in their admission status).
- There was missing data in 34% (39/115) of cases.

Elective admissions

All 18 elective admissions underwent operation.

3.2.6 Cases where surgery was not performed

- In 26% (34/133) of all cases, patients had no operation (20 terminal care admissions).
- In 15% (20/133) of emergency admissions cases, no operation was performed.
- All elective admissions underwent operation.
- The reasons given for not having an operation were:
  - > An active decision was made by the consultant surgeon not to operate (n=20).
  - > A decision was made to limit treatment (n=5).
  - > It was not a surgical problem (n=7).
  - > The patient refused the operation (n=5).
  - > Rapid death occurred (n=11).

Two or more reasons may have been assigned to a case.

3.2.7 Time in hospital before death

- The median length of stay in hospital was eight days, with the range <1 day to 182 days (n=159).
- In 29% (46/159) of cases, patients were in hospital for <1 to 2 days (see Figure 9).

Figure 9: Time in hospital before death

3.2.8 Use of intensive care or high dependency units

The treating surgeons and assessors were asked, 'Was ICU/HDU (high dependency unit) used?', and 'If not, should it have been used?' Table 4 outlines the key responses.

Table 4: Use of ICU or HDU

Was ICU/HDU used? **Surgeons stated:**	**Percentage of cases (%)**
ICU/HDU was used	58%
If not, should ICU/HDU have been used? **Assessors' opinions:**	**Percentage of cases (%)**
ICU should have been used	0%
HDU should have been used	0%

ICU: intensive care unit; HDU: high dependency unit.

When asked the question 'Was the surgical team satisfied with the critical care unit (ICU or HDU) management of this patient?', in 96% (71/74) of cases surgeons felts that they were happy with the care.

However, in three cases surgeons were not satisfied with the care and responded that:

- The patient was a high risk candidate with known very low ejection fraction (20%) and borderline renal function. The dialysis could have been started earlier, although it may not have altered the ultimate course.
- Very aggressive oral feeding postoperatively resulted in aspiration.
- The ICU registrar failed to adequately review the patient.

3.3 Patients

The patients whose deaths were audited by TASM were predominantly elderly, with multiple and significant comorbidities, and had been admitted for emergency surgery.

The patient characteristics in 2011 are similar to the patient characteristics stated in the 2010 Annual Report. Further details are presented below.

3.3.1 Demographics

- In total, 159 deaths were reported to TASM in the study period:
  - > In total, 153 (96%) SCFs had been completed by June 2011.
  - > The median age at death was 76 years.
  - > Forty-eight per cent of cases were males.
  - > In total, 47% had an American Society of Anesthesiologists (ASA) grade of at least 4.
  - > At least 92% had one significant comorbidity that surgeons considered could contribute to death.

3.3.2 Age distribution

Figure 10 displays the age distribution of patients for cases notified by hospitals (n=159).

- The median age of patients in 2011 was 76 years, with a range of 0 years to 99 years.
- The age mode (the most frequent age) was 81 years, up from 78 years in the 2010 report.
- There were 18 patients aged between 91 and 99 years.

Figure 10: Age distribution by gender

Comment

Figure 10 indicates the age and sex distribution of all reported cases. Patients between the age of 71 and 90 years account for approximately 54% of all cases. The 81-90 year range remains the predominant group in the sample. Males had the highest number of deaths in the 61-80 age range whereas females had the most number of deaths in the 81 plus year age range.

3.3.3 Gender distribution

Figure 10 indicates the gender distribution of all reported cases:

- A total of 48% were male.
- A total of 52% were female.

3.3.4 Patients by specialty of surgeon

Table 5 shows the proportion of patients treated by surgeons of different specialties.

Table 5: Patients by specialty of surgeon

Specialty	Frequency	%
Cardiothoracic surgery	2	1
ENT(OHN)	2	1
General surgery	76	49
Neurosurgery	29	18
O & G*	2	1
Ophthalmology	1	0
Orthopaedic surgery	29	18
Paediatric surgery	2	1
Plastic surgery	5	4
Urology	8	5
Vascular surgery	2	11
Total	**159**	**100**

ENT: ear, nose and throat;
O & G: obstetrics and gynaecology;
OHN: otolaryngology, head and neck.

General surgery, Neurosurgery and Orthopaedic Surgery reported the most deaths, and these specialties also have the highest workloads due to the correlation with the number of surgeons within that specialty and/or considerable major trauma cases.

3.3.5 American Society of Anesthesiologists (ASA) grades

The American Society of Anesthesiologists (ASA) grade (see Table 6) is an internationally recognised classification of perioperative risk. An ASA grade is assigned to a Tasmanian hospital patient before an operation..

Table 6: ASA grade definitions

ASA grade	Characteristics
1	A normal healthy patient
2	A patient with mild systemic disease
3	A patient with severe systemic disease which limits activity, but is not incapacitating
4	A patient with an incapacitating systemic disease that is a constant threat to life
5	A moribund patient who is not expected to survive 24 hours, with or without an operation
6	A brain dead patient for organ donation

Figure 11 profiles the ASA grade of all TASM cases. Seventy-seven per cent (95/123) of all patients who died had an ASA grade of 3 or higher.

Figure 11: American Society of Anesthesiologists grades

Note: Total number of cases (n)=123. Missing data in 29% (36/123) of cases.

Comment

A large proportion (47%) of patients had an ASA grade greater than or equal to 4, indicating that a moderate to severe degree of systemic disease was present at the time of treatment (data not shown).

3.3.6 Anaesthetic-associated deaths

Four per cent of deaths were reported by the surgeon to be associated with the anaesthetic and 4% to be possibly associated with the anaesthetic.

TASM links these deaths with the anaesthetist and completes a similar audit process to that described above. These results are reported to the National Mortality Committee of the Australian and New Zealand College of Anaesthetists (ANZCA), which publishes a triennial report based on mortality data forwarded from each state. The latest triennial report can be found at anzca.edu.au, entitled “Safety of Anaesthesia - A review of anaesthesia related mortality reporting in Australia and New Zealand 2006-2008”.

3.3.7 Malignancy

- Malignancy was present in 29% (38/132) of all the cases. This is up from 21% in the 2010 report. Malignancy contributed to death in 87% (33/38) of those cases. (Malignancy did not contribute to the death in 11% of cases and it was unknown if it contributed in 2% of cases.)
- Malignancy was present in 34% (33/98) of all cases who had operations.
- Malignancy was present in a higher proportion of **elective** cases having operations: 67% (12/18) compared with 23% (26/114) of emergency cases having operations.

3.3.8 Comorbidities

Surgeons are asked to record all known comorbidities (coexisting medical conditions) additional to the primary medical (presenting) problem. The frequency of multiple comorbidities in individual patients per year is provided in Table 7. Ninety-three per cent (123/132) of all cases (emergency and elective) admitted for surgical care had comorbidities that increased the risk of death before surgery. Only 9 cases had no comorbidities.

In Figure 12 the types of comorbidities are presented by frequency. (The most common comorbidity present was cardiovascular disease, found in 48% of all cases.)

Figure 12: Types of comorbidities present by frequency

* 'Other' comorbidities included chronic malnutrition, alcohol abuse, dementia, Ehlers-Danlos syndrome and cerebral palsy.

Table 7: Types of comorbidities present by frequency (2006-2011)

	2006	2007	2008	2009	2010	2011	Total
Cardio	82	78	97	78	91	60	**486**
Respiratory	11	13	17	12	13	15	**81**
Renal	2	5	2	3	6	2	**20**
Hepatic	1	4	0	3	1	4	**13**
Neuro	6	3	6	8	10	15	**48**
Advanced malignancy	3	6	5	10	7	6	**37**
Diabetes	3	0	1	0	0	0	**4**
Obesity	0	1	2	1	1	0	**5**
Age	4	4	9	9	16	17	**59**
Other*	8	4	2	0	2	4	**20**

* 'Other' comorbidities included chronic malnutrition, alcohol abuse, dementia, Ehlers-Danlos syndrome and cerebral palsy.

The 7% (11/159) who did not have comorbidities present but who died were predominantly:

- neurosurgical and general surgical patients
- females
- emergency admissions
- at considerable or expected risk of death
- in hospital for an average of five days.

3.3.9 Risk of death before surgery

Surgeons were asked to rate the overall risk of death (before any surgery) for each patient:

- It was noted that 43% were at considerable or more risk, according to the admitting surgeons.
- Eight patients were recorded as being at minimal or small risk. These patients are listed in Table 8.

Table 8: Minimal-risk patients (cause of death)

Cause of death	Number of patients
Cardiac ischaemic secondary to intra-abdominal bleed	1
Respiratory failure	2
Postoperative acute myocardial infarction	1
Ischaemic cerebral infarct	1
Acute cardiorespiratory failure	1
Metastatic gall bladder cancer	1
Aspiration and infarction	1

See Figure 13 for the risk of death distribution

Figure 13: Risk of death distribution (%)

Note: Missing data in 4% (4/97) of cases.

Comment

The overall risk of death before any surgery was given for 97 cases.

3.3.10 Typical patient

The 'typical patient' who died after surgically related care in hospital:

- was female
- was approximately 76 years of age
- was in hospital for less than two days
- had no malignancy present
- had an incapacitating disease that was a constant threat to life on admission to hospital
- had deep vein thrombosis (DVT) prophylaxis
- had an operation
- did not have a postoperative complication
- did not need improvement in management before, during or after the operation.

3.4 Classification of cases

3.4.1 Postoperative complications

The frequencies of postoperative complications recorded from 2006 to 2011 can be seen in Table 9.

Table 9: Postoperative complications

Postoperative complications	2006	2007	2008	2009	2010	2011
	%	%	%	%	%	%
Post-operative complications	38	38	46	39	41	39
Delay to recognise complications	10	17	16	10	14	8
Return to theatre	13	11	15	13	12	11
Unplanned admission to ICU	18	13	17	14	14	17
Hospital readmission	9	8	3	2	5	3
Fluid balance issue	8	5	7	7	6	7

ICU: intensive care unit

The most recent national figure for postoperative complications is 33%[1]. The national figure for fluid balance issues is 10%. The significance of these complications in relation to the eventual outcome was not stated in the national report. Significance will of course vary from minor (with no effect on outcome) to major (leading to death).

Complications

- Several cases had more than one postoperative complication.
- There were 38 postoperative complications:
  - > procedure-related sepsis (1)
  - > significant postoperative bleeding (3)
  - > small bowel anastomotic leak (1)
  - > colorectal anastomotic leak (1)
  - > pancreatic/biliary anastomotic leak (1)
  - > tissue ischaemia (2)
  - > vascular graft occlusion (1)
  - > other 28, including multiples of some of these: aspiration pneumonia, pharyngeal perforation, perforation of hepatic flexure colon, gastrointestinal bleed, ischaemic bowel sigmoid colon stump, DVT and pulmonary embolism, septicaemia congestive cardiac failure, ischaemic stroke, failure to heal, respiratory failure, acute myocardial infarction, brain death, haemorrhage on commencing the procedure, cerebrovascular accident, wound breakdown (partial and total).

[1] The Australian and New Zealand Audit of Surgical Mortality, ANZASM *National Report 2010*, North Adelaide: Royal Australasian College of Surgeons, 2010. Available from http://www.surgeons.org/ANZASM.

3.4.2 Prophylaxis of thromboembolism

The treating surgeon is asked to record if DVT prophylaxis was given and what prophylaxis was actually used (see Figure 14). If not given, the reason it was withheld is requested.

In 90% (95/105) of all cases, patients had DVT prophylaxis. (There was missing data in 28 cases.)

- Ten per cent (11/105) of all cases did not have DVT prophylaxis.
- In total, 79% (77/97) of operated cases had DVT prophylaxis.
- In 21% (20/97) of operated cases, patients either did not have DVT prophylaxis or the surgeon did not know whether the patient had DVT prophylaxis.

Of those patients who did not receive DVT prophylaxis, the main reasons for withholding was:

- actively intracerebral & intraventricular bleeding
- brain death
- withheld due to age and comorbidities
- due to active bleeding
- patient for palliation (3)
- patient on warfarin with International Normalized Ratio (INR) 3.5 with active intracerebral bleed
- patient referred to palliative team
- patient with life-threatening epistaxis
- short operation only 10 minutes duration
- terminal situation (3)
- was on Clopidegral prior to admission and no reason was given during admission.

Figure 14 indicates the number of patients who had DVT prophylaxis, according to the method used.

Figure 14: DVT prophylaxis

3.4.3 Post-mortem

- Only 6% (8/130) of cases had a postmortem performed by the coroner.
- In 65% (84/130) of cases a postmortem was not performed.
- There were 4% (5/130) of cases in which a postmortem was performed by the hospital.
- In 2% (3/130) of cases, a postmortem was refused.
- For 23% (30/130) of cases, the postmortem status was unknown.
- There was missing data in three cases.

3.4.4 Management of cases

In cases that had clinical incidents, surgeons and assessors felt that care sometimes could have been improved in particular areas (see Table10).

Table 10: Need for improvement in management of cases that had clinical incidents

Area	Surgeons (n=98) %	First-line assessors (n=133) %	Second-line assessors (n=15) %
Preoperative management	1	7	5
Decision to operate	4	7	0
Choice of operation	1	5	2
Timing of operation	2	1	1
Intraoperative care	1	1	0
Experience of surgeon deciding	0	1	0
Experience of surgeon operating	0	1	0
Postoperative care	5	9	3

Comment

Most commonly, improvement could have occurred in non-operative areas (preoperative care and postoperative care, timing of operation and choice of operation); within those areas preoperative care improvements and postoperative care were the most commonly cited.

3.5 Clinical incidents

This section describes clinical incidents beyond the context of the individual case. It is important to have an epidemiological overview of clinical incidents and their levels of importance. The limitation in this data is that no numbers could be obtained for source populations. Therefore, comparisons are difficult and the data becomes simply observational. TASM hopes that in the future this will be rectified, so that more meaningful and useful information can be obtained.

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

There are two possible outcomes: either the death was a direct outcome of the disease process and the clinical management had no impact on the outcome, or there was a perception that aspects of patient management may have contributed to the death of the patient.

Where there is a perception that the clinical management may have been problematic, ANZASM has specified a range of criticism from which the assessor can choose:

- *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 very minor criticism.
- *Area of concern* – The assessor believes that an area of care should have been better.
- *Adverse event* – This refers to an unintended injury or event that was caused by the medical management of the patient rather than by the disease process, and which was sufficiently serious to lead to prolonged hospitalisation, or to temporary or permanent impairment or disability of the patient, or which contributed to or caused death. In addition there are predetermined outcomes classified as adverse event, e.g. anastomotic leak, pulmonary embolus.

3.5.1 Clinical incidents

There were 15 (34%) areas of concern and adverse events (not cases) reported by assessors. This is down from 17 (53%) events in the 2010 report. Of the 15 clinical incidents, 11 were areas of concern and four were adverse events.

Assessors attributed these incidents to:

- early reintroduction of full anticoagulation with Clexane post extracorporeal shock wave lithotripsy (ESWL) in a patient usually on warfarin for atrial fibrillation prophylaxis
- delayed recognition of pancreatic necrosis preventing early pancreatic debridement
- delay to surgery caused by missed diagnosis
- inadequate postoperative observation overnight following surgery
- decision not to proceed to endoscopy
- failure to adequately secure a nasogastric tube in an intellectually handicapped patient.
- DVT and pulmonary embolism following surgery in patient where no DVT prophylactic medication was prescribed
- pharyngeal perforation
- delay to commence treatment
- embolic stroke due to endovascular treatment
- postoperative management
- postoperative bleed following open surgery
- no recognition of intra-abdominal bleed causing cardiac ischaemia
- noted to have decreased oxygen saturation but no change to treatment or investigation
- bleeding and confused patient removed their intravenous infusion, which was not reinserted.

3.5.2 Associations for areas of concern and adverse events

- In total, 27% (4/15) of areas of concern or adverse events were associated with another clinical team.
- Of the reported areas of concern or adverse events, 47% (7/15) were associated with the surgical team.
- Twenty per cent (3/15) of cases were associated with the hospital.

Note: Some areas of concern and adverse events had multiple associations.

3.5.3 Preventability of areas of concern and adverse events

A total of 73% (11/15) of all areas of concern and adverse events (not cases) were probably or definitely preventable (see Figure 15).

Figure 15: Preventability of areas of concern and adverse events

Table 11: Preventability of areas of concern and adverse events 2006-2011

Preventable issue	2006 (n=9)	2007 (n=10)	2008 (n=16)	2009 (n=12)	2010 (n=14)	2011 (n=11)	Total
Perforation of small bowel during endoscopic operation	0	0	0	1	0	0	**1**
Adverse factors in management	0	0	0	2	0	0	**2**
General complications of treatment	1	1	0	0	0	0	**2**
Aspiration pneumonia after anaesthetic	0	0	0	0	1	0	**1**
Pulmonary embolus	0	0	0	1	1	0	**2**
Abdominal abscess	1	0	0	0	0	0	**1**
Perforation of colon after open surgery	0	0	0	0	1	0	**1**
Anastomotic leak from colon after open surgery	0	0	1	0	0	0	**1**
Intraoperative bleeding during open surgery	1	0	0	0	0	0	**1**
Anastomotic leak after open surgery	0	0	1	0	0	0	**1**
Lower GI complication of laparoscopic operation	1	0	0	0	0	0	**1**
Vascular complication of endoscopic operation	0	0	0	0	1	0	**1**
Intraoperative bleeding related to endoscopic operation	0	1	0	0	0	0	**1**
Hypotension complicating general anaesthetic	0	0	0	0	1	0	**1**
Equipment-related complication	0	0	0	0	1	0	**1**
Diagnosis-related complications	0	0	0	0	1	2	**3**
Delays	0	1	2	0	0	0	**3**
Delay in transfer to surgeon by general practitioner	0	0	1	0	0	0	**1**
Delay in transfer to surgeon by physicians	0	0	0	1	0	0	**1**
Delay to surgery (i.e. earlier operation desirable)	1	1	3	1	1	0	**7**
Delay to operation caused by missed diagnosis	0	0	1	0	0	0	**1**
Delay in investigating the patient	0	0	1	1	1	3	**6**
Delay to reoperation	0	0	1	0	0	0	**1**
Surgeon too junior	1	0	0	0	0	0	**1**
Poor communication between physician and surgeon	1	0	0	0	0	0	**1**
Incorrect/ inappropriate therapy	0	0	2	1	1	0	**4**
Postoperative care unsatisfactory	1	0	1	1	0	2	**5**
Fluid balance unsatisfactory	0	1	0	0	0	0	**1**
Monitoring problems	0	1	0	0	0	0	**1**
Assessment problems	0	0	0	1	0	0	**1**
Preoperative assessment inadequate	0	1	0	0	0	0	**1**
Better to have done different operation or procedure	0	1	0	0	0	0	**1**
Delay in diagnosis	0	0	1	0	3	0	**4**
Decision to operate	0	2	1	2	0	1	**6**
Poor communication between nursing and surgical staff	0	0	0	0	1	1	**2**
Failure to anticoagulate the patient	0	0	0	0	0	2	**2**
Foreign object left in body during surgical operation	1	0	0	0	0	0	**1**

Note: Due to the very small numbers of events under each heading, great care needs to be taken in interpreting changes from year to year.

3.6 Cases with clinical incidents

This section provides the clinical context of the incidents noted by the assessors:

- In total, 133 cases were sent to assessment by first- or second-line assessors or both during the audit period.
- Twelve per cent of closed cases (15/129) had at least one area of concern (four cases awaiting assessment).
- Three per cent of closed cases (4/129) had at least one adverse event.

The number of cases with clinical incidents is displayed in Table 12.

Table 12: Cases with clinical incidents

Cases with:	No. of cases (%)
At least one area of consideration	17 (53)
At least one area of concern	15 (34)
At least one adverse event	4 (13)
An adverse event that caused death and was definitely preventable	0

3.6.1 Adverse events

An adverse event is defined as:

> *An unintended 'injury' caused by medical management, rather than by the disease process, that is sufficiently serious to lead to prolonged hospitalisation, or lead to temporary or permanent impairment or disability of the patient at the time of discharge, or have contributed to or have caused death.*

There were four cases with adverse events (2 preoperative, 0 intraoperative and 2 postoperative). All four adverse events occurred outside the operating theatre and were attributed to:

Preoperative (n=2)

- failure to adequately secure the nasogastric tube
- delay to theatre

Postoperative (n=2)

- postoperative bleed
- embolic stroke as result of endovascular treatment.

3.6.2 Areas of concern

An area of concern is defined as:

> *An incident where the clinician believes that an area of care should have been better.*

There were 11 cases with 11 areas of concern (6 preoperative, 1 intraoperative, 4 postoperative). Therefore, 91% (10/11) of areas of concern occurred outside the operating theatre.

The following reasons were given for these incidents:

Preoperative (n=6)

- decision not to proceed to endoscopy
- diagnosis not made at initial presentation to the Emergency Department
- decision to operate at all, initially unrecognising perforation of the pharynx
- preoperative imaging inadequate or not interpreted correctly
- therapeutic anticoagulant for patient with atrial fibrillation and previous mitral valve surgery post ESWL
- preoperative review by intern – patient had significant low oxygen saturation and this was not actioned

Operative (n=1)

- pharyngeal perforation

Postoperative (n=4)

- poor postoperative observation
- failure not to react to continuing blood loss and failure not to notify the surgeon
- failure to anticoagulate a patient with a number of risk factors for venous thromboembolism
- poor postoperative management.

4. Audit comparisons

A baseline for most aspects of surgical care has been constructed and comparisons can be made. See Table 13 for a comparison of audit baseline data from 2008 to 2011.

Table 13: Audit comparisons (2008 - 2011)

	2008	2009	2010	2011
Notifications of death	189	163	189	159
Males	53%	52%	57%	48%
Median age	79	79	79	71
ASA grade >= 4	56%	65%	63%	47%
At least one significant comorbidity	90%	92%	92%	93%
Elective admissions	17%	22%	10%	12%
Delay in main surgical diagnosis	10%	8%	3%	3%
No operation	31%	32%	43%	13%
Cases with unplanned return to theatre	15%	13%	12%	11%
Cases with unplanned admission to ICU	17%	14%	14%	17%
Fluid balance an issue	7%	7%	6%	7%
All cases DVT prophylaxis used	66%	72%	74%	72%
Operated cases DVT prophylaxis used	79%	86%	85%	80%
Cases assessed	78%	80%	93%	94%
Second-line assessment requested	21%	15%	14%	9%
Assessed cases with areas of concern or adverse events	17%	14%	11%	9%
Assessed cases with adverse events that caused death	3%	5%	5%	2%
Assessed cases with adverse event that caused death & definitely preventable	0%	1%	0.5%	0%

Overall there has been little change in the pattern of findings over the reporting period.

5. Audit limitations

As an audit, the data are collected to provide feedback to surgeons, rather than for academic research. However, in audit terms, the data are of a high quality because every case had external peer review.

The data are self-reported and a certain level of bias may be present, but independent assessors make their own assessments on the facts presented. The accuracy of the notifications of deaths to TASM cannot be guaranteed.

6. Conclusions

The Tasmanian Audit of Surgical Mortality is in an excellent position to utilise the extensive information learned to promote safer healthcare practices. There is significant value to the Australian health consumer in the audit continuing as a quality assurance activity, in order to maintain the forthright participation of surgeons and enhance the existing data on surgical mortality.

Comments

- The audit has had wide acceptance and cooperation from the surgeons.
- The use of all TASM-registered assessors, rather than a small panel of assessors, has spread the workload and involved as much of the workforce as possible.
- TASM has approached other states for first- and second-line assessments of small specialities.
- Surgeons who disagree with their second-line assessment have the right of appeal and can obtain another assessment from a different surgeon in that specialty. This has only happened on one occasion (not in this reporting period).
- The case note review booklet containing around 12 illustrative cases is produced twice a year for distribution to surgeons and trainees (where requested). The cases are based on assessors' comments and all have a clinical message. This has been well received by the surgical community.

Conclusions

- A decrease was noted in the percentage of cases in which some aspects of surgical care were reported, including:
  - > elective admission (drop from 2009 to 2010)
  - > delay in the main diagnosis (steady decline)
  - > no operation (drop from 2010 to 2011)
  - > SLA assessment required (steady decline – more SCFs may have provided sufficient information, or else less cases needed SLA
  - > assessed cases with an area of concern or adverse event (steady decline).
- The use of DVT prophylaxis in patients was similar to previous years and there was one case where it was likely to have been a medical omission. TASM will continue to monitor DVT prophylaxis usage.
- TASM contributed to the National Surgical Mortality Report in 2010.
- The electronic web-based interface was released in the third quarter of 2010. A growing number of surgeons have elected to use this system, which allows them to enter their own surgical case and first-line assessment forms electronically.
- There is a need to continue to identify emerging trends in mortality and to address these where possible through ongoing educative and interactive seminars.
- Improvement of the quality and effectiveness of communications within the clinical teams is an important issue which needs to be addressed.

A greater national awareness and acknowledgment of the value of the audit amongst health professionals should see increased surgical participation and data completeness of forms and thus enable further in-depth trend analysis and informative reporting.

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  - > Mr Gordon Guy — ANZASM Manager.

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