



Royal Australasian College of Surgeons
Victorian Audit of Surgical Mortality

Victorian Audit of Surgical Mortality (VASM)

2020 Annual report



Royal Australasian College of Surgeons
**Australian and New Zealand
Audits of Surgical Mortality**



Health
and Human
Services



**Victorian Perioperative
Consultative Council**



**The Royal Australian
and New Zealand
College of Obstetricians
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CONTACT DETAILS

Victorian Audit of Surgical Mortality (VASM)
Royal Australasian College of Surgeons
College of Surgeons' Gardens
250–290 Spring Street
East Melbourne VIC 3002

Web: www.surgeons.org/VASM
Email: vasm@surgeons.org
Telephone: +61 3 9249 1153

Postal address:
Victorian Audit of Surgical Mortality
GPO Box 2821
Melbourne VIC 3001

Image on the front cover, "*Standing Tall*" by Elisa Coceski (watercolour, February 2021).

The information contained in this annual report has been prepared by the Royal Australasian College of Surgeons, Victorian Audit of Surgical Mortality Management Committee. Safer Care Victoria provides the funding for the project and guidance through the complexities of the health systems.

The Australian and New Zealand Audit of Surgical Mortality, including the Western Australian, Tasmanian, South Australian, Australian Capital Territory, Northern Territory, New South Wales, Victorian and Queensland Audits of Surgical Mortality, has protection under the Commonwealth Qualified Privilege Scheme under Part VC of the Health Insurance Act 1973 (gazetted 25 July 2016).

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Foreword from VASM

The pandemic associated with the novel Coronavirus, COVID-19, presented significant challenges (both medically and economically) throughout 2020, which continues into 2021. The health impacts in Australia were relatively controlled compared to other jurisdictions but frightening scenes of overwhelmed hospitals from China and Europe in March 2020 resulted in mass lockdowns in an (ultimately successful) effort to protect local health services. One of the measures employed was a restriction on elective surgery in both the public and private health sectors, which is reflected in the near 10% decrease in procedures performed in Victoria. Victoria endured a second wave of infections with a stricter lockdown starting in July 2020, with the data from that period to be reported next year.

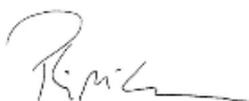
The number of surgery-related deaths in Victoria, and Australia as a whole, decreased during the lockdowns, reflecting the smaller number of elective operations performed, but the number of deaths related to emergency operations, which have always been most of the cases reviewed by VASM, have also decreased. This will be explored in future peer-reviewed publications; causes will include patients avoiding hospitals during the pandemic and not presenting with urgent conditions, and, possibly, increased availability of senior surgical staff due to the lack of elective work.

The pandemic has significantly changed the way we work and the VASM office is no different. All VASM staff were based at home for the majority of 2020 with the Royal Australasian College of Surgeons (RACS) Melbourne building closed. The electronic submission of surgical cases through the Fellows Interface has allowed the number of reported cases and first-line assessments to remain fairly constant, and we are grateful to the Fellows for maintaining this work during difficult times. Unintended consequences of the office closure have included difficulty retrieving hospital notes and sending out the bundles of notes to our second-line assessors. The keen reader will note that the proportion of second-line assessments in this report is approximately half that in previous reports, and as these cases are often the most challenging and contentious, the overall messages for the reported year may be diluted. There has certainly been a reduction in the number of difficult cases crossing my desk but, as Case Note Review Booklets are now produced using the national dataset, this will have no impact on educational opportunities. The assessments will be done, and any lessons included in future reports.

Despite all the above, surgery in Victoria remains safe and the results reported here are consistent with the best reported outcomes in the world. It is pleasing that there are no major outlying health services for the first time since we introduced this analysis. There have been noted improvements in deaths related to infections and deep vein thrombosis (DVT) prophylaxis but there are still issues with the choice of appropriate treatment and falls in hospitals causing significant trauma contributing to death (Table 4).

VASM will continue to work closely with SCV, and the anticipated changes to Commonwealth QP will allow better sharing of work with VPCC.

As always, I would like to thank everyone who contributes to the continuing success of VASM. The office team have kept everything running in trying circumstances. All health agencies have been working under intense strain because of the pandemic and it is amazing that the background work involved in the audit has continued. We are indebted to our surgical Fellows who continue to provide world class surgical care and still have the time to complete our audit forms and assessments.



Associate Professor Philip McCahy, FRACS (Urology)
VASM Clinical Director

Foreword from VPCC

The Victorian Perioperative Consultative Council (VPCC) works closely with VASM and Safer Care Victoria (SCV) to improve perioperative care before, during and after surgery. VPCC, working under Victoria's Public Health and Wellbeing Act 2008, was established to promote better information flow across the health sector, without compromising the Commonwealth Qualified Privilege (QP) under which VASM operates. To this end, VASM's QP has now been amended to allow more interaction with VPCC and so better integrate the key findings from the audits across the sector and, when indicated, to provide multidisciplinary review.

VPCC interacts directly with health services, SCV and the Department of Health, hence, is able to promote the improvement opportunities identified by VASM.

The [VPCC 2020 report](#) for example, actively promotes high standards for mortality and morbidity meetings (see appendices 5 & 6, p 50-64), and provides guidelines to ensure that the issues identified for improvement, flow through to hospital clinical governance meetings.

The Council includes consumers who, into the future, can offer VASM greater opportunity for consumer engagement and feedback. VPCC also monitors and reviews perioperative morbidity which is outside the scope of VASM. This allows VPCC to identify any lessons from complications where death has not occurred. With this knowledge we can determine if the mortalities that occur represent the tip of a large morbidity iceberg.

This year's report highlights yet again, that it is emergency and elderly patients, usually those with comorbidities, that are the most likely to die in the perioperative period. The most common conditions leading to death were acute abdomen, malignancy, and fractured neck of femur (Fig 5 p 18).

Mortality from fractured neck of femur has declined in recent years, which has been driven by actions resulting from both audit of those cases resulting in mortality and by the establishment of the Australia and New Zealand Hip Fracture Registry (ANZHFR).

Lance Emerson, Victorian Agency for Health Information's CEO, highlighted in the recent [VAHI news](#) the benefit of participation in ANZHFR for patients treated at the Alfred Hospital, but also the need for more Victorian sites to contribute data to the registry. The [Australian Commission on Safety and Quality in Health Care clinical care standard](#) for patients with hip fractures also promotes the best care before, during and after surgery.

The condition with the leading cause of death in Victoria is acute abdomen with the need for an emergency laparotomy. The Australia and New Zealand emergency laparotomy audit was established as a quality improvement project ([ANZELA-QI](#)) by both the RACS and ANZCA in 2018, and its inaugural report was published late last year. There are, similar to ANZHFR, clear key performance indicators and standards of good care established by ANZELA, based on England's National Emergency Laparotomy Audit (NELA). Over the first six years of reporting the mortality has dropped 20%, and around 90,000 bed days in hospital have been saved. In its first reporting period, ANZELA-QI has already shown a declining mortality over the period of the audit and a reduced length of stay.¹ There is a clear need for an emergency laparotomy clinical care standard, along the lines developed for hip fractures.

Better outcomes for patients should incentivise health services to participate in both ANZELA-QI and ANZHFR.

In reading this report, the RACS team at VASM, the surgeons and assessors who participate are to be congratulated for its contribution to monitoring and improving the safety and quality of perioperative care in Victoria.



Professor David A Watters AM OBE
Chair, Victorian Perioperative Consultative Council

1 Abbreviations

ANZASM	Australian and New Zealand Audit of Surgical Mortality
ANZCA	Australian and New Zealand College of Anaesthetists
ANZELA-QI	Australia and New Zealand Emergency Laparotomy Audit – Quality Improvement
ANZHFR	Australia and New Zealand Hip Fracture Registry
AOA	Australian Orthopaedic Association
ASA	American Society of Anesthesiologists
CCU	Critical care unit
CHASM	Collaborating Hospitals' Audit of Surgical Mortality
CMI	Clinical management issue
DHHS	Department of Health and Human Services
DRG	Diagnosis-related group
DVT	Deep vein thrombosis
FLA	First-line assessment
ICU	Intensive care unit
IQR	Interquartile range
HDU	High dependency unit
M&M	Mortality and Morbidity
NELA	National Emergency Laparotomy Audit
NSQHS	National Safety and Quality Health Service
QP	Qualified Privilege
RACS	Royal Australasian College of Surgeons
RANZCOG	Royal Australian and New Zealand College of Obstetricians and Gynaecologists
SCF	Surgical case form
SCV	Safer Care Victoria
SLA	Second-line assessment
VAED	Victorian Admitted Episodes Dataset
VAHI	Victorian Agency for Health Information
VASM	Victorian Audit of Surgical Mortality
VPCC	Victorian Perioperative Consultative Council

2 Executive Summary

Participation in the audits of surgical mortality was mandated by RACS in 2010 as part of the continuing professional development program. Compliance with the audit is determined by the number of cases that have completed the audit process compared with the total number of surgical deaths in the audit period. Key findings are based on 1,061 peer-reviewed cases from the audit period of **1 July 2019 to 30 June 2020**.

Most surgical deaths (84.5%; 895/1,059) in this audit period occurred in elderly patients with underlying health problems who were admitted as an emergency with an acute life-threatening condition requiring surgery.

2.1 Hospital admission and operative patient profile

The most frequent operative procedures described for VASM during the current audit period (2019–2020) were for trauma or acute abdominal pathology. Most patients (91.5%; 970/1,061) had at least one operation during their final hospital admission. Of the patients who had surgery, 11.3% (110/970) had an unplanned return to the operating theatre due to complications.

A consultant was present in theatre in 82.3% (1,036/1,259) of operations compared to the national rate of 75.6% (1,629/2,156). In Victoria, this is further broken down to the consultants being present in theatre in 79.5% (801/1,007) of operations in public hospitals, compared to 93.3% (235/252) in the private sector (Appendix Table 2).

2.2 Clinical management issues

Clinical management issues (CMIs) identified in this audit show that more than one issue can occur during a patient's hospital stay.

The peer-review process did not criticise the patient management in 74.7% (790/1,057) of audited cases, whereas potential issues were found in the overall perioperative management of the remaining 25.3%. In 12.4% (131/1,057) of cases, the criticisms were mild and considered to be differences of opinion (areas of consideration). In 5.0% (53/1,057) of cases, the assessments were more severe (classified as areas for concern), and in 7.9% (83/1,057) of cases, the peer-review process concluded that adverse events had occurred.

Identified perioperative clinical management issues for each case have been directed to the treating surgeons to allow feedback and reflection. It is important to note that not all clinical management issues are associated with the surgical team as perioperative care is broad and complex, including preoperative, intraoperative and postoperative care delivered by multidisciplinary teams.

2.3 Potentially preventable clinical outcomes

In addition to identifying clinical management issues, clinical assessors also decide whether those issues were potentially preventable. The rate of preventability of adverse events or concerns has decreased from 11.9% (157/1,316) in 2018–2019 to 8.6% (91/1,057) in the current audit period (2019–2020) (Appendix Figure 2). VASM distributes clinical performance reports to each participating site, allowing for healthcare services to examine their own de-identified potentially preventable outcomes.

The key VASM recommendations in this report align with six of the eight National Safety and Quality Health Service (NSQHS) Standards (Section 5) that can be used by hospitals and health professionals to improve clinical practice and patient safety. Overall, the goal is for the information that VASM collects to help all surgical Fellows and participating health organisations improve the quality of their service and safeguard high standards of care.

2.4 Recommendations

Decision making around surgical care

Operations should only be performed on sites with appropriate facilities/support.

All patients must be allocated to a consultant who is responsible for clinical care.

Goals of care should be clearly discussed and recorded for every hospital admission.

Patients, and their families, should be more involved in planning their treatment.

Multidisciplinary involvement should be increased in pre-operative care.²

Senior doctors should be more actively involved in decision making.

Communication between health professionals and their patients should be improved.

Transfers

Delays and problems in transfer can cause risks and challenges for shared surgical care.

Senior medical input is required at all sites when transferring patients.

In-hospital fall prevention

Improve the rate of falls that contribute to surgical deaths occur within a hospital or health care facility.

Trend analysis on falls noted as part of VASM will help form strategies to improve this aspect of patient care, especially in hospitals and health care facilities.³

Postoperative management

Control and manage infections with appropriate investigation, rapid administration of treatment and timely involvement of expert teams.

Recognise and act on evidence of clinical deterioration.

Clinical Governance – Learning from outcomes of care

All appropriate patients should be discussed at unit Mortality and Morbidity (M&M) meetings.⁴

All M&M recommendations should be reported to Hospital Executive.

VASM should provide information about the outcomes and learnings from VASM in a form accessible to consumers.

3 Introduction

The Victorian Audit of Surgical Mortality (VASM) forms part of the Australian and New Zealand Audit of Surgical Mortality (ANZASM)—a national network of regionally-based audits of surgical deaths that aim to ensure the highest standards of safe and comprehensive surgical care. VASM, like its interjurisdictional counterparts, monitors trends in surgical deaths via independent peer-review assessments. These assessments identify CMLs for which strategies can be developed to manage and improve patient safety.

This report presents key findings and recommendations for the period 1 July 2019 to 30 June 2020, with tables and figures providing information from 1 July 2012 to 30 June 2020 to illustrate changes over time. This allows for significant changes to be identified and investigated further. If data has not been provided to the VASM office, the case is excluded from analysis for the relevant section only. For this reason, the denominator varies for different results.

To further assess emerging trends and to benchmark outcomes of surgical care, data comparisons have been made between VASM and ANZASM. The Collaborating Hospitals' Audit of Surgical Mortality (CHASM) in New South Wales runs a comparable audit methodology and collects similar data to ANZASM. CHASM is independently managed by the Clinical Excellence Commission of New South Wales and the data was unavailable to ANZASM for this report, thus national data aggregate comparisons include all State and Territory audit outcomes except for New South Wales.

VASM has been externally audited three times (2011, 2015 and 2018) by Aspex Consulting to assess its functionality. Recommendations from the 2018 Aspex Consulting review⁵ are presented in this report as part of the key findings.

The need for hospitals and surgeons to reduce CMLs and preventable outcomes (identified in Sections 13 and 14) represents a key recommendation from the current audit. Messages from the key findings are reiterated in Section 5 (NSQHS Standards). VASM audit findings could be utilised to meet NSQHS Standards to identify areas for improvement.

The VASM staff would like to acknowledge the support and assistance of the many individuals and institutions that have helped in the development and continual improvement of this project (Section 16).



4 Victorian healthcare statistics

Victoria has a good and safe healthcare system

VASM monitors and learns from surgical death to inform how high surgical standards can be maintained and patients can receive the best surgical care possible. The data below is derived from audited cases from 1 July 2019 to 30 June 2020.

Demographic

Victorian total

Population	6.7 million
Procedures	660,583

Audited mortalities



Males	59.8%
Females	40.2%
Median age	78
Mortality rate	0.3%



Admission status

Elective	15.5%
Emergency	84.5%



Transfer

Patient transfer	22.8%
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Risk



Preoperative risk of death

Expected	11.3%
Considerable	48.9%
Moderate	27.0%
Small	8.3%
Minimal	4.5%



Most common comorbidities

Cardiovascular	21.2%
Age*	20.3%
Respiratory	11.2%
Renal	10.8%
Neurological	7.7%



Most common causes of death

Multiple organ failure	9.4%
Pneumonia	8.5%
Septicaemia	8.2%
Respiratory failure	7.5%
Cardiac event	7.4%

Key findings



Areas of improved patient care

Improved fluid balance management
Improved DVT prophylaxis

Decreased clinically significant infection
Decreased adverse events



Peer review outcomes

Adverse event 7.9%
Area of concern 5.0%

Area for consideration 12.4%
No issues 74.7%

*Victorian patients over the age of 80 made up 44.7% (474/1,061) of audited deaths.

5 National Safety and Quality Health Service Standards

The findings in this report can be aligned with the following NSQHS Standards⁶ highlighted in the Key Recommendations (Figure 1) and the Clinical Risk Management sections (Sections 13 and 14).

Figure 1: NSQHS Standards aligned with VASM recommendations

		VASM Key Recommendations
<p>Standard 1 Clinical Governance</p> 		<ul style="list-style-type: none"> - It should be clear who is responsible for a patient's care with all decisions clearly charted and appropriately discussed. - All appropriate patients should be discussed at unit M&M Meetings⁴ to facilitate learning from outcomes.
<p>Standard 2 Partnering with Consumers</p> 		<ul style="list-style-type: none"> - Consumer engagement: involve patients in planning their treatment, ensuring the decision to operate is understood. - Consider quality of life and end-of-life care. Goals of care should be clearly discussed and recorded for every admission to hospital. - Increase VASM engagement with Consumers and provide dedicated consumer information on outcomes and learnings from VASM.
<p>Standard 3 Preventing and Controlling Healthcare-Associated Infection</p> 		<ul style="list-style-type: none"> - Control and manage infections with appropriate investigation, rapid administration of treatment and timely involvement of expert teams.
<p>Standard 5 Comprehensive Care</p> 		<ul style="list-style-type: none"> - Operations should only be performed in health services with appropriate facilities/support. - Improve preoperative multidisciplinary involvement to optimise the patient's clinical condition. - Improve timely escalation of surgical emergencies by earlier involvement of senior staff. - Reduce falls in hospitals and residential care through monitoring risk assessments.
<p>Standard 6 Communicating for Safety</p> 		<ul style="list-style-type: none"> - All care plans and clinical events must be clearly documented. - Improve communication between health professionals and their patients through consent discussion. - Senior medical input at all health services involved in patient transfers. - All M&M recommendations should be reported to the Hospital's Clinical Governance team.
<p>Standard 8 Recognising and Responding to Acute Deterioration</p> 		<ul style="list-style-type: none"> - Recognise and act on evidence of clinical deterioration. - Senior doctors to be involved in decision making.

The recommendations listed have been selected based on lessons learned from different specialty-based cases in the audit. Case studies are routinely provided to hospitals and health professionals and can be used to facilitate discussion on areas of clinical practice and patient safety needing improvement. The case studies are featured in Case Note Review Booklets and Cases of the Month.⁷ Hospital Mortality and Morbidity Meetings should adhere to the RACS recommendations.⁴

6 Victorian surgical mortality rates

The VASM audit process depends upon receiving notifications of deaths from participating hospitals. Each hospital prepares and submits a list of deaths that have occurred when a patient was under the care of a surgeon. Thus, the discharging unit would usually be recorded as surgical, however in some instances a patient who has received surgical care may not be under the care of a surgeon at the time of death.

In parallel with the VASM audit process, hospitals must also submit data to the Victorian Admitted Episodes Dataset (VAED). This database is maintained by the Department of Health and Human Services (DHHS), and is a robust database providing case mix information required for hospital activity-based funding.⁸ Individual patient care episodes are classified to diagnosis-related groups (DRGs) that are specialty specific, which provides an alternative source of mortality data. VAED data for procedural deaths of patients with surgical DRGs over the period 1 July 2019 to 30 June 2020 indicates that 660,583 interventional procedures were provided to 518,769 patients in Victorian public and private hospitals. Of these, 0.4% (1,901/518,769) resulted in auditable mortalities reported to VASM. Over the same time period, VASM received 1,770 direct notifications of deaths associated with surgical care (Appendix Table 1).

As the VAED reported mortalities is based purely on the DRG codes associated with the procedure, the numbers will always be higher than the VASM report mortalities since VASM limits the definition of a procedure to those conducted by a surgeon or a gynaecologist. Some procedures associated with the DRG code included in VAED's dataset are performed by non-surgeons which are not captured by the VASM program (Appendix Table 1).



7 Audit compliance

All hospitals providing surgical services are expected to either participate in the audit or comply with the audit requirements. Regular reporting of mortalities from hospitals launches the audit process but to comply, RACS Fellows must return completed surgical case forms (SCF) and assessment forms in a timely and accurate manner (Figure 2). Thus, there is a difference between surgeon participation and compliance. Surgeons in Victoria completed the SCFs in 81.4% (1,583/1,770) of the notified deaths in 2019–2020. The remainder of cases are still in progress and compliance for this period will be monitored by VASM (Appendix Figure 1).

The aim is for each step of the audit process—submission of the SCF, the first-line assessment (FLA) and second-line assessment (SLA)—to be completed within 21 days. Obtaining medical records and documentation can take up to four months for complex cases. VASM is working with hospitals to explore methods to speed up the process.

Board members of RANZCOG, AOA and ANZCA have approved formal collaboration with ANZASM in the audit process, ensuring that a greater number of surgery-related cases are captured. The Consultative Council on Obstetric and Paediatric Mortality and Morbidity continues to separately review obstetric and neonatal deaths.

Of the reported mortalities in the current audit year, 16.3% (289/1,770) were excluded from further analysis due to them being terminal care admissions. Some mortality details (dates of birth, admission and death) associated with the case are pending for 0.8% (14/1,770) from the health services, assessments are underway for 13.2% (233/1,770) of cases, with the remaining 9.8% (173/1,770) pending the return of the SCF. The peer assessment rate for 2019–2020 data will increase as pending cases undergo the full audit process, and they will be reported in future publications.

Figure 2: VASM audit numbers, 2019–2020

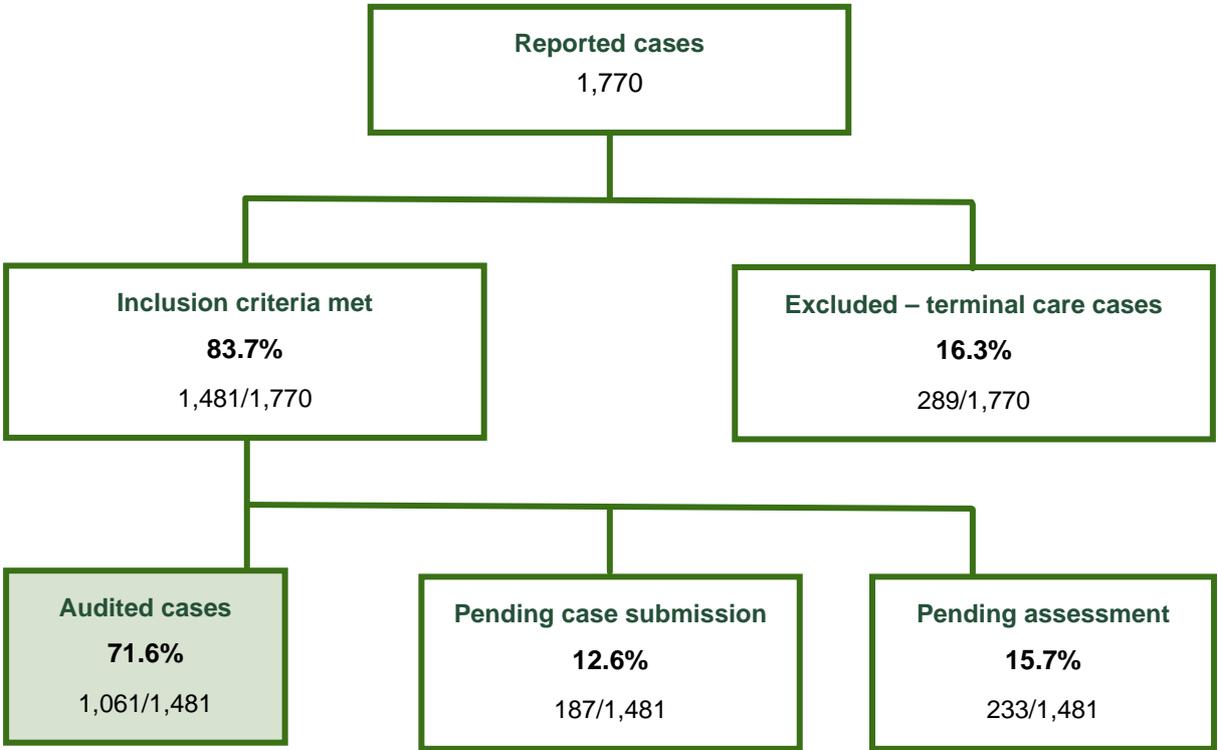
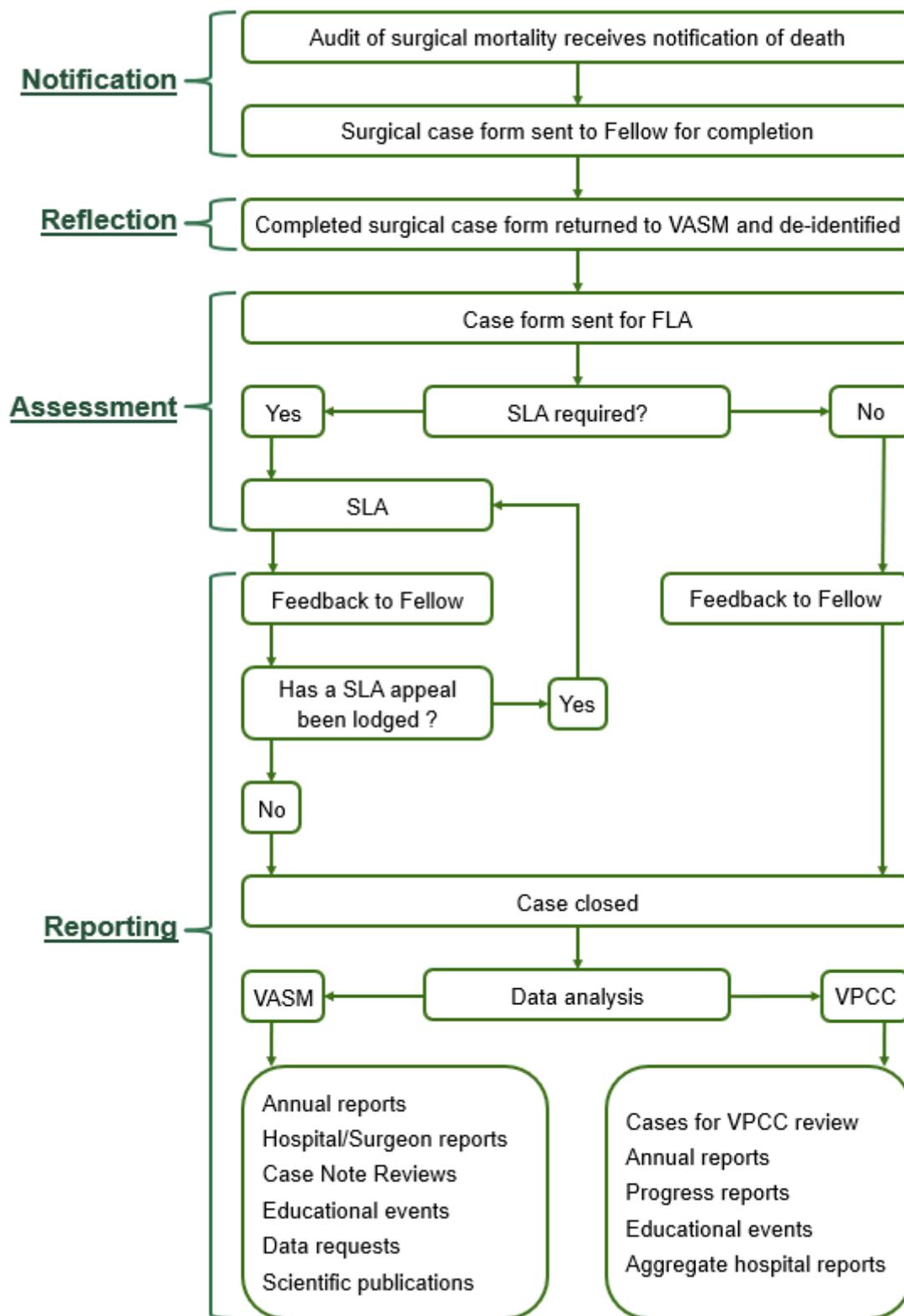


Figure 3: VASM audit process



Notes:
 ASM: Audit of Surgical Mortality. FLA: First-Line Assessment. SLA: Second-Line Assessment. VPCC: Victorian Perioperative Consultative Council.

8 Characteristics of audited deaths

Table 1 shows that the demographic data for Victoria was similar to the national data during the audit period. The risk of death classified by the reporting surgeon as 'considerable' or 'expected' prior to surgery remains high at 60.2% (577/959) in Victoria and 60.9% (935/1,536) nationally. In Victoria, there were more cases where single operations were performed, and there was a corresponding decrease in the cases where no operation was performed. The percentage of cases with multiple operations are similar between VASM and national figures (Table 1).

Table 1: Characteristics of audited deaths, VASM compared to national data, 2019–2020

		VASM	National
Number of audited deaths		1,061	2,008
Median age of patient in years (IQR)		78 (66–87)	76 (64–85)
Operative cases		91.5%	76.7%
Sex	Male	59.8%	59.3%
	Female	40.2%	40.7%
Admission status	Elective	15.5%	14.1%
	Emergency	84.5%	85.9%
ASA grades	ASA 1–2	4.2%	6.5%
	ASA 3	25.2%	29.6%
	ASA 4	52.9%	48.3%
	ASA 5–6	17.8%	15.6%
Risk of death prior to surgery	Expected	11.3%	8.9%
	Considerable	48.9%	52.0%
	Moderate	27.0%	24.8%
	Small	8.3%	10.2%
	Minimal	4.5%	4.2%
Most common comorbid factors	Cardiovascular	21.2%	21.3%
	Age*	20.3%	19.6%
	Respiratory	11.2%	11.4%
	Renal	10.8%	9.9%
	Neurological	7.7%	7.7%
	Diabetes	7.4%	7.5%
	Other	7.3%	8.4%
	Advanced Malignancy	7.2%	7.1%
	Obesity	3.8%	4.1%
	Hepatic	3.0%	2.9%
Number of operative procedures performed	3 or more	5.9%	6.5%
	2	11.8%	10.1%
	1	73.7%	60.1%
	0	8.6%	23.4%

Notes:

*Victorian patients over the age of 80 made up 44.7% (474/1,061) of audited deaths.

The American Society of Anesthesiologists ASA grade is an international measure of patient risk used by anaesthetists.⁹

Comorbidities describe coexisting medical conditions or disease processes additional to the primary diagnosis.

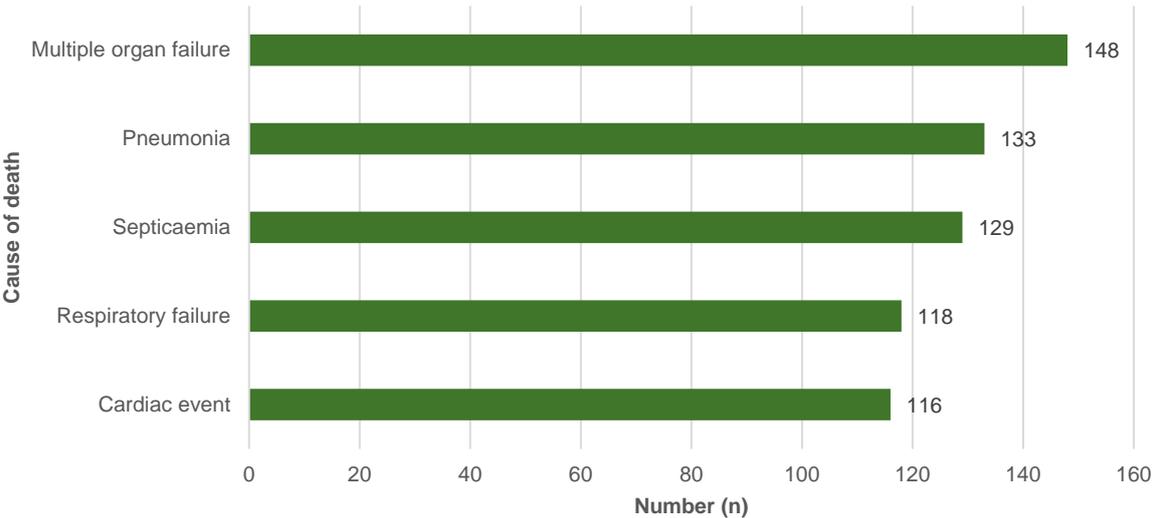
Unavailable data were excluded from analysis. Each audited case can have more than one operation.

National is defined as other participating jurisdictions, exclusive of Victoria and New South Wales data.

9 Establishing the cause of death

Cause of death as recorded by the treating surgeon is based on the clinical course of the patient and any relevant supporting evidence acquired from investigations. A patient can have multiple causes of death; from 1 July 2019 to 30 June 2020, 1,521 causes of death were identified across 1,061 cases. Of the 380 conditions perceived to have caused death, the top 5 accounted for 41.0% (644/1,521; Figure 3).

Figure 4: Top 5 VASM causes of death, 2019–2020



Notes: n=1,521 causes of death associated with 1,061 Victorian patients (1 July 2019 to 30 June 2020).

Contributory factors such as hypotension are excluded from the cause of death count as, in many cases, these reflect the terminal event and not the underlying pathology. The cause of death can be related to existing comorbidities that contribute to the outcome.¹⁰

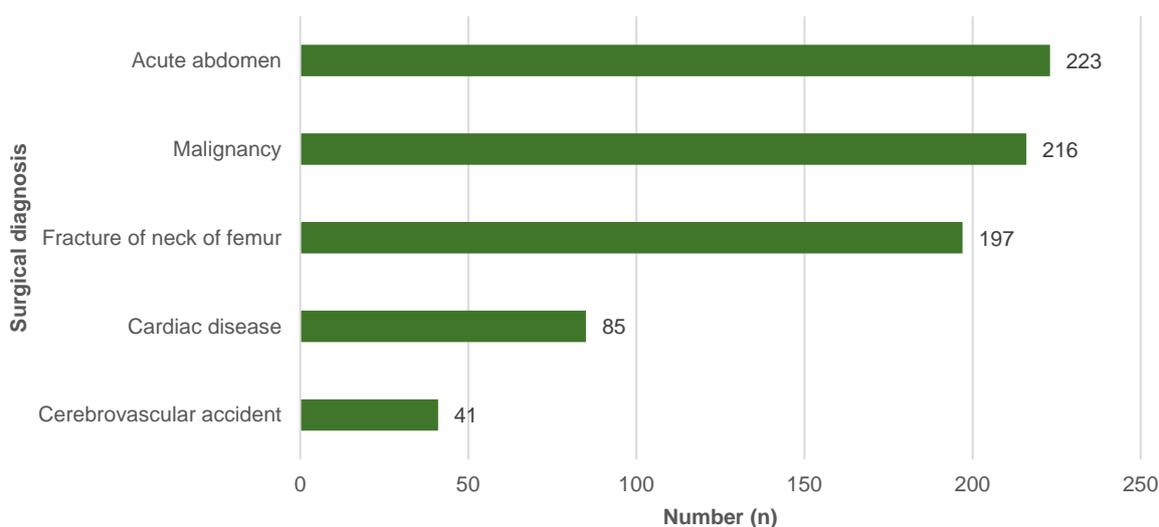
Cases are referred to the coroner when the probable cause of death cannot be determined, or where an accidental death occurs in a healthcare facility. Coronial investigations and VASM peer-review assessments have different purposes. One of the Coroner’s duties is to define the cause of death, while VASM evaluates the overall surgical care of a patient who has died. Both data sources add value to quality assurance activities to improve surgical care and should be considered as complementary assessment tools.

10 Clinical risk management

10.1 Establishing the surgical diagnosis

Establishing a surgical diagnosis after review of test results and any operations can assist with understanding a patient's condition prior to surgery. Patients can have multiple surgical diagnostic codes associated with their death, with 1,563 surgical diagnoses associated with 1,061 cases from 1 July 2019 to 30 June 2020. The top 5 surgical diagnoses account for 48.8% (762/1,563) of the total (Figure 4).

Figure 5: Top 5 VASM surgical diagnoses, 2019–2020



Notes: n=1,563 surgical diagnoses associated with 1,061 patients (1 July 2019 to 30 June 2020).

In the current audit period, the proportion of cases with malignancies identified as a comorbidity remains stable at 20.4% (216/1,061) relative to 19.8% (262/1,322) for the previous audit year (2018–2019).

10.2 Delay in surgical diagnosis

Early diagnosis is critical in preventing surgical complications or deterioration, particularly in a frail population. Delays in treatment are known to increase the risk of death.¹² Treating surgeons are asked to reflect, and then record, any perceived delays in establishing a diagnosis and proceeding to definitive treatment.

For the current audit period (2019–2020), the rate of delays in establishing a diagnosis was 4.6% (49/1,058) which remains stable compared to the previous year but represents an improvement over the life of the audit (Appendix Figure 2).

An elderly patient with atrial fibrillation and a previous right hemicolectomy presented with diarrhoea and vomiting and a tender right lower quadrant. CT scan showed dilated loops of thickened small bowel. A surgical registrar diagnosed gastroenteritis and the patient was admitted under a medical team. Consultant surgical review 2 days later, after a Medical Emergency Team call, resulted in a laparotomy where ischaemic ileum was resected. The patient deteriorated postoperatively and was palliated.

The assessors felt the ischaemic bowel diagnosis was initially missed and recommended that all emergency admissions have a consultant assessment.

It is important to note that delays are not always attributable to the surgical team, for example, late referral to specialist or the patient presenting late.

10.3 Hospital transfers

Delays and problems in transfer can cause risks and challenges for shared surgical care. In the current audit period, a small proportion of patients requiring preoperative transfer to another hospital experienced delays, inappropriate transfer, or inappropriate care. In 2019–2020, 218 patients were transferred between hospitals pre-operatively and 7.9% (17/214) of them were reported to have had delays in the transfer, which was comparable to the national average (9.9%; 52/526; Appendix Figure 3). Data on post-operative transfers have not routinely been collected by the audit.

A middle-aged woman underwent an elective hysterectomy for benign disease. Over the next few days she developed nausea and vomiting and was later found unconscious. CPR was initiated and she required defibrillation in the ambulance as she was transferred to a larger hospital 10km away. A laparotomy was performed on arrival where small bowel adhesions were divided. A subsequent CT brain showed severe irreversible hypoxic ischaemic changes causing death.

The surgical assessors agreed that the care provided in the second hospital was satisfactory. However, the ability of the first hospital to manage the complications was substandard. Should the hysterectomy have been performed at this site?

10.4 Deep vein thrombosis prophylaxis

Pulmonary emboli remains a concerning cause of death in hospital patients across Australia despite the availability of effective pharmacological and mechanical deep vein thrombosis (DVT) prophylaxis options. It is important to note that not all PEs can be prevented but may be an indication that the operation should have been postponed or more aggressive therapy attempted.

There were 21 cases (2.0%; 21/1,061) associated with post-operative pulmonary emboli reported to the Audit in the current year, where just 1 case did not receive DVT prophylaxis. The appropriate use of DVT prophylaxis is outlined in the Clinical Practice Guidelines for the Prevention of Venous Thromboembolism in Patients Admitted to Australian Hospitals.¹³ The choice of prophylaxis is subject to the judgement of clinicians caring for individual patients and has changed little since 2012.

In Victoria, there was a slight decrease in the use of DVT prophylaxis from 84.2% (1,094/1,299) in 2018–2019 to 81.6% (863/1,058) in 2019–2020 (Appendix Figure 4).

A decision by the treating team to actively withhold DVT prophylaxis within the operative pool of Victorian patients increased from 23.2% (38/164) in 2018–2019 to 25.0% (39/156) in 2019–2020.

From the Victorian peer reviews, assessors agreed with the use or non-use of DVT prophylaxis in 80.2% (846/1,055) of cases in 2019–2020, a decrease from 85.9% (1,127/1,312) in 2018–2019. Victorian assessors also recognised that the use or non-use of DVT prophylaxis was not applicable in 12.7% (166/1,312) of cases in 2018–2019, compared to 18.9% (199/1,055) in 2019–2020.

In the current audit year, less than 1% (10/1,055) of cases were found by the assessors to have received an inappropriate choice of DVT prophylaxis, which is consistent with previous years (Appendix Figure 5).

10.5 Adequacy of provision of critical care support to patients

Over the course of the audit, 65.1% (6,264/9,617) of Victorian cases have involved the use of critical care support (Appendix Figure 6). Assessors reviewed the appropriateness of the use of critical care facilities. The assessors reported that, over the period 2012–2020, 7.5% (228/3,027) of patients who did not receive critical care support were likely to have benefited from it. This number, although small, was more than triple that identified by the treating surgeon, who perceived that a lack of critical care support was potentially an issue in only 2.1% (65/3,091) of cases.

Seriously ill patients can be admitted to a critical care unit (CCU) unexpectedly, which can indicate that the care being provided needs to be addressed. In the current audit period, 16.2% (171/1,055) of patients had an unplanned CCU admission. This is lower than both previous reports and national figures (Appendix Figure 7).

An elderly patient with a history of renal and bowel cancer presented to an emergency department with abdominal pain. The NELA¹⁴ score was 24%. A diagnosis of ischaemic bowel was made and a transfer to a related tertiary hospital completed. No limits of care were documented. Nine hours after presentation a laparotomy was performed by a registrar (with consultant present) where band adhesions were divided and small bowel apparently re-perfused. The patient was returned to the surgical ward after 6 hours in recovery. Hypotension and rectal bleeding lead to a further laparotomy performed by another registrar and ischaemic bowel was resected and the abdomen packed with a view to a further look the next day. The third laparotomy lead to palliation.

The assessor felt that the transfer led to a delay in the laparotomy and that the transfer process was not robust. The high NELA score could have been used to argue against any intervention but once the decision was made the patient should have gone to ICU post-operatively. A consultant should have been involved in the re-look operations.

10.6 Unplanned readmission to hospital

In the current reporting period, there has been an increase in unplanned readmission from 4.2% (55/1,309) in 2018–2019 to 5.2% (55/1,051) in 2019–2020. Over the course of the audit, Victoria's readmission figures has been consistently higher than the national findings of around 3.0% (Appendix Figure 8). VASM will continue to monitor trends of the higher Victorian rate, seeking ways to reduce the rate of readmission, leading to better patient outcomes, increased quality of life, and more effective use of limited health system resources.



10.7 Significant infection

At the time of death, approximately a third of surgical patients can have an infection associated with the mortality, which may be acquired before or during the admission (Appendix Figure 9).

Details of audited deaths with clinically significant infections acquired during admission are outlined in Table 2. Most reported infections in the current audit period were acquired postoperatively, which in Victoria accounted for 70.5% (117/166) of infection cases, compared with 65.1% (205/315) nationally.

Table 2: Deaths with clinically significant infections acquired during admission, VASM compared to national data, 2012–2020

Infection acquired	VASM 2012–2019	National 2012–2019	VASM 2019–2020	National 2019–2020
Acquired postoperatively	70.9% (1,106/1,561)	65.9% (1,918/2,912)	70.5% (117/166)	65.1% (205/315)
Acquired preoperatively	16.0% (249/1,561)	18.2% (531/2,912)	15.7% (26/166)	13.3% (42/315)
Other invasive site infection	5.4% (85/1,561)	8.0% (232/2,912)	7.2% (12/166)	16.5% (52/315)
Surgical site infection	7.8% (121/1,561)	7.9% (231/2,912)	6.6% (11/166)	5.1% (16/315)

Notes:

n=1,727 out of 9,453 Victorian audited deaths acquired a clinically significant infection during admission (1 July 2012 to 30 June 2020).

Data not available: n=166.

n=3,227 out of 17,958 national audited deaths acquired a clinically significant infection during admission (1 July 2012 to 30 June 2020).

Data not available: n=50.

National is defined as other participating jurisdictions, exclusive of Victoria and New South Wales data.

The 2019-2020 data will be more complete in the next report as more cases become available for analysis.

For the current audit period, pneumonia and sepsis comprised 73.6% (231/314) of the reported cases of infection. The infective organism was identified in 38.5% (121/314) of the infection cohort, with *E.Coli* being the most frequent at 13.2% (16/121). Strategies for reducing surgical site infections have been implemented overseas and in Australia¹⁵ and guidelines should be followed.

The infection rate varied across individual specialties, reflecting their differing case mix. During the current audit period (2019–2020), Plastic Surgery had the highest reported infection rate at 42.2% (19/45) of audited mortality cases followed by Urology at 37.0% (20/54), General Surgery (including trauma and colorectal subspecialties) at 34.6% (116/335), and Orthopaedic Surgery at 31.2% (78/250).

A middle-aged patient underwent an elective flexible pyeloscopy and stone lasering to a large partial staghorn renal calculus. Pre-operative urine culture grew *E.coli*, and the patient was prescribed trimethoprim for three days before surgery and had peri-operative gentamycin. The operation took over 2 hours and in recovery the patient was hypotensive with tachycardia. The patient was re-intubated and transferred to ICU and treated for acute sepsis, but developed disseminated intravascular coagulation and multiple organ failure and died. Blood cultures were positive for *P.mirabelis*.

The assessors were concerned about both the antibiotic coverage for the procedure and the choice of operation, as guidelines recommend percutaneous stone removal for large stones.

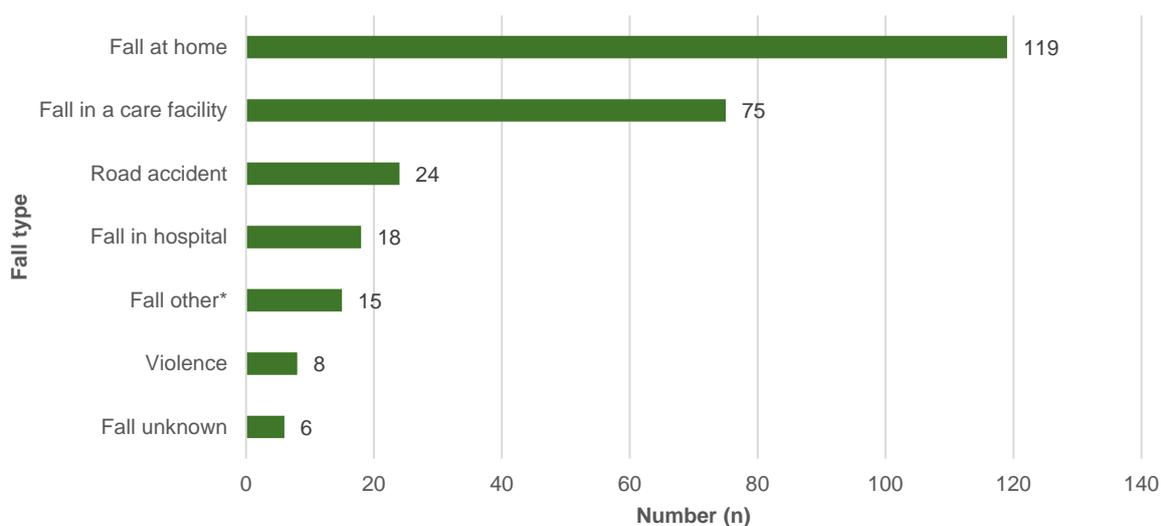
The average rate of surgical site infections for patients in Victoria for the period 2012–2019 was 7.8% (121/1,561), which decreased to 6.6% (11/166) in the current audit period. The national findings show a decrease from 7.9% (231/2,912) to 5.1% (16/315) over the same time periods, respectively.^{16,17}

10.8 Trauma

Trauma cases are those in which a patient receives severe bodily injury or shock from a fall, accident, or violence. VASM started collecting data on trauma cases in 2012 to monitor trends associated with surgical mortalities. Falls have accounted for the majority of VASM trauma cases and represent 87.9% (233/265) of cases for the 2019–2020 audit period. Of the 265 trauma cases reported to VASM, 43.8% (116/265) were admitted to hospital with fractured neck of femurs. Figure 5 describes the types of trauma events experienced by Victorian patients, including a breakdown of falls. VASM classifies falls in hospitals as an adverse event if related to a surgical patient's death.

Future trend analysis of falls will help inform strategies for improvement in this aspect of patient care, especially in care facilities or in hospitals.³ VASM will include such trends in its educational programs, for example, a reduction in postoperative falls was observed in patients who participated in a preoperative education program.¹⁸ Reviewing falls in trauma and orthopaedic cases can be a powerful tool to unite institutions to minimise risk and address the issues.

Figure 6: VASM deaths by causes of trauma, 2019–2020



Notes:

n=265 trauma cases in 1,045 Victorian audited deaths (1 July 2019 to 30 June 2020). Data not available: n=16.

*Includes roads and public venues.

11 Profile of operative procedures

It is the responsibility of the treating surgeon to ensure that the operation proceeds smoothly, including the appropriate use of DVT prophylaxis, antibiotics, and intensive care facilities; appropriate fluid balance; minimal unplanned returns to theatre; and appropriate involvement of the senior consultant, especially in a training environment. This is a shared role of all health care professionals involved in the patient's care.

In the current audit period (2019–2020), 91.5% (970/1,060) of patients had at least one operative procedure. Consultants were present in theatre for 82.3% (1,036/1,259) of operations with Victorian surgeons consistently having a greater presence than their national counterparts (Appendix Figure 10). This can be further broken down to the consultants being present in theatre in 79.5% (801/1,007) of operations in public hospitals, compared to 93.3% (235/252) in the private sector (Appendix Table 2). The actual percentage of consultants present in theatre may be under-represented due to incomplete form completion.

For emergency admissions to a surgical unit in Victoria, the percentage of first procedures occurring within 24 hours remained the same from 2018–2019 (59.6%; 575/965) to 2019–2020 (59.6%; 473/794).

11.1 Postoperative complications

Complications can be expected following complex surgery due to the pre-existing comorbidity profile, surgical risk status, and the nature of the disease being treated.

In the current audit year (2019–2020), 75.9% (728/959) of audited Victorian deaths had no complications, which is slightly higher than the national rate (71.4%; 1,098/1,537; Appendix Figure 11).

A late middle-aged patient presented to their local hospital with aortic valve endocarditis. They were transferred to cardiac surgery and underwent an aortic valve replacement with closure of a left atrial appendage. Post-operatively the patient deteriorated in ICU with a trans-oesophageal echocardiogram suggesting clot behind the right atrium. The patient returned to theatre where tamponade was relieved and repaired. A subsequent return to theatre for suspected tamponade revealed little and the patient deteriorated further and died.

The assessors felt there was a delay in diagnosing and dealing with the tamponade. Once diagnosed sternotomy should have been performed as an emergency, even outside theatre if necessary.

Victorian surgeons reported delays in recognising postoperative complications in 8.3% (19/229) of deaths over the period 2019–2020.

11.2 Unplanned return to theatre

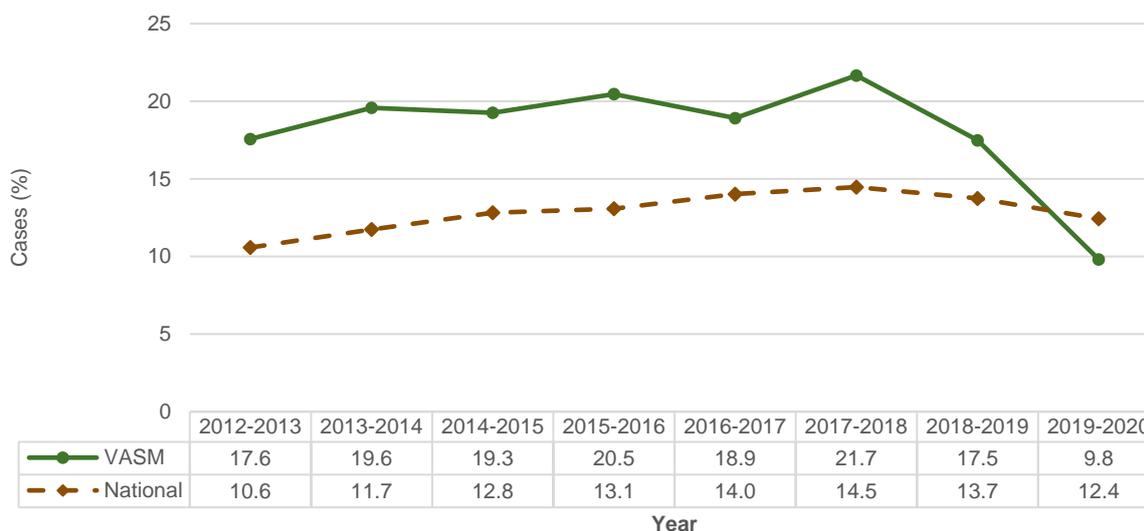
Complications following complex surgery are sometimes unavoidable and require an unplanned return to theatre. A high rate of return to theatre can reflect timely recognition, intervention, and escalation of care for complications on the ward, and may reflect highly specialised units taking on high risk patients. However, it can also indicate that the care being provided could be improved.

In the current audit year, surgeons reported a lower rate of 11.3% (110/970) of operative deaths following an unplanned return to theatre in Victoria, compared with the national rate of 14.7% (226/1,537; Appendix Figure 12).

12 Peer-review process

The peer-review process was impacted by the COVID-19 pandemic, which resulted in fewer cases being closed compared to previous years. Since 2012, FLAs have been completed for 9,637 VASM cases, with 18.3% (1,763/9,637) requiring an in-depth SLA during the complete audit period. Figure 6 details the percentage of cases that went for SLA review. The reduction in SLA referral rate for 2019–2020 was due to more complex cases still undergoing review; data for these cases will be included in future reports.

Figure 7: Audited deaths that underwent SLA, VASM compared to national data, 2012–2020



Notes:

n=1,763 cases out of 9,637 Victorian audited deaths were referred for SLA peer review (1 July 2012 to 30 June 2020).

n=2,384 cases out of 18,502 national audited deaths were referred for SLA peer review (1 July 2012 to 30 June 2020).

National is defined as other participating jurisdictions, exclusive of Victoria and New South Wales data.

The 2019-2020 data will be more complete in the next report as more cases become available for analysis.

Each first-line assessor was asked to indicate if the treating surgeon had provided adequate information to allow a conclusion to be reached; if not, an SLA was requested. SLAs were also requested if a more detailed case review was required to clarify events leading up to death, or if death was unexpected and could indicate issues with clinical management.

Comprehensive and legible hospital case notes are an important record of what has occurred during a patient's treatment. Information provided in the SCFs has increased since audits began, but improvement is still needed. At SLA, suggested areas for improvements in medical records were focused on poor medical admission notes; missing reports, imaging, transfer notes or follow-up records; and incomplete descriptions of the surgical procedure. In the current audit year (2019–2020), the majority (64.4%; 67/104) of VASM cases were sent for second-line peer review due to insufficient information, down slightly from 67.0% (154/230) in 2018–2019. The remaining 37 cases sent for SLA identified issues that required further investigation (3.5%; 37/1,060 total cases).

Greater attention to detail in completing the SCF would help reduce the workload of assessors, as well as facilitating a more efficient audit process.

13 Outcomes of the peer-review

The VASM peer-review process is a retrospective examination of the clinical management of patients who died while under the care of a surgeon. Assessors must decide if any aspects of patient management may have contributed to the outcome and if so, VASM requires the assessor to attribute a level of severity, as outlined below:

- An **area for consideration** exists. The assessor believes that an area of care **could** have been improved or done differently but recognises that this issue is debateable. It represents very minor feedback.
- An **area of concern** exists. The assessor believes that an area of care **should** have been improved.
- An **adverse event** occurred. The assessor believes that an unintended injury or event **caused** by the medical management of the patient (as opposed to the disease process) led to prolonged hospitalisation or temporary or permanent impairment or disability of the patient; or directly contributed to, or caused, death.

Audited cases may have multiple CMIs identified per patient. A weighting system accounting for incidents identified per patient is used to analyse their severity (Table 3). The causes of CMIs and associated trends are monitored closely by VASM and remain the focus of reports and educational events.

Table 3: Severity of perceived CMIs

	Least severe			Most severe
Areas of clinical incident	None detected	Consideration	Concern	Adverse event
Outcomes of incident	Not applicable	Did not affect clinical outcome	May have contributed to death	Probably contributed to death
Preventable incident	Not applicable	Probably not	Probably	Definitely
Association of incident	Not applicable	Hospital	Clinical team	Surgical team

The percentage of patients affected is the important measure. For the current audit period (2019–2020), assessors perceived that CMIs occurred in 25.3% (267/1,057) of cases. Minor issues (areas of consideration) were perceived to have occurred in 12.4% (131/1,057) of cases; areas of concern were identified in 5.0% (53/1,057) of cases; and 7.9% (83/1,057) of cases were categorised as an adverse event. Adverse events or areas of concern classified as preventable or possibly preventable have decreased from 11.9% (157/1,316) in 2018–2019 to 8.6% (91/1,057) in 2019–2020 (Appendix Table 3).

14 Preventable clinical management issues

Table 4 lists the most severe CMI (areas of concern or adverse events) that contributed to the death of the patient which were considered to be preventable (possibly or definitely) by assessors in 2019–2020. Of the 840 patients audited in 2019–2020, 24 patients had at least one preventable CMI that contributed to death, with a total of 28 issues.

Falls in hospital causing significant injuries should be preventable (NSQHS Standard 5) and are over-represented in the current data (3 instances). An individualised falls prevention plan of care should be developed and implemented on the findings of a falls screen or assessment.¹⁹

Operative management mostly relate to the choice of operation or procedure, or technical issues. There were six cases where appropriate support from either senior surgeons or other teams has not been utilised.

Futile surgery on frail patients with multiple comorbidities remains a prominent clinical issue. Alternative treatments with less extensive procedures or conservative management may reduce postoperative complications.²⁰ The Targeting Zero report²¹, the Aspex evaluation, and the VPCC committee recommended that VASM produce an improved and transparent categorisation of preventable CMIs. These categories are used in Table 4.

Assessors perceived more clinical issues when compared to those raised by treating surgeons, highlighting the importance and value of an independent peer-reviewed assessment. The prevalence of areas of concern and adverse events identified by assessors was similar between the specialties.

Table 4: Preventable CMI's that caused VASM deaths identified by assessors, 2019–2020

Admission phase	Incident category	
Preoperative	Pre-operative assessment inadequate	
	Failure of junior surgeon to seek advice	
	Failure to use a Specialist centre	
	Decision to operate	
Perioperative	Venous bleeding related to open surgery	
	Arterial complication of open surgery	
	General complications of treatment	
	Better to have done different operation or procedure (3 patients)	
	Better to have performed more limited surgery (2 patients)	
	Under anticoagulation	
	Aspiration pneumonia (2 patients)	
	Peri operative cerebral ischaemia or infarction	
	Pleural complication of open surgery	
	Postoperative	Anastomotic leak after open surgery (3 patients)
		Post-operative care unsatisfactory
Incorrect/inappropriate therapy		
Injury caused by fall in hospital (3 patients)		
Upper gastrointestinal bleeding		
HDU not used post-operatively, HDU full		
Post-operative bleeding after open surgery		

14.1 Areas for improvement in surgical care management

Table 5 identifies the point of surgical care at which assessors considered that care management could have been improved in Victoria and nationally.

For the current audit period (2019–2020), assessors indicated the point of surgical care at which care management could have been improved. In Victoria, CMIs relating to the “decision to operate at all” have been significantly greater than the national figures (Table 5) which may contribute to the previously noted difference in patients receiving operative intervention (Table 1).

Table 5: Areas for surgical care improvements identified by assessors, VASM and national data, 2019–2020

Area for improvement	VASM	National	p value
Preoperative management/preparation	6.7%	7.4%	0.512
Decision to operate at all	8.7%	5.0%	<0.001
Choice of operation	4.0%	3.0%	0.158
Timing of operation (too late, too soon, wrong time of day)	5.6%	4.9%	0.434
Intraoperative/technical management of surgery	3.1%	3.7%	0.432
Grade/experience of surgeon deciding	0.5%	0.6%	0.605
Grade/experience of surgeon operating	0.7%	1.0%	0.373
Postoperative care	3.7%	4.1%	0.592

Notes:

Audit period 1 July 2019 to 30 June 2020.

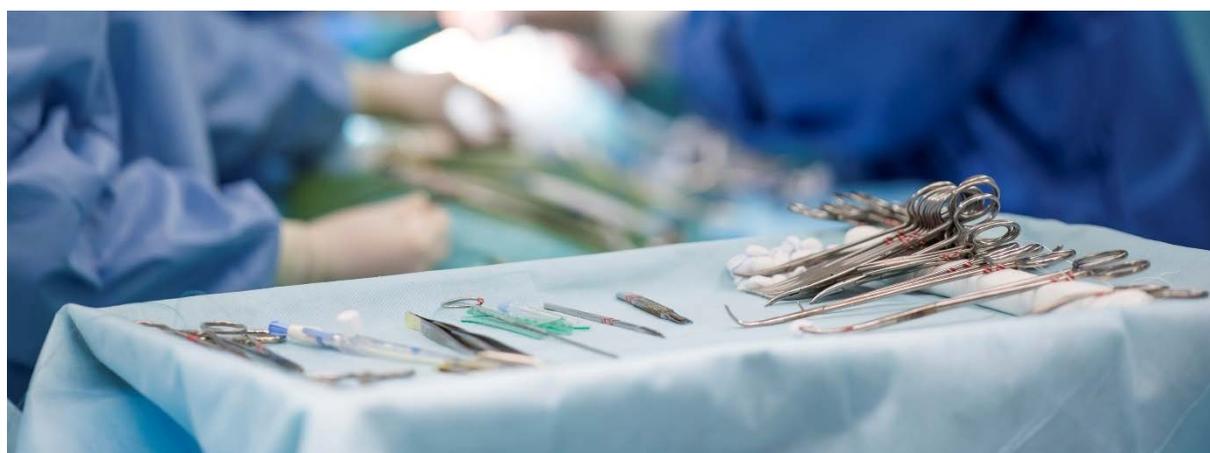
Bold entries indicate statistically significant differences between VASM and national data ($p < 0.05$ using χ^2 tests).

National is defined as other participating jurisdictions, exclusive of Victoria and New South Wales data.

To encourage improvement, the audit office actively disseminates information on problems identified from the data to clinicians and healthcare services via educational events, hospital forums, committee meetings, individual feedback letters to the treating surgeon, hospital governance reports, scientific papers, and newsletters.

ANZASM has finalised amendments to the Commonwealth QP to recognise the VPCC, enabling information to be shared by VASM. A new Perioperative Mortality Committee is being formed which aims to identify surgical mortality cases that would benefit from further anaesthetic or multidisciplinary review. Information shared with VPCC is covered by the Commonwealth QP, the only information allowed outside of the committee is the minimum dataset required for hospitals to identify the patient to provide additional notes.

These additional VASM and VPCC processes will increase educational and learning opportunities for surgeons, anaesthetists, and all those involved in perioperative care. Health services are encouraged to increase their level of perioperative mortality and morbidity review, using the RACS M&M guidelines⁴, thus providing better opportunities to address system issues affecting the safety and quality of provided services.



14.2 VASM and national trends in areas of clinical management

Outcomes from VASM and national trends in areas of CMIs can be a catalyst to change clinical governance management in surgical health services as per the NSQHS Standards. Victorian findings in CMIs are compared with national data in Table 6. Of the five significant differences identified in 2019–2020, the presence of an operating surgeon in theatre has consistently been higher in Victorian (81.2% (10,112/12,452) compared with national (71.5%; 13,891/19,437) data since 2012.

Table 6: CMIs, VASM and national data, 2019–2020

Variable	VASM	National	p value
Audited deaths with delay in surgical diagnosis	4.6% (49/1,058)	4.9% (98/2,008)	0.759
Audited deaths with delay in transfer	7.9% (17/214)	9.9% (52/526)	0.410
Audited deaths without use of intensive care (ICU) or high dependency unit (HDU)	60.9% (646/1,060)	62.3% (1250/2,007)	0.468
Audited deaths with unplanned admission to intensive care (ICU)	16.2% (171/1,055)	19.1% (382/1,997)	0.046
Audited deaths with unplanned readmission	5.2% (55/1,051)	3.6% (72/1,999)	0.032
Audited deaths with a clinically significant infection	29.8% (315/1,058)	30.3% (608/2,004)	0.745
Operation with the consultant surgeon present in theatre	82.3% (1,036/1,259)	75.6% (1,629/2,156)	<0.001
Proportion of elective admissions with elective surgery performed as planned	79.9% (131/164)	71.0% (201/283)	0.039
Audited operative deaths with unplanned return to theatre	11.3% (110/970)	14.7% (226/1,537)	0.016
Inappropriate DVT prophylaxis treatment as viewed by the assessor	0.9% (10/1,055)	1.6% (31/1,923)	0.137
Audited deaths with fluid balance issues as viewed by the assessor	6.7% (71/1,057)	6.4% (123/1,924)	0.731

Notes:

Audit period 1 July 2019 to 30 June 2020.

Denominator varies due to different criteria for each row.

Bold entries indicate statistically significant differences between VASM and national data ($p < 0.05$ using χ^2 tests).

National is defined as other participating jurisdictions, exclusive of Victoria and New South Wales data.

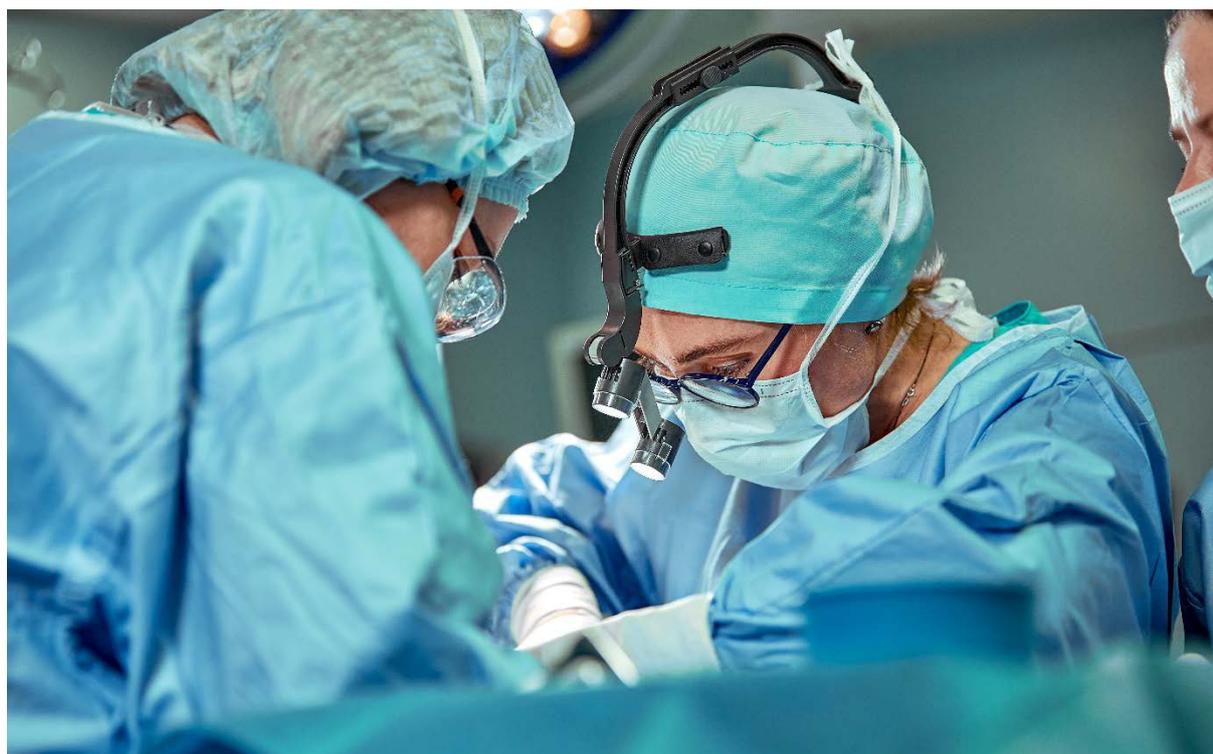
14.3 Continuous performance monitoring

The performance of individual hospitals with preventable CMIs, as identified by VASM's independent peer-review assessment process, is tracked by VASM. In the current audit period, there was a decrease in the number of hospitals requiring monitoring of their surgical performance with four hospitals having cases with preventable CMIs (one standard deviation above the Victorian mean) identified, compared to seven hospitals in the period 2017–2020.

Hospitals identified in this quality assurance analysis and review have been advised to further investigate their surgical care based on the specific CMIs identified at their site. Most sites that were flagged in the 2017–2020 period have improved their surgical care in the current audit period. VASM and VPCC will continue to monitor the outlying sites to ensure improvement strategies are implemented.

This analysis enables benchmarking and monitoring of clinical management trends within a hospital and allows for comparison between participating peer-grouped hospitals, regionally and nationally. For educational purposes, VASM disseminates national Case Note Booklets with selected de-identified cases featuring clinical issues for improvement. VASM holds educational seminars to highlight important quality and safety issues identified through the audit, and clinical areas requiring immediate improvements.

VASM's primary objective is the review of surgical deaths and assessment of the surgical treatment provided. The audit is a dynamic, ongoing, educative, and performance-monitoring process. If the assessment suggests that a treatment was less than optimal, feedback is provided directly to the treating surgeon. A secondary objective is the identification of systemic issues and adverse trends in surgical care, such as DVT prophylaxis, management of the deteriorating patient, shared care, communication issues, and shared care in surgical emergencies. Transfers will be the focus of further work in the future.



15 Conclusion

Since the audit was introduced, annual reports produced by VASM continue to identify trends in CMIs related to surgical deaths. Although it is positive to see a reduction in the number of identified preventable CMIs, the identified issues highlight ongoing opportunities for system-wide improvements.

Restrictions imposed during the COVID-19 pandemic have driven a reduction of surgical procedures being performed in Victoria, which will be reflected upon in the next report when a more complete picture of CMIs arising in this audit period will be available.

The number of hospital outliers has decreased, with fewer hospitals demonstrating high rates of preventable issues. This progress suggests that appropriate measures are being taken by individual hospitals to improve their performance and overall management of surgical patients.

VASM continues to emphasise the importance of clinical leadership in providing clear patient management pathways and treatment plans which are understood by all those involved in the patient's care. Multidisciplinary collaboration should be encouraged, noting that good communication is vital to improving patient management, including detailed handovers and maintenance of adequate documentation in the patient healthcare record.

VASM, together with the support of the VPCC, SCV and Victorian hospitals, will continue to monitor preventable CMIs, along with postoperative transfers involving surgery, as a helpful measure for ensuring the highest standard of safe and comprehensive surgical care in Victoria.

16 Acknowledgements

VASM would like to acknowledge the support and assistance of the many individuals and institutions that have helped in the development and continual improvement of this project, including:

- Participating Victorian hospitals
- Participating Victorian Fellows and International Medical Graduates
- Fellows who have acted as assessors, for the time and effort providing detailed and valuable case note reviews
- Hospital health information departments
- Victorian Perioperative Consultative Council
- Australian and New Zealand College of Anaesthetists
- Royal Australian and New Zealand College of Obstetricians and Gynaecologists
- Australian Orthopaedic Association
- Australian Capital Territory Audit of Surgical Mortality
- Northern Territory Audit of Surgical Mortality
- Queensland Audit of Surgical Mortality
- South Australian Audit of Surgical Mortality
- Tasmanian Audit of Surgical Mortality
- Western Australian Audit of Surgical Mortality
- Collaborating Hospitals' Audit of Surgical Mortality
- National Coroners Information System
- Safer Care Victoria, for funding the project
- Royal Australasian College of Surgeons, for infrastructure and oversight of this project.

16.1 VASM Management Committee

A/Prof Philip McCahy	Clinical Director, Victorian Audit of Surgical Mortality
Mr Nathan Farrow	Acting Director, Centre of Patient Safety and Experience, Safer Care Victoria
Ms Gemma Wills	Acting Manager, Consultative Council Unit, Safer Care Victoria
Prof David Watters	Chair, Victorian Perioperative Consultative Council, Safer Care Victoria
Ms Mary Manescu	Acting Executive Director, Health and System Performance Reporting, Victorian Agency for Health Information
Mr Wai-Ting Choi	Representative, Plastic Surgery
Mr Ian Faragher	Representative, General Surgery
Dr Andrea Kattula	Representative, Australian & New Zealand College of Anaesthetists
Mr Patrick Lo	Representative, Neurosurgical Society of Australia
Prof Erwin Loh	Representative, Royal Australian College of Medical Administrators
Dr Avanthi Mandaleson	Representative, Australian Orthopaedics Association
Dr Samuel Newbury	Representative, Royal Australian & New Zealand College of Obstetrics and Gynaecologists
Dr Jocelyn Shand	Representative, Dental Practice Board
Dr Mariolyn Raj	Representative, Urological Society of Australia and New Zealand
Mr Russell Taylor	Representative, Australian Association of Paediatric Surgery
Mr Timothy Wagner	Representative, Australian Vascular Association
Mr Adam Zimmet	Representative, Cardiothoracic Craft Group

16.2 ANZASM Staff

A/Prof Wendy Babidge	General Manager, Research, Audit and Academic Surgery
Dr Helena Kopunic	Manager, Australian and New Zealand Audit of Surgical Mortality
Dr Nathan Procter	Acting Manager, Australian and New Zealand Audit of Surgical Mortality

16.3 VASM Staff

A/Prof Philip McCahy	Clinical Director
Andrew Chen	Acting Project Manager
Jessele Vinluan	Senior Project Officer
Ushan Vithanage	Research Assistant
Elisa Coceski	Research Assistant
Dylan Hansen	Research Assistant / Data Analyst
Nicholas Dawkins	RMIT Placement Student

17 References

1. ANZELA-QI Working Party, Aitken RJ, Griffiths B, Van Acker J, O'Loughlin E, Fletcher D, et al. Two-year outcomes from the Australian and New Zealand Emergency Laparotomy Audit-Quality Improvement pilot study. *ANZ J Surg*; 2021 Jun 28. doi: 10.1111/ans.17037. Epub ahead of print. PMID: 34184372.
2. Patel JN, Klein DS, Sreekumar S, Liporace FA, Yoon RS. Outcomes in Multidisciplinary Team-based approach in geriatric hip fracture care: a systematic review. *J Am Acad Orthop Surg*. 2020; 28:128-133.
3. Tarrant SM, Balogh ZJ. Low-energy falls. *ANZ J Surg*. 2015;85(4):202-3.
4. Research, Audit and Academic Surgery. Guideline reference document for conducting effective Morbidity and Mortality meetings for Improved Patient Care: *Royal Australasian College of Surgeons*; 2017. Available from https://www.surgeons.org/-/media/Project/RACS/surgeons-org/files/position-papers/2017-04-12_gdl_conducting_effective_morbidity_and_mortality_meetings_for_improved_patient_care.pdf.
5. Aspex Consulting. Review of the Victorian Audit of Surgical Mortality Melbourne: *Royal Australasian College of Surgeons*; 2018. Available from: <https://www.surgeons.org/-/media/Project/RACS/surgeons-org/files/surgical-mortality-audits/vasm/2018-12-06-aspx-final-report.pdf>.
6. Australian Commission on Safety and Quality in Health Care. National Safety and Quality Health Service Standards: Second edition Sydney: *Australian Commission on Safety and Quality in Health Care*; 2019. Available from: <https://www.safetyandquality.gov.au/wp-content/uploads/2017/12/National-Safety-and-Quality-Health-Service-Standards-second-edition.pdf>.
7. Victorian Audit of Surgical Mortality. Case Note Review Booklet Melbourne: *Royal Australasian College of Surgeons*; 2020. Available from: <https://www.surgeons.org/for-health-professionals/audits-and-surgical-research/anzasm/vasm/#CNRB>.
8. Department of Health & Human Services. Victorian Admitted Episodes Dataset: 2017-18 VAED manual State of Victoria: *Department of Health & Human Services*; 2017. Available from: <https://www2.health.vic.gov.au/hospitals-and-health-services/data-reporting/health-data-standards-systems/data-collections/vaed>.
9. American Society of Anesthesiologists (ASA). *ASA Physical Status Classification System*. Park Ridge, Illinois. 2017. Available from: <http://www.asahq.org/resources/clinical-information/asa-physical-status-classification-system>.
10. Pham C, Gibb C, Field J, Gray J, Fitridge R, Marshall V, et al. Managing high-risk surgical patients: modifiable co-morbidities matter. *ANZ J Surg*. 2014;84(12):925-31.
11. Hansen D, Retegan C, Woodford N, Vinluan J, Beiles CB. Comparison of the Victorian Audit of Surgical Mortality with coronial cause of death. *ANZ J Surg*. 2015;86(6).
12. Wilkinson K, Martin IC, Gough MJ, Stewart JAD, Lucas SB, Freeth H, et al. An Age Old Problem: A review of the care received by elderly patients undergoing surgery. *National Confidential Enquiry into Patient Outcome and Death* [Internet]. 2010: [1-17 pp.]. Available from: http://www.ncepod.org.uk/2010report3/downloads/EESE_fullReport.pdf.
13. National Health and Medical Research Council. *Clinical practice guideline for the prevention of venous thromboembolism in patients admitted to Australian hospitals*. Melbourne: National Health and Medical Research Council 2009.
14. National Emergency Laparotomy Audit. Support – NELA Risk Adjustment Model. Available from: <https://data.nela.org.uk/Support/NELA-Risk-Adjustment-Model.aspx>.

15. Worth LJ, Bull AL, Spelman T, Brett J, Richards MJ. Diminishing surgical site infections in Australia: time trends in infection rates, pathogens and antimicrobial resistance using a comprehensive Victorian surveillance program, 2002-2013. *Infect Control Hosp Epidemiol*. 2015;36(4):409-16.
16. Worth LJ, Spelman T, Bull AL, Richards MJ. A major reduction in hospital-onset *Staphylococcus aureus* bacteremia in Australia: a question of definition. *Clin Infect Dis*. 2014;59(12):1808-9.
17. Worth LJ, Spelman T, Bull AL, Richards MJ. *Staphylococcus aureus* bloodstream infection in Australian hospitals: findings from a Victorian surveillance system. *Med J Aust*. 2014;200(5):282-4.
18. Victoria State Government. Falls prevention in hospital. Available from: <https://www2.health.vic.gov.au/hospitals-and-health-services/patient-care/older-people/falls-mobility/falls/falls-preventing>.
19. Australian Commission on Safety and Quality in Health Care. Falls prevention. Available from: <https://www.safetyandquality.gov.au/our-work/comprehensive-care/related-topics/falls-prevention>.
20. Royal Australasian College of Surgeons. End of life care Melbourne: *Royal Australasian College of Surgeons*; 2017. Available from: <https://www.surgeons.org/about-racs/position-papers/end-of-life-care-2020>.
21. Victorian Department of Health & Human Services. Targeting Zero: supporting the Victorian hospital system to eliminate avoidable harm and strengthen quality of care. *Department of Health & Human Services*; 2016.

CONTACT DETAILS

Victorian Audit of Surgical Mortality (VASM)

Royal Australasian College of Surgeons

College of Surgeons' Gardens

250–290 Spring Street

East Melbourne VIC 3002

Web: www.surgeons.org/VASM

Email: vasm@surgeons.org

Telephone: +61 3 9249 1153

Postal address:

Victorian Audit of Surgical Mortality

GPO Box 2821

Melbourne VIC 3001



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Royal Australasian College of Surgeons
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