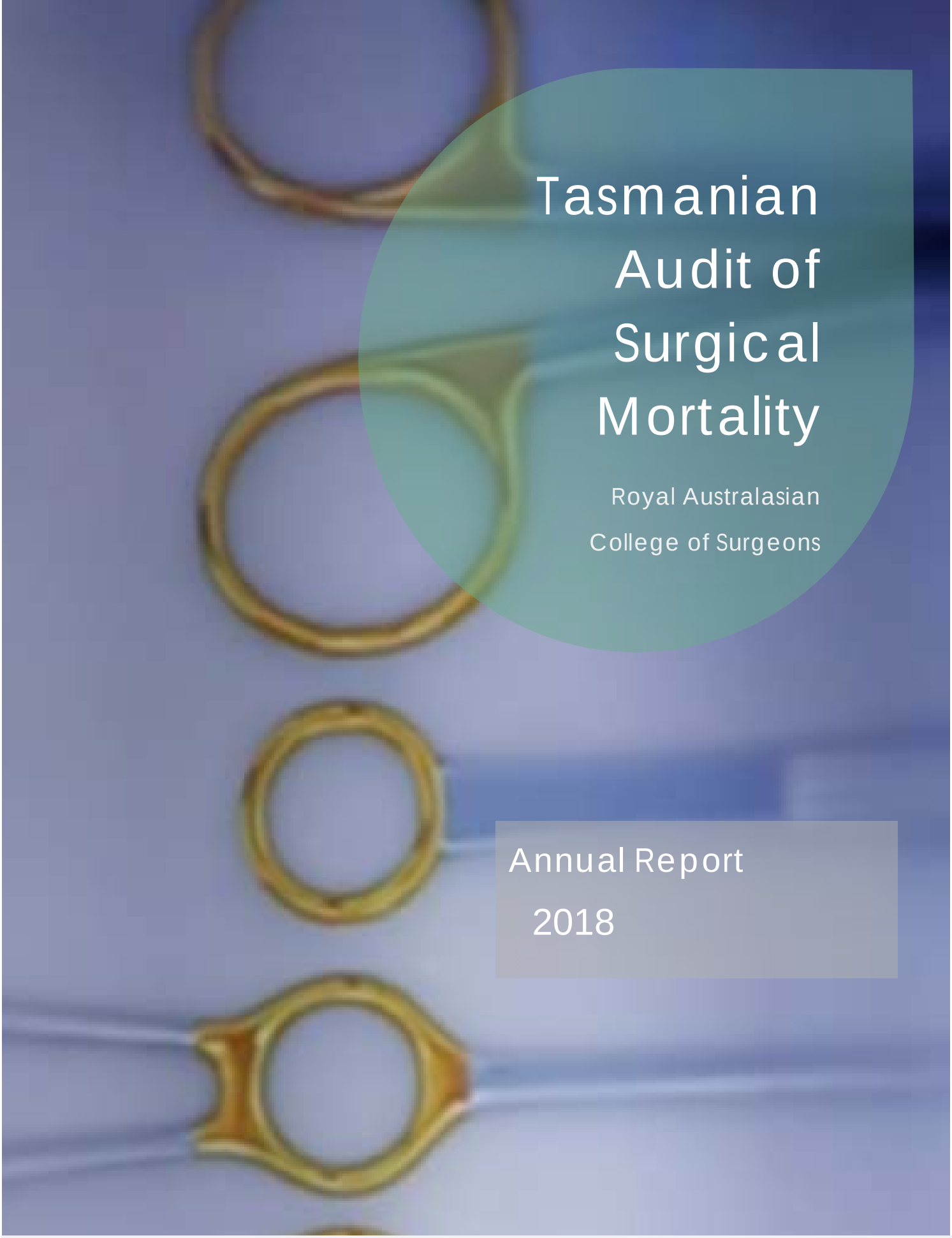

Tasmanian Audit of Surgical Mortality

Royal Australasian College of Surgeons

Annual Report 2018

Royal Australasian College of Surgeons

Tasmanian Government

ANZASM Australian and New Zealand Audit of Surgical Mortality

TASM Tasmanian Audit of Surgical Mortality

UTAS Faculty of Health Science School of Medicine

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(i) Abbreviations

ANZASM	Australian and New Zealand Audit of Surgical Mortality
ANZCA	Australian and New Zealand College of Anaesthetists
AOA	Australian Orthopaedic Association
ASA	American Society of Anaesthesiologists
CCU	Critical care unit
CHASM	Collaborating Hospitals' Audit of Surgical Mortality
CMI	Clinical management issue
CNRB	Case Note Review Booklet
CPD	Continuing professional development
DoH	Department of Health
DVT	Deep vein thrombosis
FLA	First-line assessment
GI	Gastrointestinal
Hrs	Hours
IQR	Inter Quartile Range
NOD	Notification of death
NSQHS	National Safety and Quality Health Service
PE	Pulmonary embolism
RACS	Royal Australasian College of Surgeons
RANZCOG	Royal Australian and New Zealand College of Obstetricians and Gynaecologists
SCF	Surgical case form
SLA	Second-line assessment form
TASM	Tasmanian Audit of Surgical Mortality
VTE	Venous thromboembolism

(ii) Acknowledgements

Tasmanian Audit of Surgical Mortality (TASM) would like to acknowledge the support and assistance of the many individuals and institutions that have helped in the development of this project, including:

- Australian and New Zealand Audit of Surgical Mortality (ANZASM)
- Research, Audit and Academic Surgery (RAAS)
- participating hospitals
- participating Fellows and International Medical Graduates
- treating surgeons and surgeons who have acted as assessors, for their time and effort providing detailed and valuable case note reviews
- hospital health information departments
- Western Australian Audit of Surgical Mortality
- Australian Capital Territory Audit of Surgical Mortality
- Northern Territory Audit of Surgical Mortality
- Victorian Audit of Surgical Mortality
- National Coroners Information System
- South Australian Audit of Perioperative Mortality
- Queensland Audit of Surgical Mortality
- Collaborating Hospitals' Audit of Surgical Mortality
- Department of Health, for funding the project
- RACS, for infrastructure and oversight of this project

(iii) TASM Management Committee

Mr Rob Bohmer	Chairman, MBChB, FRACS – General Surgeon
Prof Peter Stanton	Vice Chairman, BMedSci (Hons), MBBS(Hons), PhD (Glas) RCPSG, FRACS – General Surgeon
Dr Amanda Young	FRCS(Edin) FRACS – General Surgeon
Mr Stephen Brough	MBChB, MSc, FRCS(Urol), FRACS – Consultant Urologist
Dr Margaret Walker	MBBS(Hons), FANZCA – Anaesthetist
Dr Jodi Glading	BSc, MPsych, BMedSci, MBBS(Hons), MHM, FRACMA – Deputy Chief Medical Officer DoH
Prof Richard Turner	MBBS(Hons), BMedSc, FRACS, PhD
Mr James Roberts-Thomson	BMedSci, MBBS, FRCS, FRACS – General Surgeon
Dr Brett Daniels	BSc (Hons), PhD, MBBS(Hons), FRANZCOG
Ms Lisa Lynch	Project Manager – TASM – Registered Nurse

(iv) Executive Summary

Key points:

Summary of key findings based on **108** peer reviewed cases from the audit period **1 July 2017** to **30 June 2018**:

- Majority of TASM clinical indicators are comparable to the national audit data
- More patients admitted as emergencies (81.5%) with acute life-threatening disease
- More patients (82.8%) had at least one operation during their hospital stay
- Surgical consultant involved in most surgeries, particularly when a patient re-admitted to theatre
- Top three comorbidities contributing to death: advanced age, cardiovascular and respiratory
- Top three causes of death: multi-organ failure, sepsis and respiratory failure
- Most infections acquired postoperatively
- Clinical management issues identified in 12% of cases; these can occur perioperatively during a patient's hospital stay
- Futile surgery, as reflected in the decision to operate, is one of the top clinical management issues; high-risk treatment needs to be avoided in very complex and frail patients
- Falls occur mostly at home and at care facilities.

1. Demographic and operative profile

The demographic and surgical risk profiles of audited cases reveal similar trends to those identified in previous reports. The majority of surgical deaths occurred in elderly patients with underlying health problems who were admitted via the emergency department, with an acute life-threatening condition. The cause of death was often linked to the pre-existing health status. In these cases, review assessors often determined that death was unpreventable or a direct result of the disease processes, rather than a consequence of the treatment provided. The most commonly reported causes of death were multi-organ failure, septicaemia and respiratory failure. This is congruent with the most common comorbidities in Tasmanian patients and is similar to the national audit findings.[1]

This report presents recommendations and key findings for the period 1 July 2017 to 30 June 2018. Tables and figures provide information obtained between 2012 and 2018 to illustrate changes in trends over time. The denominator for the current year was 108. The denominator for the seven-year period, 2012–2018, was 714 (if data was unavailable it was excluded from the analysis, therefore accounting for occasional differences in the denominator).

To further assess emerging trends, and to benchmark outcomes of surgical care, case comparisons have been made between TASM and the national counterpart (ANZASM). Clinical information on which the review is based was generally provided by the treating consultant, and not junior medical staff.

2. Hospital admission and operative patient profile

The majority of surgical deaths since 2012, occurred in elderly patients with underlying health problems who were admitted via the emergency department (85.0%; 607/714) with an acute life-threatening condition often requiring surgery. The actual cause of death was often linked to the pre-existing health status, in that the cause of death frequently mirrored the pre-existing illness. Death was most often deemed to be unpreventable, and a direct result of the disease processes involved, rather than the treatment provided.

If surgery was not performed, this was due to an active decision by the patient, family or clinician not to proceed. This decision often occurred in patients with an untreatable clinical problem who were admitted as emergency cases.

The most frequently described operative procedures were orthopaedic injuries in older patients and acute abdominal pathology. This reflects the high percentage of patients admitted as emergencies. Patients may have more than one operation during their hospital stay. In total, 72.8% (520/714) of patients had at least one operation during their final hospital admission and the consultant was present in theatre for 77.6% (577/744) of operations.

Of the patients who had surgery, 17.9% (93/520) had an unplanned return to the operating theatre due to complications.

Clinical factors to prioritise

Based on clinical trends identified nationally, specific areas of clinical priority have been identified for monitoring, such as deep vein thrombosis prophylaxis use, fluid balance management, critical care management, and clinical management issues in surgical care.

Deep vein thrombosis (DVT) prophylaxis

Use of DVT prophylaxis is important in the prevention of pulmonary embolus. From 1 July 2012 to 30 June 2018, 75.0% (533/711) of cases involved use of DVT prophylaxis. The appropriate use of DVT prophylaxis was similar to the national data at 79.8% (16,730/20,956).

In 1.4% (10/714) of Tasmanian cases, surgical assessors considered the DVT prophylaxis usage to be inappropriate, compared to 1.7% (356/20,466) in the national database.

Fluid balance management

In-depth investigations identified a subset of cases where surgeons had reported problems with fluid balance management. While this analysis is ongoing, the dissemination of information on fluid management to surgeons has raised awareness in each state's surgical community. In 12% (13/108) of audited deaths in Tasmania, fluid balance was an issue, which is higher than the national finding of 8.3% (1,720/20,683).

Critical Care Unit

In Tasmania, 37.1% (265/714) of audited deaths from 1 July 2012 to 30 June 2018 had no critical care support. Surgical assessors considered that 4.6% (12/263) of those cases would have benefited from this care.

Over the same period, surgeons reported an unplanned admission to the critical care unit (CCU) in 16.5% (118/713) of audited deaths in Tasmania, which is comparable to the national data at 18.2% (3,814/20,921).

3. Clinical management issues

Clinical management issues—minor issues, areas of concern, and adverse events—that occurred during a patient's hospital stay are identified in this audit.

Audited cases may have more than one identifiable clinical management issue per patient. The most serious clinical management issue per patient is included in this report.

In the current audit year, minor issues of patient management were perceived to have occurred in 11.1% (12/108) of cases, areas of concern were identified in 6.5% (7/108) of cases, and clinical issues serious enough to be categorised as an adverse event occurred in 5.6% (6/108) of cases.

In 2017–2018 in Tasmania, 32.4% (35/108) of patients audited had a clinically significant infection, which is slightly less than the national figure of 34.5% (1,226/3,549). In those instances (5.6%) when the peer review process concluded that adverse events in management had occurred, individual criticisms have been directed to the treating surgeons for their reflection.

4. Outcomes of the peer review

Potentially preventable clinical outcomes are based on clinical management issues identified in TASM peer reviews.

The most common clinical management issues identified were delays; preoperative, intraoperative and postoperative care; and protocol issues. One patient can have multiple clinical management issues associated with an episode of care.

Clinical management issues assessed as definitely or probably preventable were identified in 9.3% (10/108) of cases.

5. Conclusion

Key TASM recommendations in this report reflect the six National Safety and Quality Health Service (NSQHS) Standards used by hospitals and health professionals to address areas of clinical practice and patient safety that need improvement.

TASM, along with other surgical audits and research and quality assurance collaborators, is paving the way toward conquering the educational goals to improve patient care. These goals ensure that all surgical Fellows and participating health organisations are accountable for providing the highest standards of care.

(v) National Safety and Quality Health Service Standards

This report can assist hospitals with accreditation for the National Safety and Quality Health Service Standards[2] highlighted alongside the Key Recommendations below and the Clinical Risk Management sections in Section 3.

National Safety and Quality Health Service Standards		TASM Key Recommendations
Standard 1 Clinical Governance Standard		• To improve leadership in patient care.
Standard 2 Partnering with Consumers Standard		• To assess if the decision to operate is appropriate. • To consider quality of life and end-of-life care.
Standard 3 Preventing and Controlling Healthcare-Associated Infection Standard		• To control and manage infections with appropriate investigation, rapid administration of treatment, and timely involvement of expert teams.
Standard 5 Comprehensive Care Standard		• To improve perioperative management. • To improve awareness of surgical emergencies and shared care. • To involve patients in planning their treatment. • To reduce falls in hospitals and residential care.
Standard 6 Communicating for Safety Standard		• To improve documentation of care plans and clinical events. • To improve communication amongst health professionals and their patients.
Standard 8 Recognising and Responding to Acute Deterioration Standard		• To act on evidence of clinical deterioration.

Recommendations for TASM Clinical Stakeholders

The TASM key recommendations reflect the six National Safety and Quality Health Service (NSQHS) Standards as outlined below. Themes listed are learnings from different specialty-based cases from the audit. These can be used by hospitals and health professionals to address areas of clinical practice and patient safety that need improvement. The TASM webpage features all reports from the TASM audit, including Annual Reports and Case Note review Booklets. [3]

1. Improved leadership in patient care

NSQHS Standard 1 emphasises clinical leadership, improved governance and culture. Complex cases must have clear and demonstrable leadership in patient management. The treatment plan for each patient should be understood by all involved in his or her care. The lead clinician must be accountable, responsive, prepared for challenges and must focus on optimal patient care. Senior surgical opinion is essential when dealing with surgical complications and should not be delayed by team hierarchy issues.

2. Futile surgery and end-of-life care

NSQHS Standard 2 encourages partnership with consumers, and Standard 5 outlines the implementation of a comprehensive care plan in collaboration with the patient. A number of surgeons and assessors considered that some of the surgical procedures were futile. Decisions about whether to continue with active treatment and surgery can be very complex in frail patients, particularly when the treatment has a high risk of death or the end of life is near.[4]

3. Infection control

NSQHS Standard 3 promotes prevention and control of healthcare-associated infections. The audit shows that postoperative infection remains the top cause of infection. Key actions for control and management are timely recognition, appropriate investigation, rapid administration of treatment, and timely involvement of expert teams. TASM endorses the use of current hospital protocols and guidelines to reduce the incidence of infection.[5]

4. Improved perioperative management

NSQHS Standard 5 outlines the implementation of comprehensive care plans and assessments to improve perioperative management. Appropriate pre-, intra- and postoperative preparation and management aims to decrease operative complications and promote successful recovery. Delays in investigations or recognising complications can have fatal consequences.

5. Improved awareness of surgical emergencies and sharing of care

NSQHS Standard 5 encourages improvements in shared care. The audit revealed that patients admitted as surgical emergencies are at greater risk where care is shared. All health professionals should increase their awareness of this risk to improve the quality and safety of patient care.

6. Improved communication

NSQHS Standard 6 highlights better communication for clinical handover. All health professionals and institutions should actively collaborate and communicate to support exchange of information and coordination of patient care at all stages during the admission process.

7. In-house falls prevention

NSQHS Standard 5 outlines the implementation of comprehensive care plans and assessments to minimise patient harm from falls. The audit revealed that patients admitted as surgical emergencies have a greater risk of falling while in hospital. All health professionals should increase their awareness of this risk to improve the quality and safety of patient care. TASM endorses the use of current hospital protocols and guidelines to reduce the incidence of in-hospital falls.[6]

8. Better documentation of care plans and clinical events

NSQHS Standard 6 outlines the importance of documentation of healthcare records to ensure patient safety. The case record is an essential tool for identifying clinical sequence and an appropriate clinical management plan. As such, the case record must contain clear and accurate documentation of events and plans. There are ongoing issues with the quality of data provided by some treating surgeons and their teams. In addition, greater attention to detail in completing the TASM surgical case form (SCF) would help improve data quality by minimising missing data and reducing the workload of colleagues who have agreed to act as first- and second-line assessors. The compulsory move to the electronic interface in 2017 facilitated improvements in the data quality. This has reduced the workload of the first- and second-line assessors.

9. Action on evidence of clinical deterioration

NSQHS Standard 8 highlights the need for action to be taken when clinical deterioration occurs. Clinical deterioration is an issue recognised throughout Australia and internationally. When clinical deterioration occurs, and no clear cause is identified, consideration should be given to causes beyond the treating surgeon's specialty or expertise. Clinical findings must be considered alongside the results of investigations. Clinical deterioration must be acted upon and recorded. Futile surgery should be avoided.

(vi) Future Goals/ Objective for TASM

Since inception of the TASM audit in 2004 there has been a great deal of progress in monitoring quality and safety across Tasmania. Many of the core objectives of the Tasmanian DoH are already aligned to the work of the audit. TASM has developed successful partnerships with clinicians to review and respond to episodes of surgical mortality across the state. Several ways of improving the TASM audit process have been identified, and implementation of these improvements commenced in late 2018.

The new goals are:

- Tasmanian development of a method for recognising potentially preventable adverse events characterised by common underlying issues.
- Reporting of information about the care pathway identified in the peer review as feedback to individual surgeons, hospitals and other stakeholders.
- Identification of changes in clinical management implemented by the treating surgeon and the shared care team in response to the peer review outcome of a case.
- Standardisation of the TASM reports with all jurisdictions.
- Monitoring of orthopaedic cases in the public system with the use of the state-wide pathway for fractured neck of femur.

1. Introduction

1.1 Background

TASM is part of the Australian and New Zealand Audit of Surgical Mortality (ANZASM), a national network of regionally based audits of surgical mortality that aim to ensure the highest standard of safe and comprehensive surgical care. TASM is a collaboration between the Tasmanian Government DoH and RACS. TASM is funded by the Tasmanian DoH to review all deaths associated with surgical care and identify preventable adverse outcomes. The Governance Structure for TASM is outlined in Figure 1.

1.2 Objectives

The objective of the audit is to identify preventable or contributing factors associated with surgical mortality through a peer-review process of all deaths associated with surgical care. The audit process is a patient safety and quality initiative designed to highlight trends in deficiencies of care and system issues, with a focus on education and performance improvement.

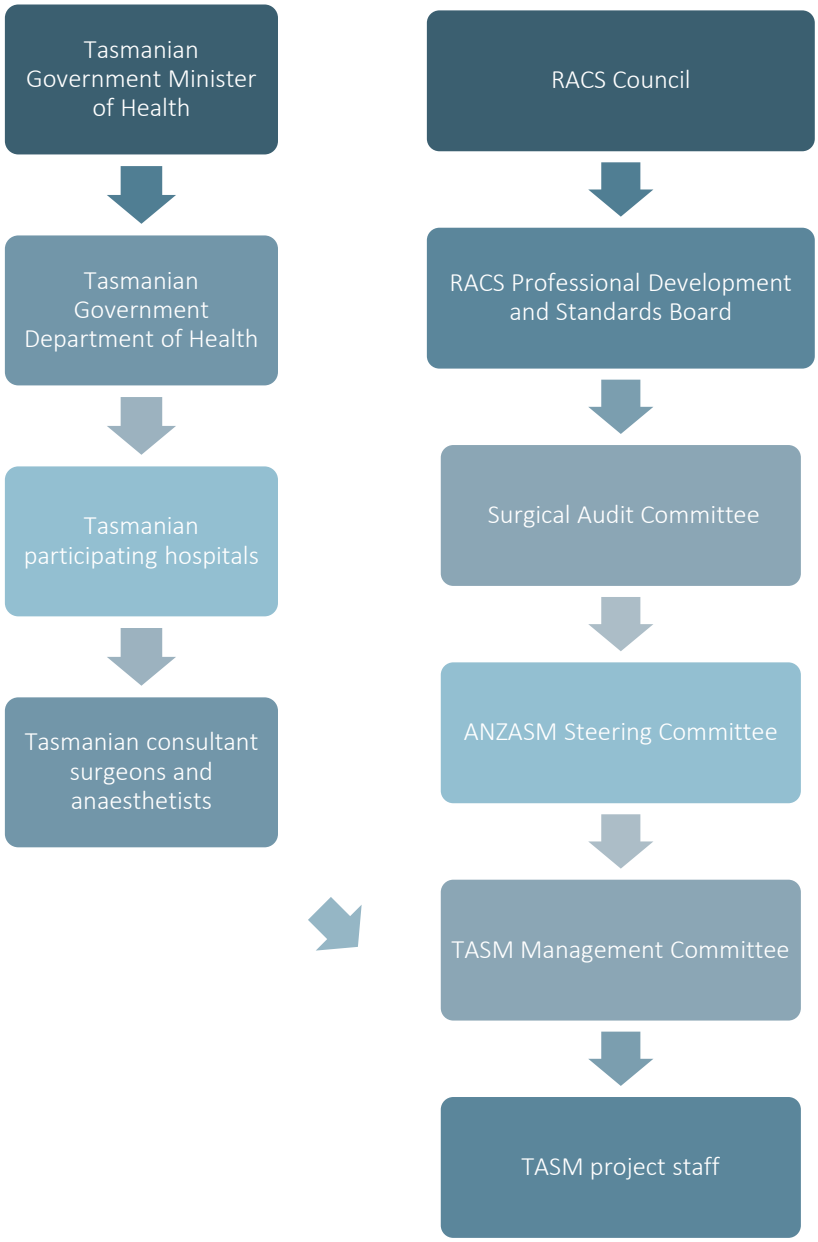
TASM audits all deaths that occur in a hospital when:

1) the patient was under the care of a surgeon (surgical admission), whether or not an operation was performed.
2) the patient was under the care of a physician (medical and non-surgical admissions) and underwent a surgical procedure.

Cases that do not fulfil either of the above-listed criteria are excluded from the audit by the notifying hospital or by audit staff. Deaths identified by the reporting surgeon as terminal care cases are recorded, but these are excluded from further assessment in the audit. Terminal care is nominated by the surgeon on the SCF and cannot be identified from the notification of death information received by the TASM office.

TASM reviews notifications of patient deaths that have occurred in hospital following a procedure or during an inpatient stay under a surgical unit. TASM does not include morbidity cases, although emerging issues identified through the review of mortality cases are also applicable to the morbidity patient pool.

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



RACS: Royal Australasian College of Surgeons.

1.3 Audit process

Individual regional audits of surgical mortality are notified of in-hospital deaths associated with surgical care. The mortality notifications in Tasmania are submitted by hospitals and directly from the treating surgeon. All cases in which a surgeon was responsible for, or had significant involvement in, the care of a patient is within the scope of the audit, whether or not the patient underwent a surgical procedure.

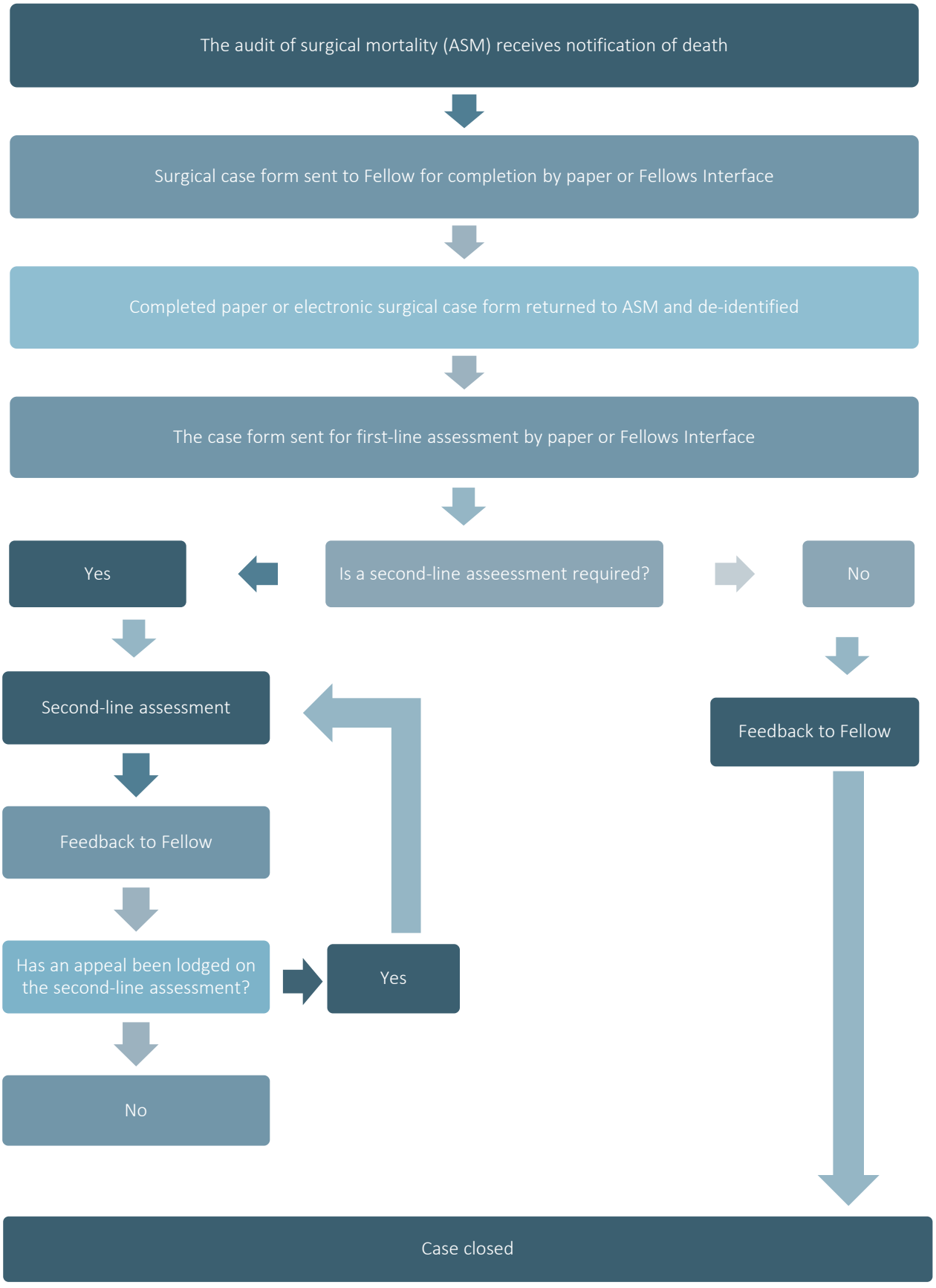
Clinical details pertaining to the management of each case are recorded on a standard, structured SCF completed by the consultant or treating surgeon associated with the case. The completed SCF is submitted to the audit office, and the information is de-identified and sent for FLA by a surgeon from a different hospital with the same surgical specialty. The first-line assessor is unaware of the name of the deceased, the name of the treating surgeon, or the hospital in which the death occurred.

There are two possible outcomes of the FLA:

- Information provided by the treating surgeon enables the assessor to reach a conclusion about the case and identify any issues of clinical management, or
- The case is referred for a second in-depth assessment in the form of an SLA (case note review). An SLA may be requested as a result of:
    - need to clarify issues of patient management identified or suspected by the first-line assessor
    - insufficient information provided on the SCF by the treating surgeon, preventing the first-line assessor from reaching a conclusion about the case.

In cases for which an SLA is deemed necessary, the assessor is selected using the same criteria as that used for the first-line assessor (see Figure 2).

Figure 2: The audit process



2. Audit participation and audit processes

2.1 Audit numbers

TASM aims to have all mortality cases reviewed within three months of notification. For the audit period 1 July 2012 to 30 June 2018, TASM received 830 notifications of deaths associated with surgical care (see Table 1).

Table 1: Audit numbers over sequential audit periods, 2012–2018

Case status	2012–2013	2013–2014	2014–2015	2015–2016	2016–2017	2017–2018	Audit period
Closed	89.6% (121/135)	84.9% (118/139)	90.4% (132/146)	86.5% (141/163)	83.2% (94/113)	80.6% (108/134)	**86.0% (714/830)**
Non-participant	0.0% (0/0)	0.0% (0/0)	0.0% (0/0)	0.0% (0/0)	0.0% (0/0)	0.0% (0/0)	**0.0% (0/0)**
Reported in error	0.0% (0/0)	0.0% (0/0)	0.0% (0/0)	0.0% (0/0)	0.0% (0/0)	0.0% (0/0)	**0.0% (0/0)**
Terminal care	10.4% (14/135)	15.1% (21/139)	9.6% (14/146)	13.5% (22/163)	16.8% (19/113)	19.4% (26/134)	**14.0% (116/830)**
Lost to follow-up	0.0% (0/0)	0.0% (0/0)	0.0% (0/0)	0.0% (0/0)	0.0% (0/0)	0.0% (0/0)	**0.0% (0/0)**
Pending cases (SCF / FLA / SLA)	0.0% (0/0)	0.0% (0/0)	0.0% (0/0)	0.0% (0/0)	0.0% (0/0)	0.0% (0/0)	**0.0% (0/0)**
All cases	**100.0% (135/135)**	**100.0% (139/139)**	**100.0% (146/146)**	**100.0% (163/163)**	**100.0% (113/113)**	**100.0% (134/134)**	100.0% (830/830)

n=830.

Specialties with the highest case mix within the reporting period were General Surgery (26.3%, 218/830), Orthopaedic Surgery (12.0%, 100/830) and Neurosurgery (8.9%, 74/830) (data not shown).

Cases recorded as admissions for terminal care (14.0%; 116/830) were excluded from the review process. There were 26 terminal-care cases in the current audit period (1 July 2017 to 30 June 2018).

2.2 Audit participation rates

To comply with the audit process surgeons must not only agree to participate, but also return completed SCFs and assessment forms in a timely, accurate and complete manner. The hospitals in which they work must provide notifications of deaths on a regular basis, since this is the main trigger for the audit process to begin.

2.3 Hospital participation

All Tasmanian public and private hospitals providing relevant surgical services participate in the audit and provide notifications of deaths (see Table 2). There has been 100% participation every year from 2012 to 2018.

Table 2: Hospital participation in the audit, 2012–2018

Hospital participation	2012–2013	2013–2014	2014–2015	2015–2016	2016–2017	2017–2018
Public	4	4	4	4	4	4
Private	9	9	9	9	9	9
Total	**13**	**13**	**13**	**13**	**13**	**13**

2.4 Participation by Fellows

Since January 2010, participation in the audit has been a mandatory component of attaining CPD approval. The RACS CPD program conducts an annual verification of CPD activities claimed by surgeons.

In August 2012, the Board of the Royal Australian and New Zealand College of Obstetricians and Gynaecologists (RANZCOG) approved formal collaboration with ANZASM (see Table 3) and gynaecological specialists were invited to participate in the audit. TASM accordingly collects data on all deaths occurring after a gynaecological surgical procedure. The Council on Obstetric and Paediatric Mortality and Morbidity continues to separately review all maternal, perinatal and paediatric deaths in Tasmania.

In the current audit year (1 July 2017 to 30 June 2018), there were 137 RACS participants. Of these 40 were locums and interstate assessors, the remaining 97 were Tasmanian RACS Fellows. All of the 97 eligible Tasmanian RACS Fellows participated in the current audit (see Table 3), consistent with 100% participation by RACS and RANZCOG Fellows every year since 2012. There was 100.0% (181/181) participation across all specialties in Tasmania (data not shown).

Table 3: Surgeon agreement to participate, 2012–2018

Fellow participation	2012–2013	2013–2014	2014–2015	2015–2016	2016–2017	2017–2018
RACS	93	93	96	137	137	137
RANZCOG	44	44	44	44	44	44
Total	**137**	**137**	**140**	**181**	**181**	**181**

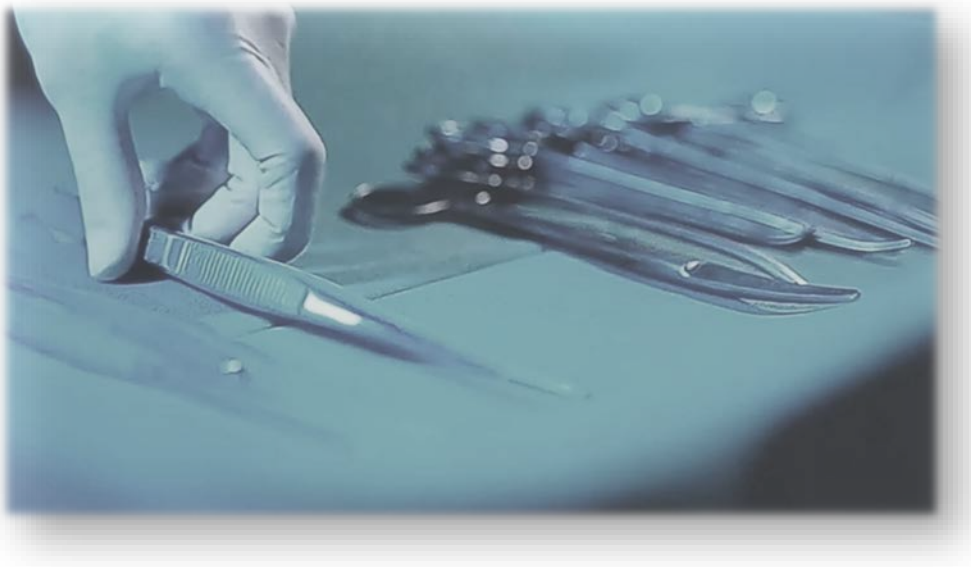
Currently, 100.0% (44/44) of gynaecological specialists invited to participate have enrolled in the TASM audit.

RANZCOG and RACS Fellows perform assessments as either first- or second-line assessors.

Table 4: Compliance by surgical specialty, 1 July 2017 to 30 June 2018 audit period

Specialty	Compliant	Non-compliant
Cardiothoracic Surgery	100.0%	0.0%
General Surgery	100.0%	0.0%
Gynaecology Surgery	100.0%	0.0%
Neurosurgery	100.0%	0.0%
Orthopaedic Surgery	100.0%	0.0%
Other*	100.0%	0.0%
Otolaryngology Head and Neck Surgery	100.0%	0.0%
Paediatric Surgery	100.0%	0.0%
Plastic and Reconstructive Surgery	100.0%	0.0%
Urology Surgery	100.0%	0.0%
Vascular Surgery	100.0%	0.0%

* includes Colorectal Surgery, Ophthalmology, and Oral and Maxillofacial Surgery.



2.5 Demographics and characteristics of audited deaths

Figure 3 shows the demographics and characteristics of TASM audited deaths in the current audit period. Comparisons to the national data appear in Table 5.

Figure 3: Characteristics of TASM audited deaths from 1 July 2017 to 30 June 2018

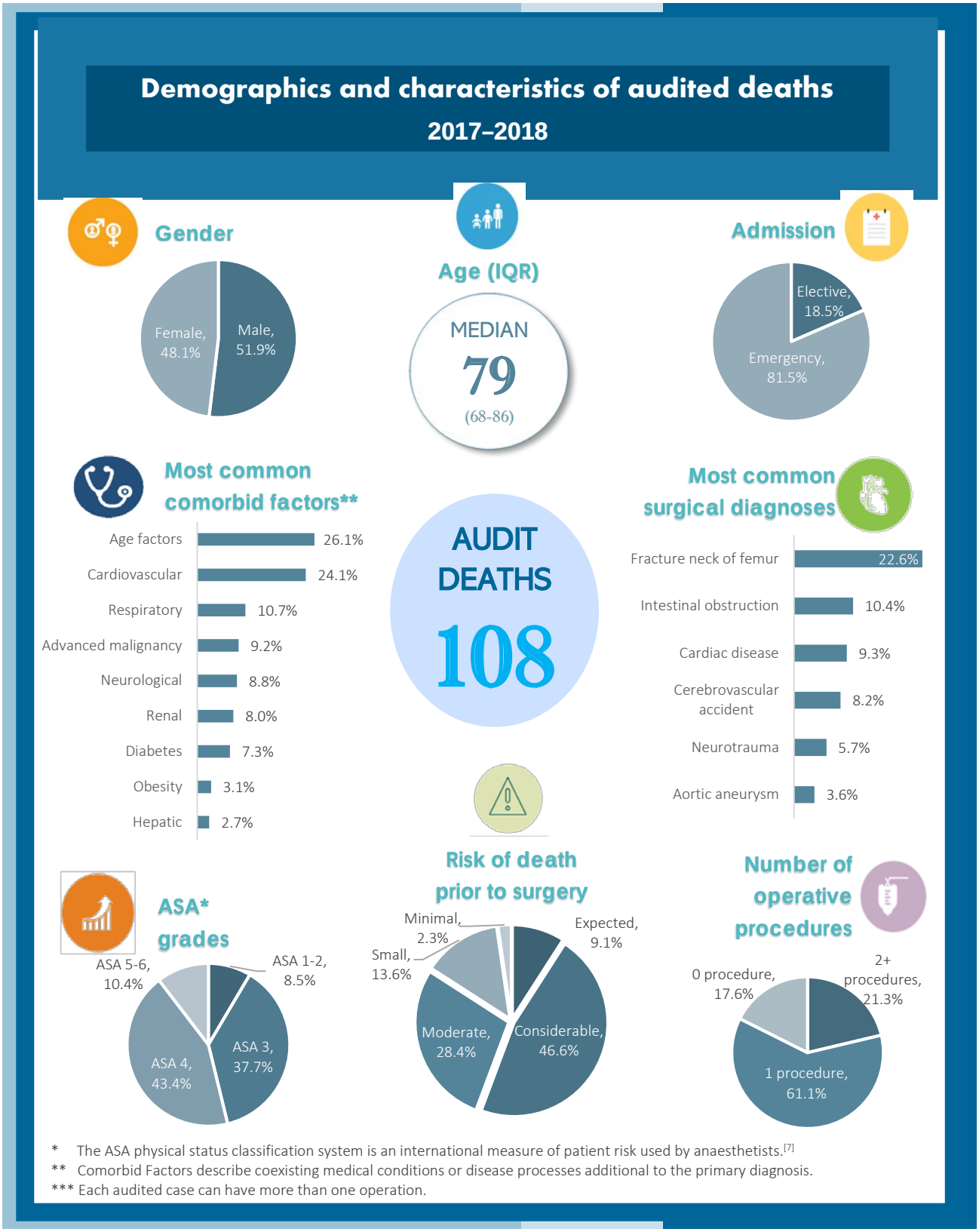


Table 5: Characteristics of audited deaths, 1 July 2017 to 30 June 2018 (TASM and national data)

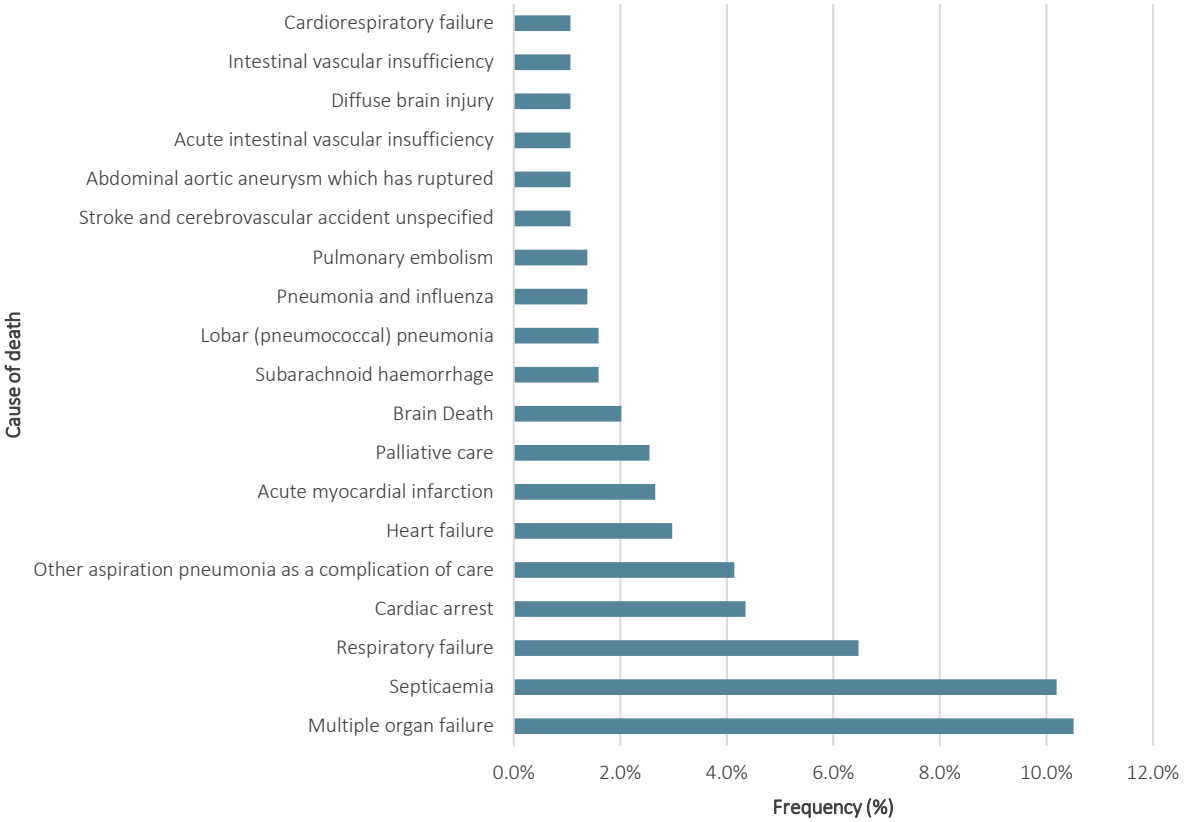
Audit Region	TASM n=108	National n=3,582
Demographic and audit factors	**(%)**	**(%)**
Median age in years (IQR)	79 (68–86)	76 (64–85)
Gender		
Male	51.9	43.6
Female	48.1	56.4
Admission status		
Elective	18.5	15.0
Emergency	81.5	85.0
American Society of Anesthesiologists (ASA)* grade		
ASA 1–2	8.5	6.2
ASA 3	37.7	30.3
ASA 4	43.4	47.9
ASA 5–6	10.4	15.6
Risk of death prior to surgery		
Expected	9.1	11.3
Considerable	46.6	49.6
Moderate	28.4	25.7
Small	13.6	10.5
Minimal	2.3	2.9
Most common comorbid factors**		
Age	23.1	21.0
Cardiovascular	21.4	21.7
Respiratory	9.5	11.3
Advanced malignancy	8.1	7.5
Neurological	7.8	6.7
Renal	7.1	9.2
Diabetes	6.4	7.5
Obesity	2.7	3.8
Hepatic	2.4	2.9
Most common surgical diagnoses		
Fracture neck of femur	22.6	26.7
Intestinal obstruction	10.4	9.8
Cardiac disease	9.3	7.7
Cerebrovascular accident	8.2	11.9
Neurotrauma	5.7	6.3
Aortic aneurysm	3.6	4.7
Number of operative procedures performed***		
2+	21.3	19.0
1	61.1	63.8
0	17.6	17.2

* The ASA physical status classification system is an international measure of patient risk used by anaesthetists.[7]
** Comorbid Factors describe coexisting medical conditions or disease processes additional to the primary diagnosis.
*** Each audited case can have more than one operation.

2.6 Establishing the 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 will be referred to the coroner. In other instances where the cause of death is unclear a postmortem examination may be requested. Figure 4 outlines the causes of deaths recorded for the total audit period.

Figure 4: Frequency of reported causes of deaths, 2012–2018



n=942 conditions that were reported causes of deaths for 714 patients, 1 July 2012 to 30 June 2018.
A cause of death has been included in this figure if the total count was ≥10.

From 1 July 2012 to 30 June 2018, there were 942 conditions perceived to have caused death. The most frequently cited being multiple-organ failure (10.5%; 99/942), septicaemia (10.2%; 96/942), and respiratory failure (6.5%; 61/942). Existing comorbidities may contribute to the final cause of death. [8-12]

2.7 Postmortem

Postmortem examinations when the cause of death is undetermined are being requested with decreasing frequency (13.8% in the period 2012–2018). Postmortems are deemed to provide educational information and valuable insights, so this declining rate is a potential area of concern.

Table 6: Postmortems performed, 1 July 2012 to 30 June 2018

Postmortem performed	Number	Per cent
Yes - hospital	9	1.3%
Yes - coroner	89	12.5%
No	439	61.5%
Refused	18	2.5%
Unknown	156	21.8%
Missing data	3	0.4%

n=98 postmortems performed on 714 patients from 1 July 2012 to 30 June 2018.

Data is incomplete for postmortem rates associated with elective or emergency surgery admissions, however the available data shows that the majority were coronial postmortems arising from deaths associated with emergency admissions.

Table 7: Postmortems performed for elective and emergency admissions, 1 July 2012 to 30 June 2018

Postmortem performed	Elective	Emergency
Yes - hospital	2	7
Yes - coroner	23	66

2.8 Peer-review process

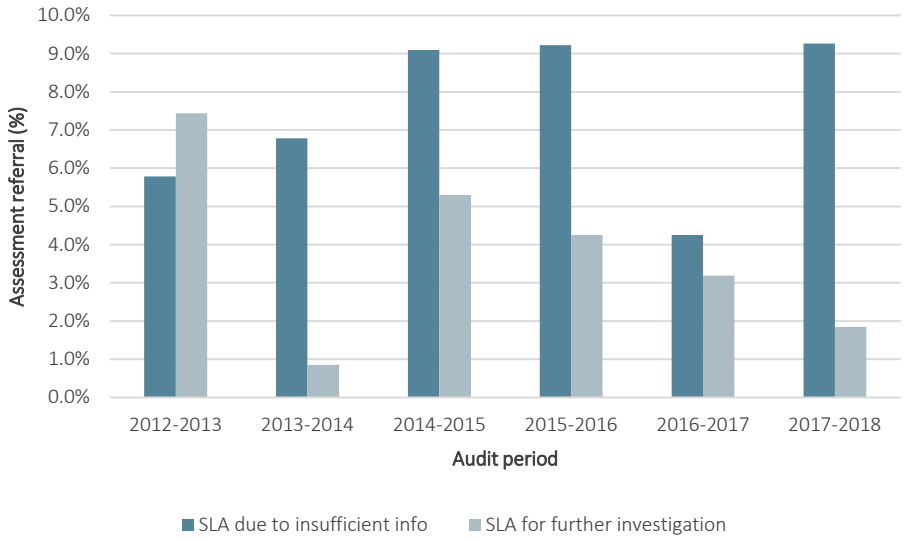
The TASM peer-review process is a retrospective examination of the clinical management of patients who died while under the care of a surgeon. All assessors (first- and second-line) must decide whether the death was a direct result of the disease process alone, or if aspects of the management of the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

FLAs were completed for all 714 cases (excluding 116 cases of terminal care). Each first-line assessor is asked whether the treating surgeon had provided adequate information to enable a conclusion to be reached. If the information was deemed inadequate, an SLA was requested. Other triggers for requesting an SLA are:

- A more detailed review of the case is required to better clarify events leading up to death and any lessons emanating from the case
- An unexpected death, such as death occurring in a young fit patient with benign disease, or a day surgery case.

The number of SLAs required due to lack of information in the SCF is an indirect measure of surgeon compliance in the audit process. The number of SLAs required for the additional triggers is more likely to represent suspected issues of clinical management. This number has decreased since the beginning of the audit in 2012 but could improve further. Reasons given for SLA referral are provided in Figure 5.

Figure 5: Reason for referral for second-line assessment, 2012–2018



n=82 of 714.
SLA: second-line assessment.

From 1 July 2012 to 30 June 2018, FLAs were completed for 714 cases and 11.5% of these (n=82) were sent for SLA (see Table 8). Of those cases referred for SLA, 65.8% (n=54) were deemed by the first-line assessor to have provided insufficient information.

Table 8 shows referrals for SLA according to surgical specialty. No obvious trends have emerged over the six-year audit period (data not shown).

Table 8: Referral for second-line assessment by surgical specialty, 2012–2018

Specialty	SLA (n=82)	Total cases
Cardiothoracic Surgery	9 (25.7%)	35
General Surgery*	45 (13.1%)	343
Gynaecology	1 (50.0%)	2
Neurosurgery	4 (4.2%)	95
Orthopaedic Surgery	14 (10.5%)	133
Other**	0 (0.0%)	2
Otolaryngology Head and Neck	1 (9.1%)	11
Paediatric Surgery	0 (0.0%)	3
Plastic Surgery	0 (0.0%)	10
Urology	3 (6.8%)	44
Vascular Surgery	5 (13.9%)	36
Total	**520 (72.8%)**	**714**

n=82 for 1 July 2012 to 30 June 2018.
* includes Colorectal Surgery.
** includes Oral and Maxillofacial Surgery and Ophthalmology.

3. Clinical risk management

3.1 Profile of operative procedures

The following section examines the frequency and timing of surgical procedures, the seniority of the surgeon performing them and the need for repeat surgery.

It is the role of the treating surgeon to take responsibility for the overall success of the operation. He or she needs to ensure that the operation proceeds smoothly with the lowest possible risk of complications or unplanned return to theatre. Table 9 shows the frequency of surgical procedures performed within the total audit period. Table 10 shows the distribution of these procedures via surgical specialty.

Table 9: Frequency of individual surgical procedures, 2012–2018

Surgical procedure	Number*	Per cent total procedures
Exploratory laparotomy	128	13.3%
Burrhole(s) for ventricular external drainage	36	3.8%
Closed (or no) reduction of fracture and internal fixation	16	1.7%
Prosthetic cemented hemiarthroplasty of hip	16	1.7%
Diagnostic cystoscopy	13	1.4%
Change of dressing	12	1.3%
Laparotomy approach NEC	12	1.3%
Other prosthetic hemiarthroplasty of hip	12	1.3%
Abdominal aortic aneurysm which has ruptured	11	1.1%
Debridement of skin NEC	11	1.1%
End colostomy	11	1.1%
Extended right hemicolectomy and end-to-end anastomosis	11	1.1%
Right hemicolectomy and anastomosis NEC	11	1.1%
Debridement of muscle NEC	10	1.0%
Intestinal adhesions with obstruction	10	1.0%
Other bypass of coronary artery	10	1.0%
Reopening of laparotomy site	10	1.0%

*only procedures with 10 or more occurences listed.
n=959 procedures, 1 July 2012 to 30 June 2018.
NEC=not elsewhere classified

Almost three quarters of audit patients (72.8%; 520/714) underwent operative treatment (see Table 10). A total of 959 separate procedures were performed on these patients, with some patients undergoing multiple procedures during their admission or during the same surgical session. Of the 959 procedures 744 were emergency cases.

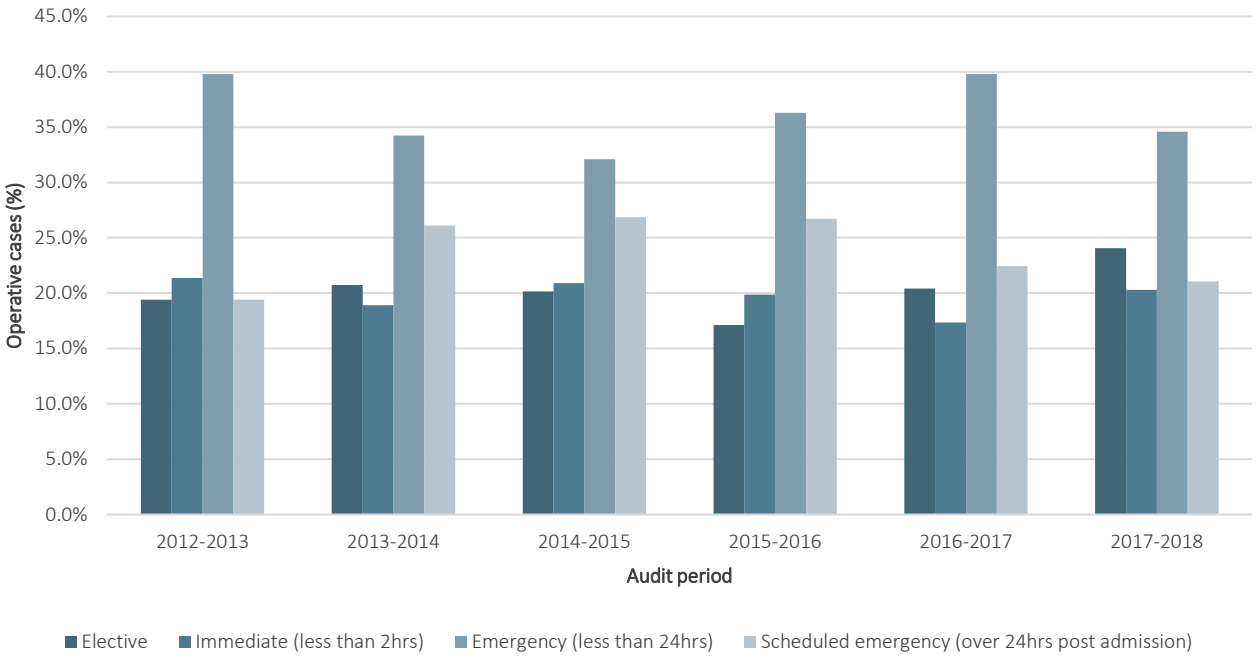
Table 10: Frequency of operative mortality by specialty, 2012– 2018

Specialty	Operated	Total cases
Cardiothoracic Surgery	32 (91.4%)	35
General Surgery*	226 (65.9%)	343
Gynaecology	2 (100.0%)	2
Neurosurgery	75 (78.9%)	95
Orthopaedic Surgery	100 (75.2%)	133
Other **	2 (100.0%)	2
Otolaryngology Head and Neck	8 (72.7%)	11
Paediatric Surgery	3 (100.0%)	3
Plastic Surgery	8 (80.0%)	10
Urology	32 (72.7%)	44
Vascular Surgery	32 (88.9%)	36
Total	**520 (72.8%)**	**714**

* Includes Colorectal Surgery.
** Includes Oral and Maxillofacial Surgery and Ophthalmology.
n=520 patients who underwent 959 separate surgical procedures, 1 July 2012 to 30 June 2018.

The urgency of a patient's condition predicts the timing of emergency surgery. Figure 6 shows the timing of operative procedures for emergency and elective admissions. For the patient emergency admissions that underwent surgery, 19.4% of surgical procedures occurred within 2 hours of admission, 34.9% occurred within 24 hours and 23% took place after 24 hours. Scheduled emergency surgery comprised 19.8% (147/744) of emergency cases.

Figure 6: Timing of operative procedures, 2012–2018



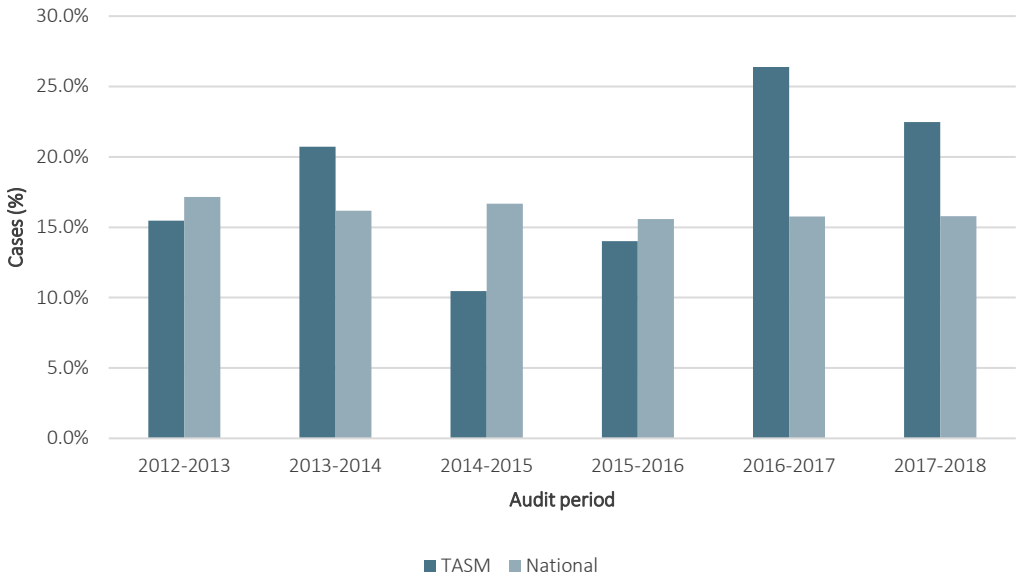
n=744 separate surgical operations on 520 patients from 1 July 2012 to 30 June 2018.
Missing data: n=19 (2.6%).

Overall, 54.3% (404/744) of surgical procedures on emergency admission patients occurred within 24 hours of admission. To ensure all emergency surgeries are performed within 24 hours of admission, strategies to address scheduling of emergency surgery are being implemented. This involves government surgeons and hospitals.[13]

3.2 Unplanned return to the Operating Room

During a patient's hospital stay an unplanned return to the operating room (OR) is usually necessitated by the development of a complication requiring further surgical intervention. Some complications following complex surgery are expected due to a patient's pre-existing comorbidity profile, surgical risk status and the nature of the disease being treated. However, any returns to the OR may indicate that improvements to care are needed. TASM would like to see a decrease in unplanned returns to the OR over future audit periods. Figure 7 shows unplanned returns to theatre over the total audit period.

Figure 7: Unplanned return to theatre, 2012–2018



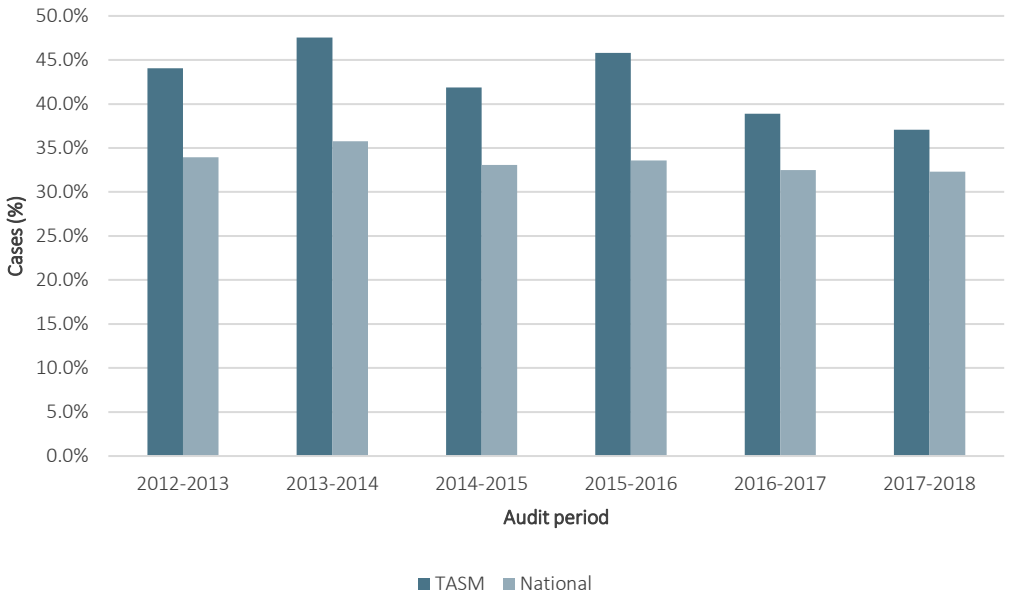
n=520 patients from 1 July 2012 to 30 June 2018.

From 1 July 2012 to 30 June 2018, 17.9% (93/520) of TASM patients had an unplanned return to the operating theatre, slightly more than the national figure of 16.1% (2,736/16,945). In the last two years unplanned return to theatre has increased. TASM will continue to monitor this trend.

3.3 Postoperative complications

Figures 8, 9 and 10 show postoperative complications recorded in Tasmania and nationally, and the range and urgency of specific complications. A total of 64.4% (172/267) of reported complications occurred in patients admitted as emergencies (see Figure 9 for specific complications). The rate of postoperative complications differed among specialties (Figure 10).). The percentage of patients with complications ranged from 12.5% (1/7) for Otolaryngology, Head and Neck Surgery to 84.4% (27/32) for Cardiothoracic Surgery.

Figure 8: Postoperative complications recorded by treating surgeons, 2012–2018



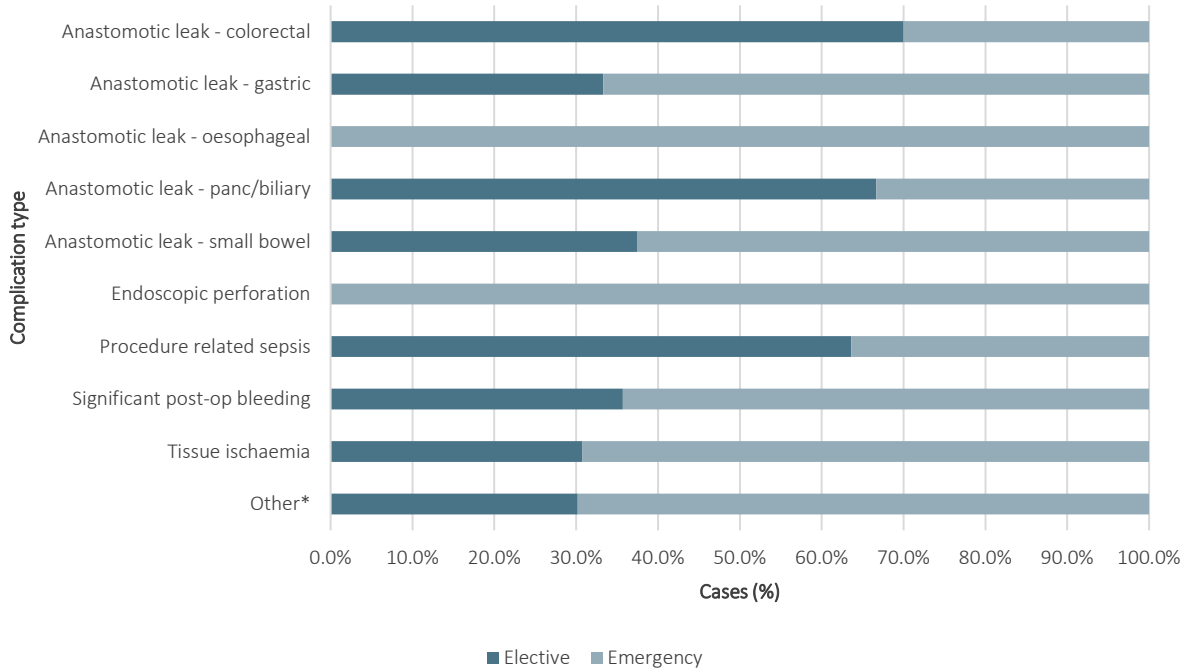
n=222 complications in 520 operative cases in Tasmania from 1 July 2012 to 30 June 2018.

Over the total audit period (1 July 2012 to 30 June 2018), 57.3% (298/520) of TASM patients who underwent operative treatment had no complications, compared with the national figure of 66.5% (11,277/16,953).

Over the audit period postoperative complications rates are decreasing.

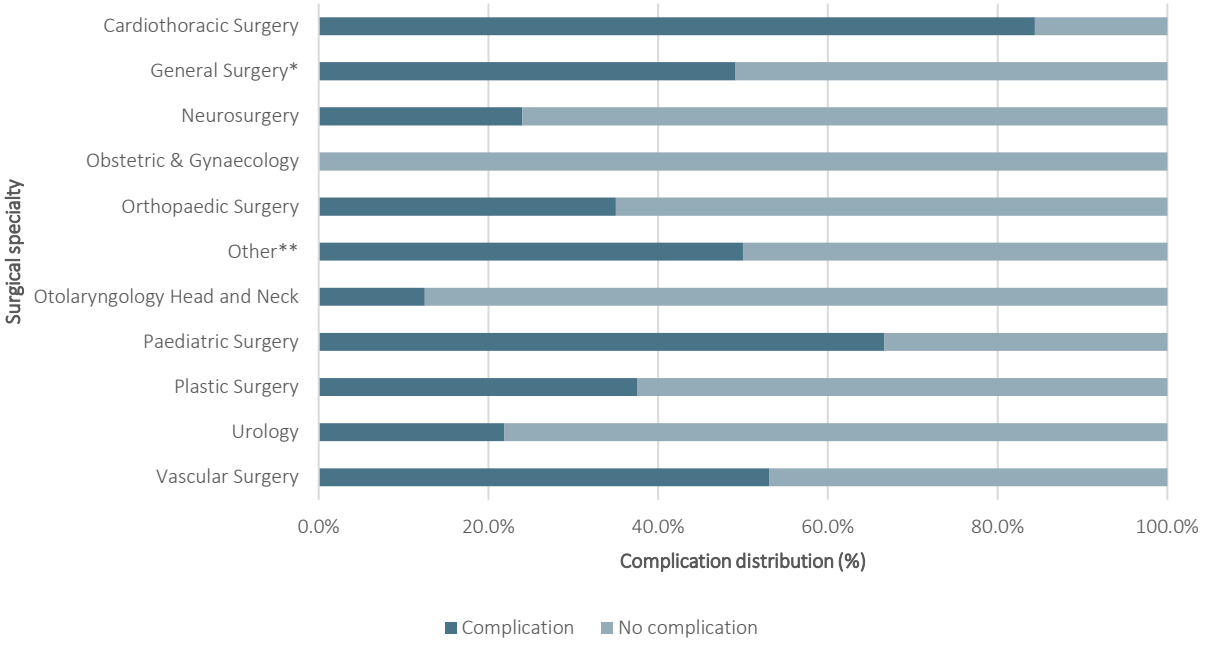
Of the deaths from 1 July 2012 to 30 June 2018 Surgeons reported a delay in recognising postoperative complications in 11.4% (25/220; data not available: n=2).

Figure 9: Frequency of specific postoperative complications by urgency status



n=267 complications in 520 operative cases (some operations had multiple complications).
*includes aspiration pneumonia, cardiac arrest, pulmonary embolus, myocardial infarction, respiratory failure and wound dehiscence.

Figure 10: Postoperative complications by specialty



Note: n=222 complications in 520 operative cases.
* includes Colorectal Surgery.
** includes Oral and Maxillofacial Surgery, Paediatric Ophthalmology and Gynaecology.

3.4 Clinically significant infections

Surgeons are asked to report if, at the time of death, a patient had a clinically significant infection associated with an intervention that occurred during hospital admission. The number of patients with a surgery-associated infection has continued to decrease over the audit period, however postoperative infection remains the leading cause of overall infection.

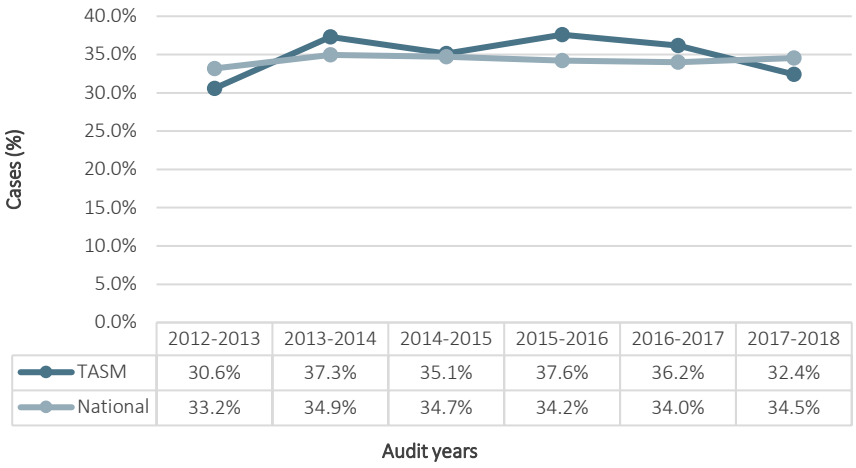
Over the total audit period (1 July 2012 to 30 June 2018), surgeons reported a clinically significant infection in 34.9% (249/713) of audited deaths in Tasmania.

In the current audit year (1 July 2017 to 30 June 2018), 32.4% (35/108) of patients had a clinically significant infection in Tasmania, similar to the national finding of 34.5% (1,226/3,549) (Figure 11). Most reported infections were acquired postoperatively, accounting for 77.3% (17/22) of infection cases in Tasmania and 69.7% (453/650) nationally (Table 11).

The infective organism was identified in 31.0% (77/248) of the infection cohort. Combined, pneumonia and sepsis comprised 69.9% (174/249) of the reported cases of infection (Table 12). Antibiotic prophylaxis is a good infection control measure in surgery and should be considered. Strategies for reducing surgical-site infections have been implemented overseas and in Australia.[14] The timeframe in which the infection was acquired can play a role in the patient's recovery following the surgical procedure.

The infection rate varied across individual specialties, reflecting the differing case mix (Figure 12). Plastic surgery had the highest reported infection rate at 60.0% (6/10) followed by obstetrics and gynaecology surgery at 50.0% (1/2), general surgery at 41.1% (138/336) and urology at 38.6% (17/44). Surgical-site infections in Tasmania continue to increase, from 6.8% (8/117) over the period 2012–2017 to 9.1% (2/22) in the current audit year (2017–2018) (data not shown). These findings are similar to the national data.[15-18]

Figure 11: Audited deaths with a clinically significant infection compared to national data, 2012–2018



n=249 of 713 patients had clinically significant infection n audited deaths in Tasmanian that were reported 1 July 2012 to 30 June 2018.
Data not available: n=1.

Table 11 shows the distribution of clinically significant infections acquired during admission. From 2012–2018, the proportion of 'other invasive-site infection' in Tasmania was significantly lower than the national figure. The proportion of 'acquired preoperatively' was also lower than the national figure.

Table 11: Audited deaths with clinically significant infection acquired during admission, 1 July 2017 to 30 June 2018

Infection acquired	2012-2017 TASM	2012-2017 National	2017-2018 TASM	2017-2018 National
Acquired postoperatively	74.4% (87/117)	67.0% (2,121/3,164)	77.3% (17/22)	69.7% (453/650)
Acquired preoperatively	16.2% (19/117)	17.7% (561/3,164)	9.1% (2/22)	16.8% (109/650)
Other invasive-site infection	2.6% (3/117)	7.1% (226/3,164)	4.5% (1/22)	6.5% (42/650)
Surgical-site infection	6.8% (8/117)	8.1% (256/3,164)	9.1% (2/22)	7.1% (46/650)

n=249 of 713 patients had clinically significant infection.
Data collection on clinically significant infections commenced 2011–2012.
Data not available: n=1.

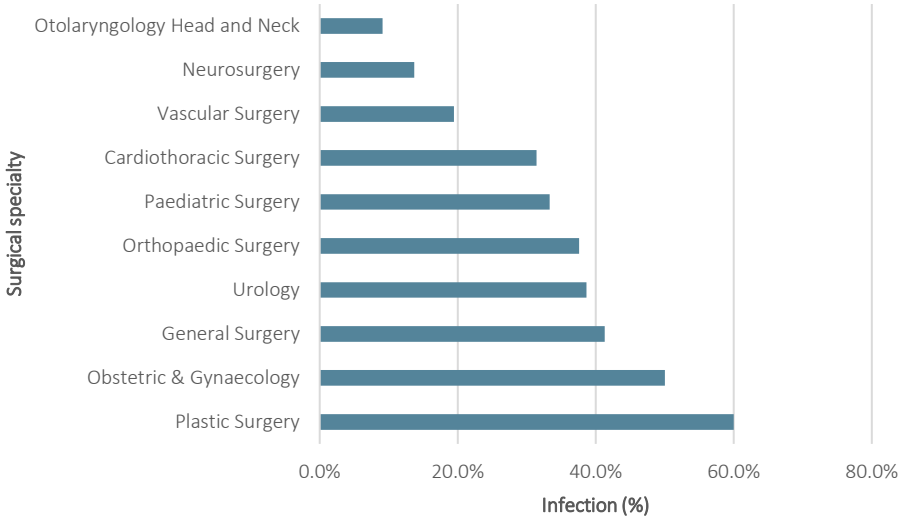
Of the cases of infection acquired during admission, 74.8% (104/139) were acquired postoperatively, 15.1% (21/139) were acquired preoperatively, 7.2% (10/139) were surgical site infections and 2.9% (4/139) were attributed to other infections. These figures will be monitored for trends in years to come.

Table 12: Clinically significant infections by type, 2012–2018

Type	Number	Per cent
Pneumonia	100	40.2%
Septicaemia	74	29.7%
Intra-abdominal sepsis	45	18.1%
Other source*	30	12.0%
All	**249**	**100.0%**

* includes Klebsiella, Clostridium difficile, Escherichia coli and methicillin-resistant Staphylococcus aureus.
n=249 infections in 714 patients.

Figure 12: Clinically significant infections by specialty, 2012–2018



n=249 infections in 714 patients.

3.5 Delay in diagnosis

Treating surgeons were asked to record any perceived delays in establishing a diagnosis and proceeding to definitive treatment (see Tables 13 and 14). Treating surgeons identified delays in establishing the diagnosis in 7.4% (116/1,560) of audited cases. (). This rate has remained relatively constant over time.

Table 13: Delays associated with establishing a diagnosis, 2012–2018

Delay association	2012-2013	2013-2014	2014-2015	2015-2016	2016-2017	2017-2018	Audit period
GP	0 (0.0%)	1 (9.1%)	1 (12.5%)	0 (0.0%)	1 (20.0%)	1 (7.7%)	4 (7.5%)
Medical unit	4 (40.0%)	2 (18.2%)	1 (12.5%)	0 (0.0%)	2 (40.0%)	4 (30.8%)	13 (24.5%)
Surgical unit	0 (0.0%)	2 (18.2%)	3 (37.5%)	2 (33.3%)	1 (20.0%)	3 (23.1%)	11 (20.8%)
Other*	6 (60.0%)	6 (54.5%)	3 (37.5%)	4 (66.7%)	1 (20.0%)	5 (38.5%)	25 (47.2%)
Total delays	**10 (100.0%)**	**11 (100.0%)**	**8 (100.0%)**	**6 (100.0%)**	**5 (100.0%)**	**13 (100.0%)**	**53 (100.0%)**
Closed	121	118	132	141	94	108	714

n=106 issues from 1,877 cases. One case can have multiple delay associations.
GP: general practitioner.
*includes delay from hospital in the home, nursing home and emergency department.

Table 14: Perceived delays in proceeding to definitive treatment 2012–2018

Reason for delay	Number	Per cent
Other*	14	25.9%
Unavoidable factors	10	18.5%
Inexperienced staff	12	22.2%
Misinterpretation of results	11	20.4%
Incorrect test	7	13.0%
Results not seen	0	0.0%
Total	54	100.0%

n=54 issues identified in 714 cases. One case can have multiple reasons for delays.
*includes delay to imaging, delay in emergency department and incorrect consultation.

3.6 DVT prophylaxis

Despite the availability of effective pharmacological and mechanical preventative options, DVT remains a major cause of mortality in hospital patients across Australia. Clinical practice guidelines for the prevention of venous thromboembolism in patients admitted to Australian hospitals[19] are reviewed and updated periodically to facilitate the best available care to patients. Recommendations within the guidelines are intended to encapsulate the available evidence for prevention of DVT. These guidelines should be followed in conjunction with the professional opinion of clinicians caring for individual patients and patients' own preferences.

TASM seeks to determine if appropriate strategies are being used to prevent DVT and subsequent pulmonary embolism in patients at risk. The treating surgeon was asked to record whether DVT prophylaxis was provided, and if so, which type of prophylaxis was used. Overall, DVT prophylaxis was used in 75.0% (533/711) of operative cases over the total audit period (Figure 13). The use of DVT prophylaxis was higher in elective admission patients 86.9% (93/107) compared with emergency admissions 72.8% (440/604) (Figure 14).

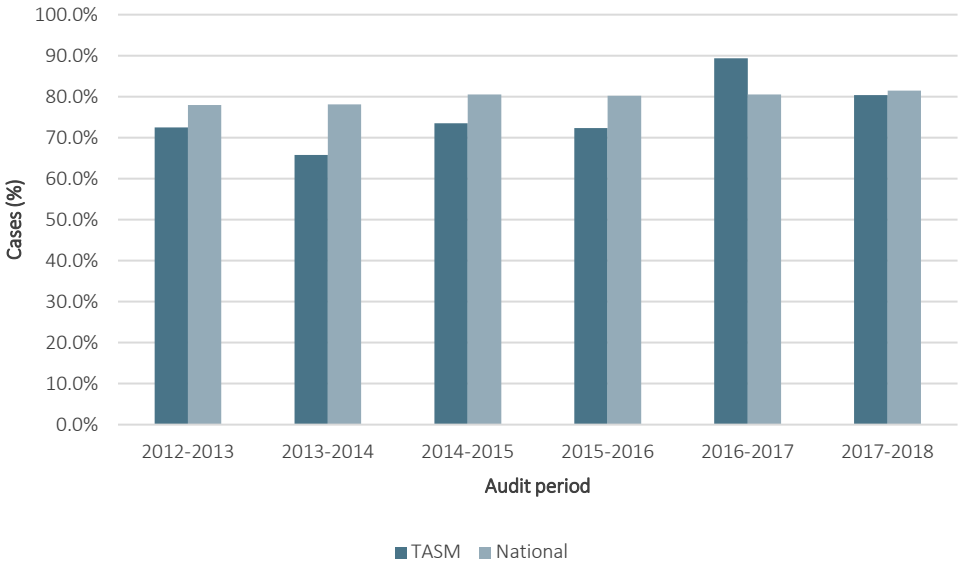
The type of prophylaxis used is subject to the judgement of clinicians caring for individual patients. Selection of DVT prophylaxis has been consistent over the reporting period, with heparin the most frequently prescribed form (see Figure 15).

Reasons given by surgeons for not providing DVT prophylaxis are also reported. In most cases (94.9%; 168/177), the non-provision of prophylaxis was a conscious decision made by the treating team (see Table 15).

Assessors were asked to comment on the appropriateness of withholding prophylaxis (see Table 16). First-line assessors felt that the decision to withhold DVT prophylaxis on clinical grounds was appropriate in 77.2% (152/197) of cases, whereas second-line assessors felt that the decision to withhold DVT prophylaxis on clinical grounds was appropriate in 44.4% (12/27) of cases. The tendency of second-line assessors to be more critical of clinical management events is to be expected after reviewing patient medical records.

Prophylaxis use by surgical specialty varied from 50.0% (3/6) to 89.7% (182/203) (see Figure 16).

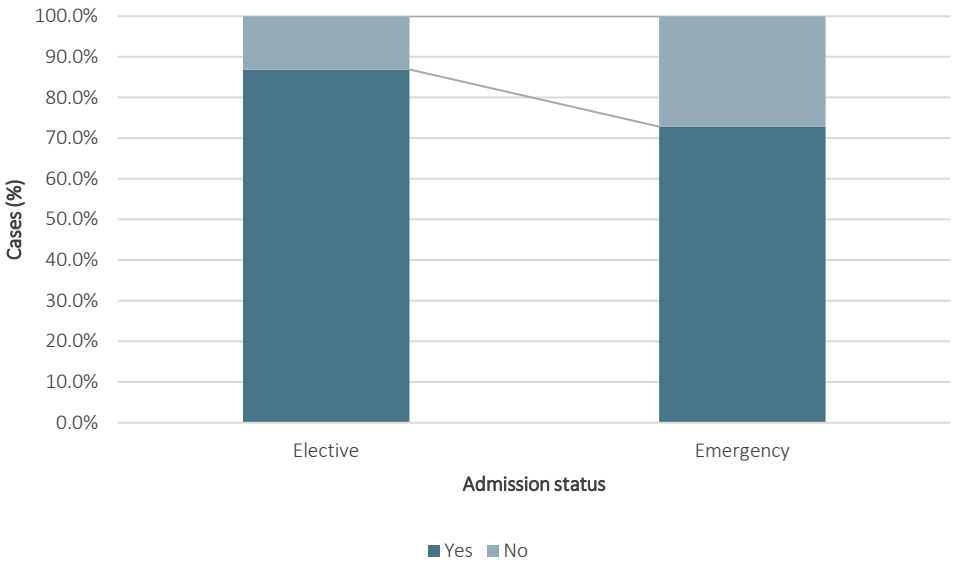
Figure 13: DVT prophylaxis use during the audit period, 2012–2018



n=711 Tasmanian patients having an operative procedure from 2012–2018

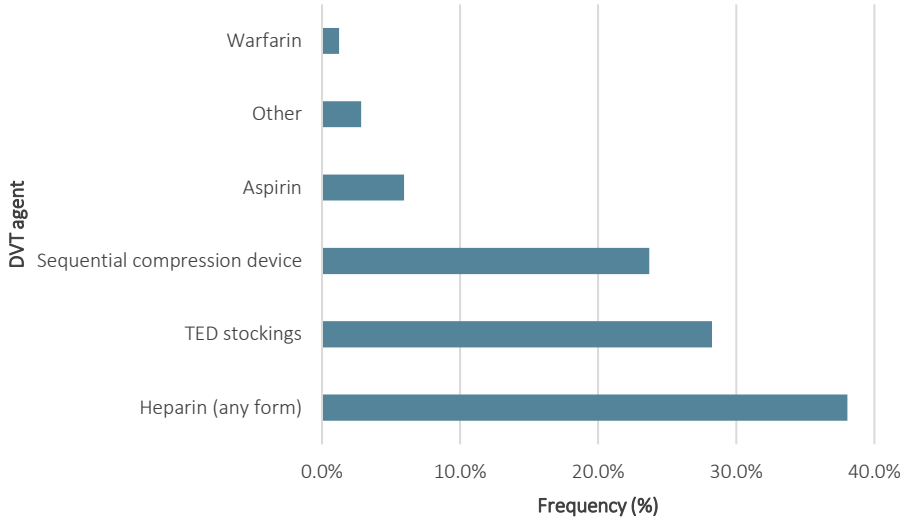
n=20,956 National patients having an operative procedure from 2012–2018

Figure 14: DVT prophylaxis use by admission type



n=711 Tasmanian patients.

Figure 15: Type of DVT prophylaxis used, 2012–2018



n=533 patients received DVT agents from 1 July 2012 to 30 June 2018.
Other includes calf stimulators, clopidogrel, epidural, full anticoagulation for non-ST segment elevation myocardial infarction, and inferior vena cava filter and infusion.

Table 15: Reasons given by treating surgeons for non-provision of DVT prophylaxis

Reason for no use	Frequency	Per cent
Active decision to withhold	47	26.6%
Not appropriate	121	68.4%
Not considered	9	5.1%
Total	177	100.0%

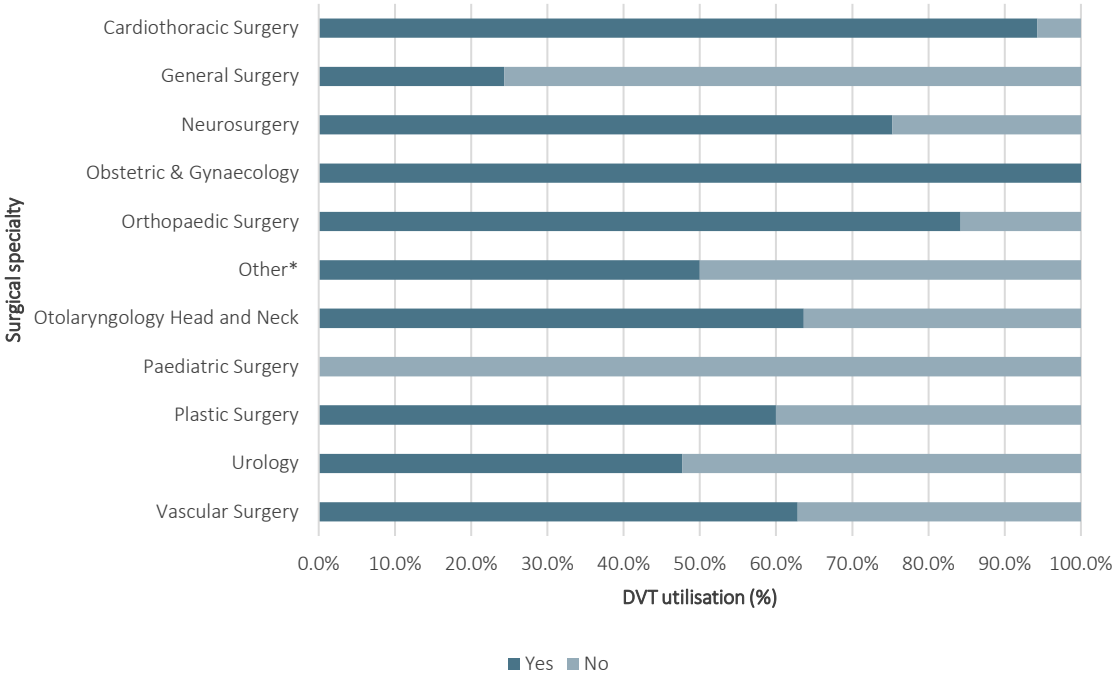
n=533 patients received DVT agents. Missing data: n=1.

Table 16: Assessor perception of the appropriateness of the decision to withhold DVT prophylaxis

Reason for no use	First-line assessor	Second-line assessor
Appropriate	152 (77.2%)	12 (44.4%)
Not appropriate/Unknown	45 (22.8%)	15 (55.6%)
Total assessments with no use of DVT	**197 (100.0%)**	**27 (100.0%)**

DVT: deep vein thrombosis.

Figure 16: DVT prophylaxis use by specialty



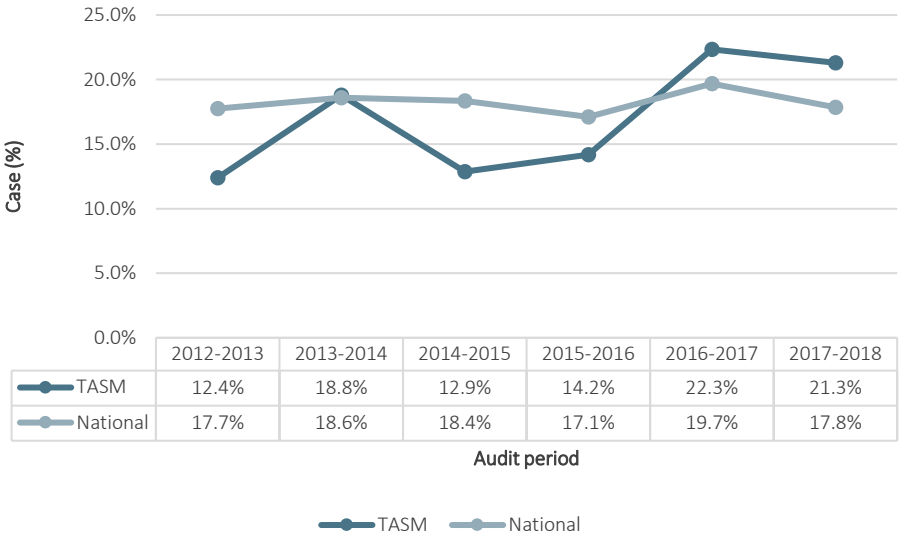
*includes Colorectal, Oral and Maxillofacial Surgery.

3.6.1 Unplanned Admission to Critical Care Unit

Critical care management is an important area of clinical priority that TASM has been monitoring. Figure 17 illustrates how unplanned admissions to Tasmanian and national CCUs have changed over time.

Between 1 July 2012 and 30 June 2018, surgeons reported an unplanned admission to CCU in 16.5% (118/714) of audited deaths in Tasmania, which is comparable to the national figure of 18.2% (3,814/20,921).

Figure 17: Audited deaths with unplanned admission to CCU compared to national data, 2012–2018

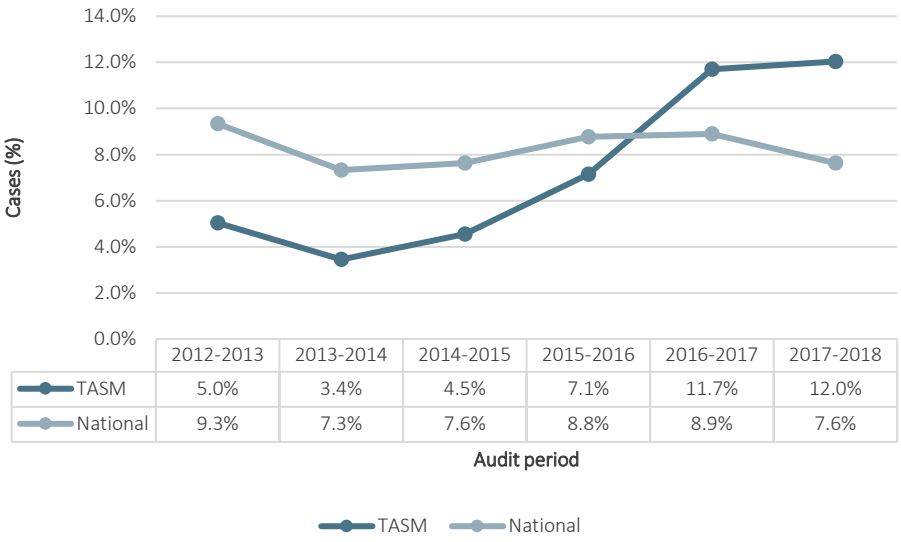


3.7 Issues with fluid balance

Surgical consultants and clinical teams should be competent in fluid management strategies. Determining the optimum amount of intravenous fluids to be administered to surgical patients and the best rate at which to give them can be complex. Treatment decisions must be based on careful assessment of individual patient needs, with the overall goal being provision of sufficient fluids and electrolytes to meet losses, maintain the normal status of body fluid components, and enable renal excretion of waste products. The interaction between fluid balance and disease severity for critically ill patients indicates that "early adequate fluid resuscitation together with conservative late fluid management may provide better patient outcomes".[20]

Treating surgeons and assessors were asked to comment on the appropriateness of fluid balance during the episode of care. Surgeons reported issues with fluid balance in 7.1% (50/709) of cases in Tasmania over the total audit period (1 July 2012 to 30 June 2018), slightly lower than the national audit figure of 8.2% (1,706/ 20,683) (see Figure 18). In the current audit year (1 July 2017 to 30 June 2018), surgeons reported that 12.0% (13/108) of audited deaths had fluid balance issues, which reflects a trend of yearly increases since 2013–2014.

Figure 18: Audited deaths with fluid balance issues compared to national data, 2012–2018

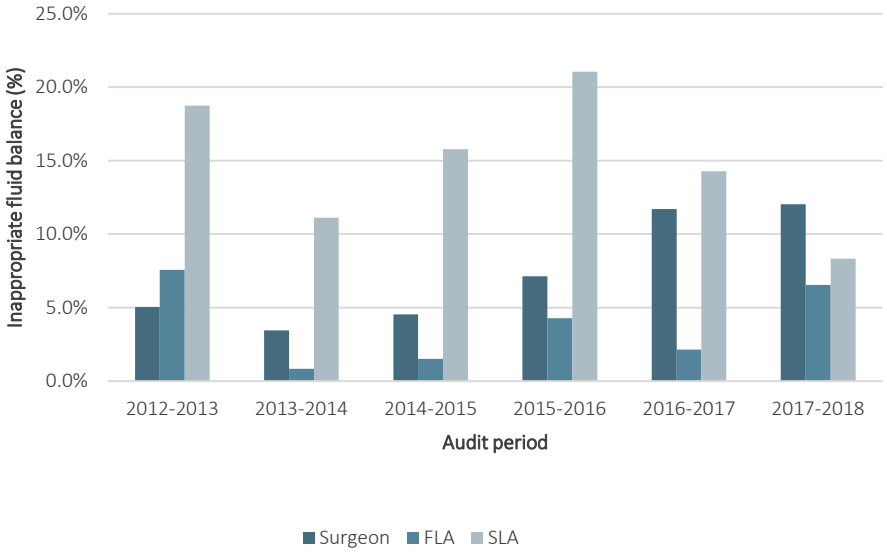


	2012-2013	2013-2014	2014-2015	2015-2016	2016-2017	2017-2018
TASM	5.0%	3.4%	4.5%	7.1%	11.7%	12.0%
National	9.3%	7.3%	7.6%	8.8%	8.9%	7.6%

n=50 of 709 patients had issues with fluid balance reported, 1 July 2012 to 30 June 2018.

Treating surgeons felt that in 7.1% (50/709) of cases the patient's fluid balance had been inappropriately managed by the clinical team (see Figure 19). First-line assessors perceived that the fluid balance was inappropriate in 3.8% (27/709) of cases, and second-line assessors perceived the fluid balance to be inappropriate in 15.9% (13/82) of the cases reviewed by them.

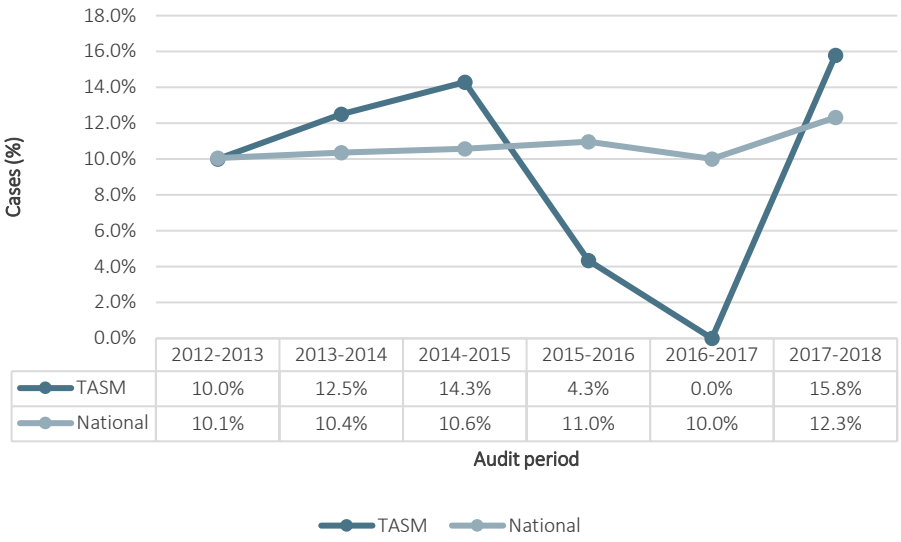
Figure 19: Perception of inappropriateness of fluid balance



3.8 Delay in transfer to another hospital

Over the total period 1 July 2012 to 30 June 2018, 16.0% (111/693) of patients were transferred to another hospital in Tasmania, a figure that has remained reasonably constant throughout the audit years. Surgeons reported that 2.9% of those transferred (11/109; of the 111 cases, two cases provided no further information) had a delay in transfer to another hospital (see Figure 20). In the current audit year (1 July 2017 to 30 June 2018), 20 patients were transferred to another hospital, and 15.8% (3/19) of those were reported to have had delays in the transfer. (In all instances, percentages were calculated after excluding cases with no additional information provided.)

Figure 20: Audited deaths with transfer to another hospital with delay compared to the national data, 2012–2018



n=11 cases of 109 patients had delays in transfers reported, 1 July 2012 to 30 June 2018. Data not available n=2.

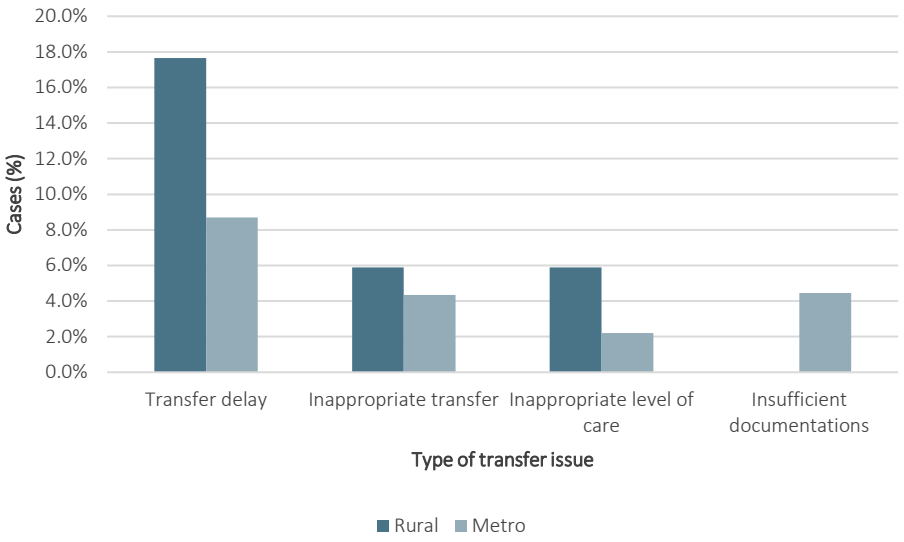
The rate of inappropriate transfer was 4.6% (5/109). An inappropriate level of care during transfer was identified for 2.8% (3/108) of transfer cases, while inadequate clinical information and documentation was provided to the receiving hospital in 3.7% (4/107) of transfer cases.

Comparing Tasmanian data to the national findings reveals very little difference in transfer delays, being 10.1% (11/109) for Tasmanian patients and 10.7% (539/5,023) for patients in the national audit.

3.8.1 Inter-hospital transfer issues by region

A major reason for transfer to another hospital is to provide a higher level of care, such as access to critical care support and surgical specialties, thus it is expected that rural hospitals will have a greater need to transfer patients. Figure 21 shows that transfer delays occurred more frequently in regional areas 17.6% (3/17) than in metropolitan areas 8.7% (8/94).

Figure 211: Types of issues associated with patient transfers from rural or metropolitan areas 2012-2018



RACS recognises the need for clinical support in rural areas, where appropriate care and availability of well-trained doctors is often limited.[21] The College is examining ways to improve the surgical training program by assisting rural hospitals to meet training standards currently designed for metropolitan training hospitals. RACS is also encouraging highly trained surgeons to relocate and practice in rural settings.[22]

Table 17 shows how transfer issues have varied over the audit period. Transfer delays and problems increase the risks to patients and are one of the challenges associated with shared care. The transfer of patients remains an area in which further improvements are required, particularly around communication between patient care teams, in order to ensure patient safety.

Table 17: Types of issues associated with patient transfer

Patient Transferred	2012-2013	2013-2014	2014-2015	2015-2016	2016-2017	2017-2018	Total
Inappropriate transfer	0 (0.0%)	1 (6.3%)	3 (14.3%)	0 (0.0%)	0 (0.0%)	1 (5.3%)	**5 (4.6%)**
Insufficient documentations	1 (5.0%)	0 (0.0%)	2 (10.0%)	1 (4.3%)	0 (0.0%)	0 (0.0%)	**4 (3.7%)**
Inappropriate level of care	0 (0.0%)	0 (0.0%)	3 (15.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	**3 (2.8%)**
Transfer delay	2 (10.0%)	2 (12.5%)	3 (14.3%)	1 (4.3%)	0 (0.0%)	3 (15.8%)	**11 (10.1%)**
Total transfer issues	**3 (3.8%)**	**3 (4.8%)**	**11 (13.4%)**	**2 (2.2%)**	**0 (0.0%)**	**4 (5.3%)**	**23 (5.3%)**

n=23 issues with 111 patients transferred.

3.9 Outcomes of the peer review

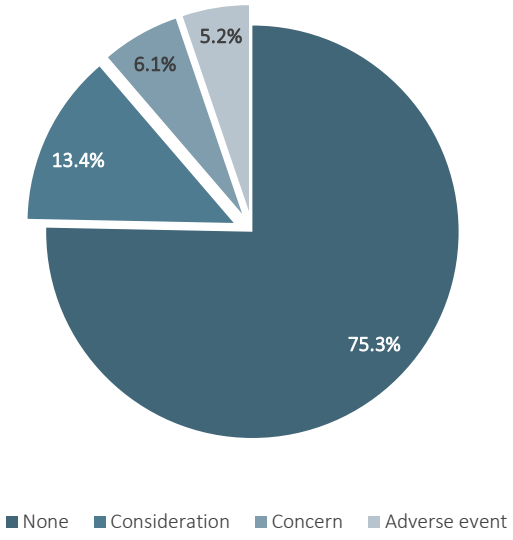
The audit process outlined in section 1.3 highlights the quality assurance loop in the review process, providing feedback and recommendations to the treating Fellow, the surgical team, the clinical community and participating hospitals.

A primary objective of the TASM peer review process is ascertaining whether death was a direct result of the disease process alone and clinical management had no impact on the outcome, or if aspects of patient management may have contributed to the death of the patient. For cases in which there is a perception that the clinical management may have contributed to the outcome, TASM has a spectrum of criticism from which the assessor can select a level of severity, as outlined below:

- An area for **consideration**: The assessor believes an area of care **could** have been improved or done differently, but recognises that the issue is debatable. It represents very minor criticism.
- An area of **concern**: The assessor believes that an area of care **should** have been better.
- An **adverse event**: An occurrence defined as an unintended injury or event **caused** by the medical management of the patient rather than by the disease process, which was sufficiently serious to lead to prolonged hospitalisation or temporary or permanent impairment or disability of the patient, or which contributed to or caused death.

For 88.7% (629/709) of audit cases there were no or only minor (area of consideration) perceived issues of patient management (see Figure 22). Areas of concern were identified in 6.1% (43/709) of cases and adverse events—the most serious form of criticism—were identified by assessors in 5.2% (37/709) of patient cases.

Figure 22: Clinical management issues as identified by assessors, 2012–2018



n=709, 1 July 2012 to 30 June 2018.

3.9.1 Areas of clinical incidents

Table 18 is a reference table showing the severity of criticism of perceived clinical management issues. More than one clinical management issue may be identified for each patient. It is the percentage of patients affected that is the important measure.

The severity of clinical incidents focuses on the accountability of the surgical team because this is the primary focus of the TASM audit. Patients often require input from other clinical teams during the course of their treatment and management issues raised may be attributable to any of these teams. Table 19 shows the frequency of clinical management issues over the audit period.

Trends in, and causes of, clinical management issues are monitored closely by TASM and remain the focus of reports and educational events.

The preventability of clinical management issues continues to be a focus and this report (225/844) 26.6% of issues were considered to be preventable

Table 18: Severity of criticism of perceived clinical management issues

	Less severe ◄			► Most severe
Areas of clinical incidents	None detected	Consideration	Concern	Adverse event
Outcome of incidents	N/A	Did not affect clinical outcome	May have contributed to death	Probably contributed to death
Preventable incidents	N/A	Probably not	Probably	Definitely
Association of incidents	N/A	Hospital	Clinical team	Surgical team

N/A: Not Applicable.

Table 19:Surgeons Reporting of Clinical management issues (CMI), 2012–2018

Perceived impact of clinical issues on patient outcome	Total occurrences of CMI	Per cent
No issues of management identified	534	61.6%
Did not affect clinical outcome	72	8.3%
May have contributed to death	211	24.3%
Probably contributed to death	50	5.8%
Total	**867**	**100.0%**

Perceived preventability of clinical issues	Total occurrences of CMI	Per cent
No issues identified	534	63.3%
Definitely preventable	67	7.9%
Probably preventable	158	18.7%
Probably not preventable	75	8.9%
Definitely not preventable	10	1.2%
Total	**844**	**100.0%**

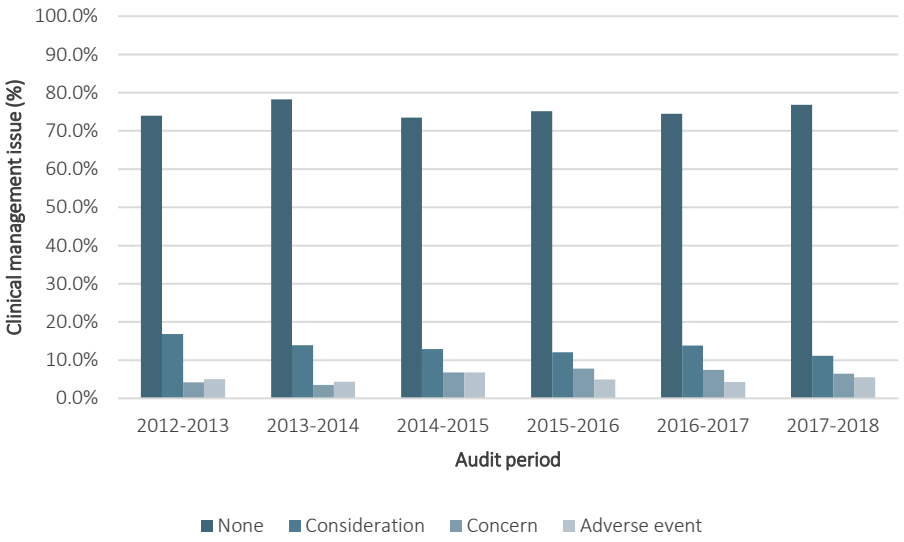
Clinical team responsible for management issue	Total occurrences of CMI	Per cent
No issues identified	534	60.6%
Surgical team	199	22.6%
Other clinical team	101	11.5%
Hospital issue	34	3.9%
Other factors*	12	1.4%
Total	**880**	**100.0%**

One patient case can be associated with more than one clinical management issue. Management issues can be attributed to more than one clinical team.
*includes issues such as staffing levels, patient transfer, patient refusal, ambulance care, anaesthetic care and availability or quality of critical care support.
From 1 July 2012 to 30 June 2018.

Overall, 22.6% (199/880) of clinical management issues were attributable to the surgical team. Other clinical teams, for example medical and emergency departments, were responsible for 11.5% (101/880) of issues. Hospital issues accounted for 3.9% (34/880) of clinical management issues and 1.4% (12/880) were attributed to other factors. These findings are similar to the 2016 national audit results.[1]

Figure 23 shows that the distribution of clinical issues has remained constant over the audit period.

Figure 23: Frequency and classification of clinical management issues by audit period



n=709.

In the current audit year, minor issues of patient management were perceived to have occurred in 11.1% (12/108) of cases and areas of concern perceived in 6.5% (7/108) (see Table 20). Peer review identified that there was a clinical issue serious enough to be categorised as an adverse event in 5.6% (6/108) of cases.

Table 20: Areas of clinical management issues by assessors

Characteristics	2012-2013	2013-2014	2014-2015	2015-2016	2016-2017	2017-2018
No issues identified	73.9% (88/119)	78.3% (90/115)	73.5% (97/132)	75.2% (106/141)	74.5% (70/94)	76.9% (83/108)
Area of consideration	16.8% (20/119)	13.9% (16/115)	12.9% (17/132)	12.1% (17/141)	13.8% (13/94)	11.1% (12/108)
Area of concern	4.2% (5/119)	3.5% (4/115)	6.8% (9/132)	7.8% (11/141)	7.4% (7/94)	6.5% (7/108)
Area of adverse event	5.0% (6/119)	4.3% (5/115)	6.8% (9/132)	5.0% (7/141)	4.3% (4/94)	5.6% (6/108)
Preventable issues	16.% (19/119)	11.3% (13/115)	16.7% (22/132)	16.3% (23/141)	14.9% (14/94)	14.8% (16/108)
Adverse event or concern that was preventable	5.9% (7/119)	5.2% (6/115)	11.4% (15/132)	10.6% (15/141)	8.5% (8/94)	9.3% (10/108)

The rate of perceived preventability of adverse events or areas of concern in the current audit year (14.8%; 16/108) is similar to that of 15.1% (91/601) over the broader audit period (1 July 2012–30 June 2017).

Assessors perceived more clinical issues than did treating surgeons (data not shown), highlighting the importance and value of an independent peer review assessment. The prevalence of areas of concern and adverse events identified by assessors was similar among the specialties, although specialties with fewer mortalities reported may skew the data.

3.9.2 Frequency of clinical management issues

Table 21 shows the frequency of specific issues of clinical management. A greater number of clinical management issues indicates the requirement for improved surgical care in that particular area.

Table 21: Frequency of clinical management issues, 2012–2018

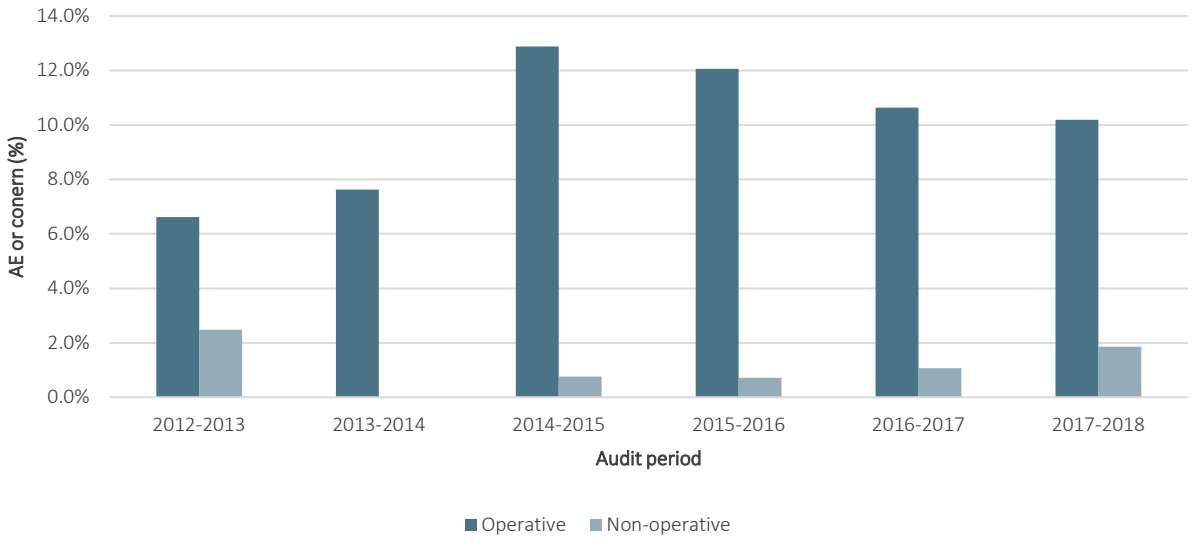
Clinical management issues	Total
General complications of treatment	7
Adverse factors in management	6
Better to have done different operation or procedure	5
Decision to operate	4
Diagnosis related complications	4
Operation should not have been done or was unnecessary	3
Wrong operation performed	3
Delay to operation caused by missed diagnosis	3
Delay to surgery (i.e. earlier operation desirable)	3
Failure to investigate or assess patient fully	3
Delay in diagnosis	2
Pre-operative assessment inadequate	2
Assessment problems	2
Post-operative care unsatisfactory	2
Unsatisfactory medical management	2
Delay in transfer to surgical unit	2
Secondary haemorrhage	2
Pulmonary embolus	2
Delay in transfer to tertiary hospital	1
Better transferred between hospitals pre-operatively for ICU support	1
Transfer should not have occurred	1
Nasogastric tube not used	1
Failure to catheterise pre-operatively	1
Unsatisfactory management of hypotension	1
More aggressive treatment of infection needed	1
Inappropriate treatment prior to surgical referral	1
Unsatisfactory management of coagulopathy	1
Care unsatisfactory (not otherwise specified)	1
Wrong surgical approach used	1
Failure to obtain a postmortem	1
Failure in communication with x-ray department	1
Failure to communicate with senior staff	1
Poor documentation	1
Lack of nursing supervision	1
Delay starting DVT prophylaxis	1
Delay starting medical treatment	1
Delay to re-operation	1
Delay in recognising a bleeding complication	1
Delay in recognising anastomotic leak	1
Delay in recognising complications	1

Clinical management issues	Total
Delays	1
Diagnosis missed by radiologist	1
Perforation of duodenum during radiological operation	1
Perforation of colon during endoscopic operation	1
Perforation of colon related to laparoscopic operation	1
Post-operative bleeding after open surgery	1
Failure stop intra-operative. Bleed during open surgery	1
Intra-operative bleeding during open surgery	1
Central vein thrombosis related to open surgery	1
Open surgery, organ related technical	1
Failure to stop intra-operative bleeding due to coagulopathy	1
Heart complication	1
Perforation of small bowel during endoscopic operation	1
Injury to spleen during laparoscopic operation	1
Total	**93**

n=93 clinical management issues identified from 1 July 2012 to 30 June 2018.
clinical management issues counted if frequency >3.

The frequency of adverse events classified according to operative status is shown in Figure 24. Together, areas of concern and adverse events amounted to 11.2% (80/714) during the total audit period. Non-operative procedures had significantly fewer areas of concern and adverse events 1.1% (8/714) compared with cases in which an operative procedure was performed 10.1% (72/714).

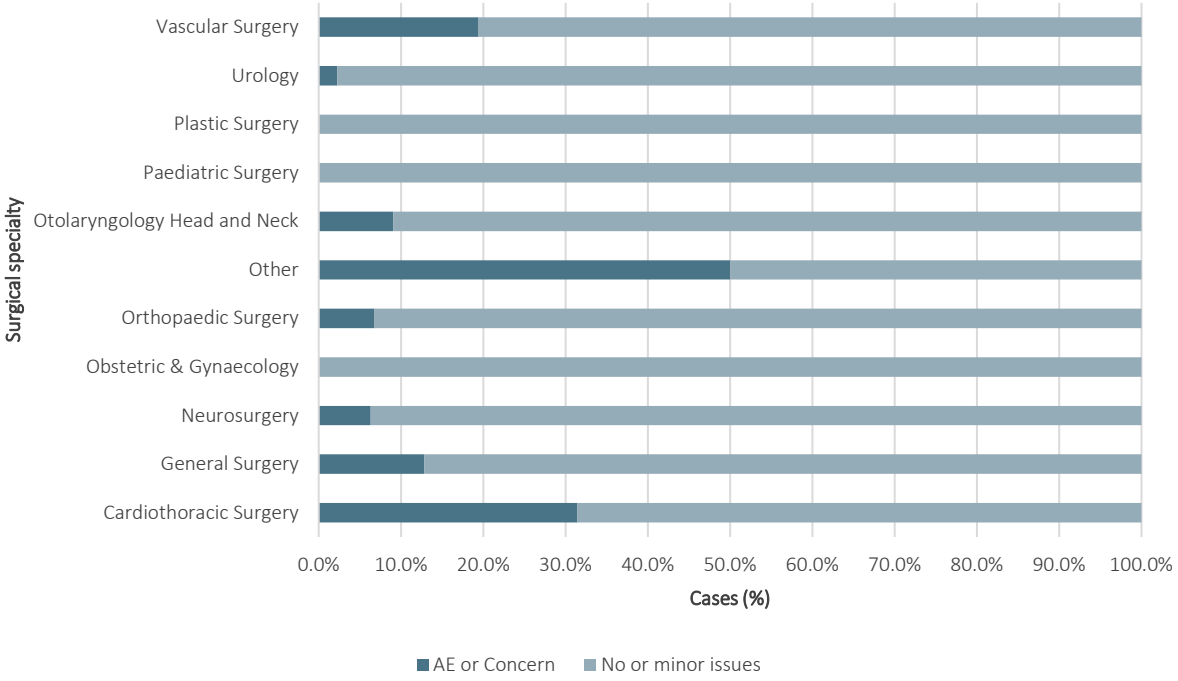
Figure 24: Frequency of adverse events and areas of concern by operative cases and audit period



n=80 areas of concern and adverse events amongst n=714 cases.
AE: adverse event.

Figure 25 shows adverse events and areas of concern classified according to surgical specialty. TASM has initiated the surgeon's individual aggregate report to enable benchmarking and monitoring of clinical management trends.

Figure 25: Adverse events and areas of concern by surgical specialty



AE: adverse event.
Other includes Colorectal Surgery, Oral and Maxillofacial Surgery.

3.9.3 Conclusions

Surgery in Tasmania is safe and well regulated. Only a small proportion of surgical patients die. When a death does occur, however, it is reviewed by peer-surgeon assessors coordinated by RACS via TASM. The de-identified and aggregated results of those investigations are presented in this document.

As our population ages, more work and more challenges will confront the surgical community. The surgeons who form this vital part of our healthcare system will rise to these challenges—learning from the issues in these pages, from scientific achievements from around the world and from the opportunities for self-reflection that TASM offers.

4. Trauma

TASM began collecting data on trauma cases in 2016 to monitor trends, especially relating to falls. Monitoring will ensure strategies are implemented to prevent and minimise harm from trauma in the future. Trauma cases are those in which a patient received severe bodily injury or shock from a fall, accident or violence.

Results from 1 July 2016 to 30 June 2018 show that falls occurred mostly at home and in care facilities (see Figure 26). Preventative measures need to consider these sites as part of the healthcare strategic planning to reduce the total number of falls. Falls in hospital can impact or be a cause for further surgical or medical intervention.

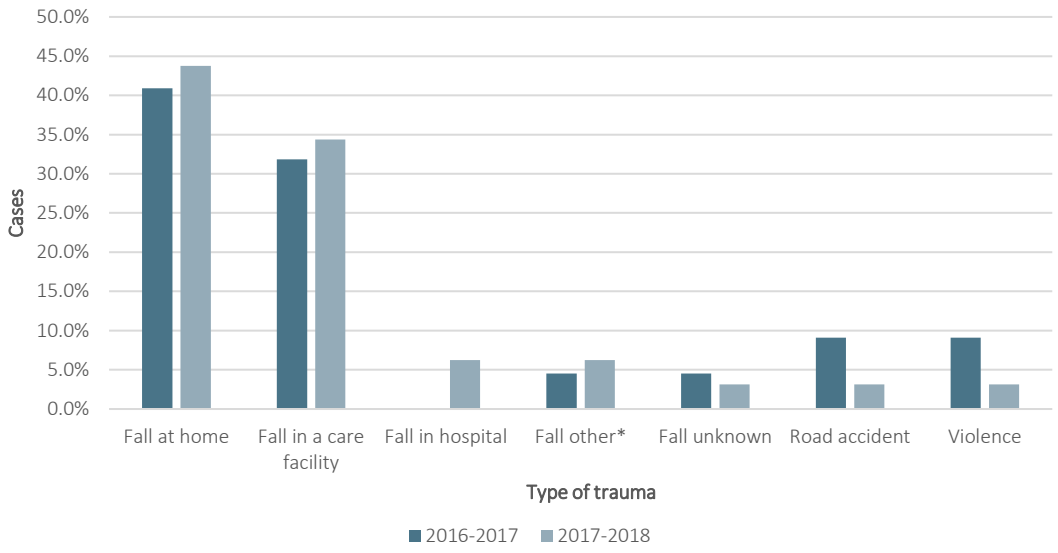
From 1 July 2016 to 30 June 2018, 28.5% (54/202) of mortalities were attributed to trauma. Of those traumatic events, 88.9% (48/54) were caused by falls, 5.5% (3/54) were caused by traffic accidents and 5.6% (3/54) were associated with violence. Of 48 falls, 41.7% (20/48) occurred in hospitals or care facilities, while 47.9% (23/48) occurred at home. Only 10.5% of falls (5/48) occurred elsewhere.

The TASM surgical population is at an increased risk of falls due to the extent of life-threatening pre-existing conditions, comorbidities and frailty associated with advanced age. The 41.7% (20/48) of falls still occurring in hospitals or care facilities in TASM, should be addressed and strategies implemented to reduce the number of falls in those locations. The 2016 census[23] released by the Australian Bureau of Statistics in 2017 shows that Tasmania had the highest proportion of the population aged 70 and above (13.0%) when compared with the rest of Australia (10.7%).

A review of the care received by elderly patients undergoing surgery in the United Kingdom had similar findings.[24] Future trends analysis of falls will help inform strategies for improvement in this aspect of patient care, especially falls in care facilities or in hospitals.[25]

TASM hopes to see a reduction in falls and will include this in its educational programs, accordingly. Reviewing falls in trauma and orthopaedic cases can be a powerful tool to unite institutions motivated to assess changing demographics and standards of treatment, and institute change.[27] One study found a reduction in postoperative falls in patients who participated in a preoperative education program.[26] Similar educational strategies could be implemented at Tasmanian healthcare facilities.[28]

Figure 26: Audited deaths with causes of trauma



n=54 trauma cases in 202 patients reported, 1 July 2016 to 30 June 2018.
*includes roads and public venues.

5. Audit limitations and data management

Data quality is an essential component of all audits. Inaccurate and incomplete clinical information will impair the audit process and prevent identification of trends.[29]

TASM audit data is primarily collected, managed, peer-reviewed and analysed to provide feedback to surgeons rather than for academic research. The data is of high quality as every case undergoes external peer review.

The data is self-reported; thus a certain level of bias may be present. Independent assessors make their own assessments on the facts presented.

Appropriate responses to TASM questions are important, as incomplete or missing data hinders the ability of the audit to identify and address adverse trends. Where data integrity issues are identified it is important to review the format of the questions generating the data. ANZASM has revised the SCF to improve the quality of audit data.

TASM upgraded the Electronic Fellows Interface in 2016 for enhanced data submission. This should lead to continuously improving data quality and integrity.

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7. Appendix

7.1 Data management and statistical analysis

All deaths occurring in Tasmanian hospitals while the patient is under the care of a surgeon, which are notified to TASM, are audited. Cases admitted for terminal care and deaths incorrectly attributed to surgery are excluded from the full audit process. The 2015–2016 report includes deaths reported to TASM since data collection commenced on 1 July 2004 up to 30 June 2016. As the multiple rate-limiting steps in the audit process result in a mean time to completion of three months, information on some deaths that occurred during the reporting period may be still under review and are not included.

Data is encrypted in the web database. This data is sent to, and stored in, a central Structured Query Language server database that 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 the RACS IT department. All communications are encrypted with Secure Sockets Layer certificates.

Data is downloaded from the secure database and then analysed using Microsoft Office Excel (2010). Demographic data and summary statistics are presented. Variables have also been tested for yearly trends. Numbers in parentheses in the text (n) represent the number of cases analysed. These numbers vary as not all data fields were completed by surgeons.

7.2 Exclusion of identifiable data

Data that might identify surgical groups, patients or hospitals have been excluded from this report, as have extreme values.

7.3 Classification of operative procedures

- Cardiac: includes angiograms, bypass of coronary artery, exploratory median sternotomy, median sternotomy approach, replacement of aortic and mitral valve.
- Colorectal: includes anterior resection of rectum and anastomosis, colostomy, partial colectomy, hemicolectomy, ileostomy and reversal of Hartmann's procedure.
- Gastrointestinal endoscopy: includes colonoscopy, gastroscopy, endoscopic retrograde cholangiopancreatography and sigmoidoscopy.
- Laparotomy and upper gastrointestinal: includes cholecystectomy, endoscopic division of adhesions of peritoneum, gastrectomy, ileostomy, jejunostomy, oversewing of small bowel and repair of inguinal hernia.
- Neurosurgical trauma: includes burrhole(s) for ventricular external drainage, craniectomy, craniotomy, evacuation of haematoma, insertion of cranial monitor, insertion of drainage system into bone and intracranial pressure monitoring evacuation.
- Orthopaedic: includes hip joint operations, hemiarthroplasty, fracture and internal fixation.
- Peripheral vascular: includes embolectomy of femoral artery and vein graft thrombectomy.
- Thoracic and tracheostomy includes bronchoscopy, insertion of tube drain into pleural cavity, thoracotomy and tracheostomy.
- Urology: includes diagnostic cystoscopy and transurethral resection of male bladder.
- Wound care: includes debridement of bone, muscle and skin, drainage of septal abscess, dressing of wound and lavage of peritoneum.

7.4 Classification of clinical management issues

- Adverse event: includes anastomotic leak after open surgery, injury caused by fall in hospital, pulmonary embolus, secondary haemorrhage and transfer should not have occurred.
- Communication or poor documentation includes communication failures due to poor case notes and poor communication between physician and surgeon.
- General complications after operation includes aspiration pneumonia, general complications of treatment, postoperative bleeding after open surgery and septicaemia.
- Management or protocol issues: includes adverse events related to treatment guidelines or protocols, diagnosis-related complication, failure to use DVT prophylaxis, high dependency unit not used postoperatively, patient-related factors and patient refusing treatment, surgeon too junior, treatment did not conform to guidelines and unsatisfactory medical management.
- Operation inappropriate: includes decision to operate and consider different operation or operation should not have been done.
- Preoperative care issues: includes computed tomography scan should have been done, cardiac monitoring inadequate, failure to investigate or assess patient, failure to recognise severity of illness and inappropriate treatment prior to surgical referral.
- Postoperative care issues: includes drug-related complication, failure to use high dependency unit postoperatively, fluid balance unsatisfactory, fluid overload and inadequate postoperative assessment.

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