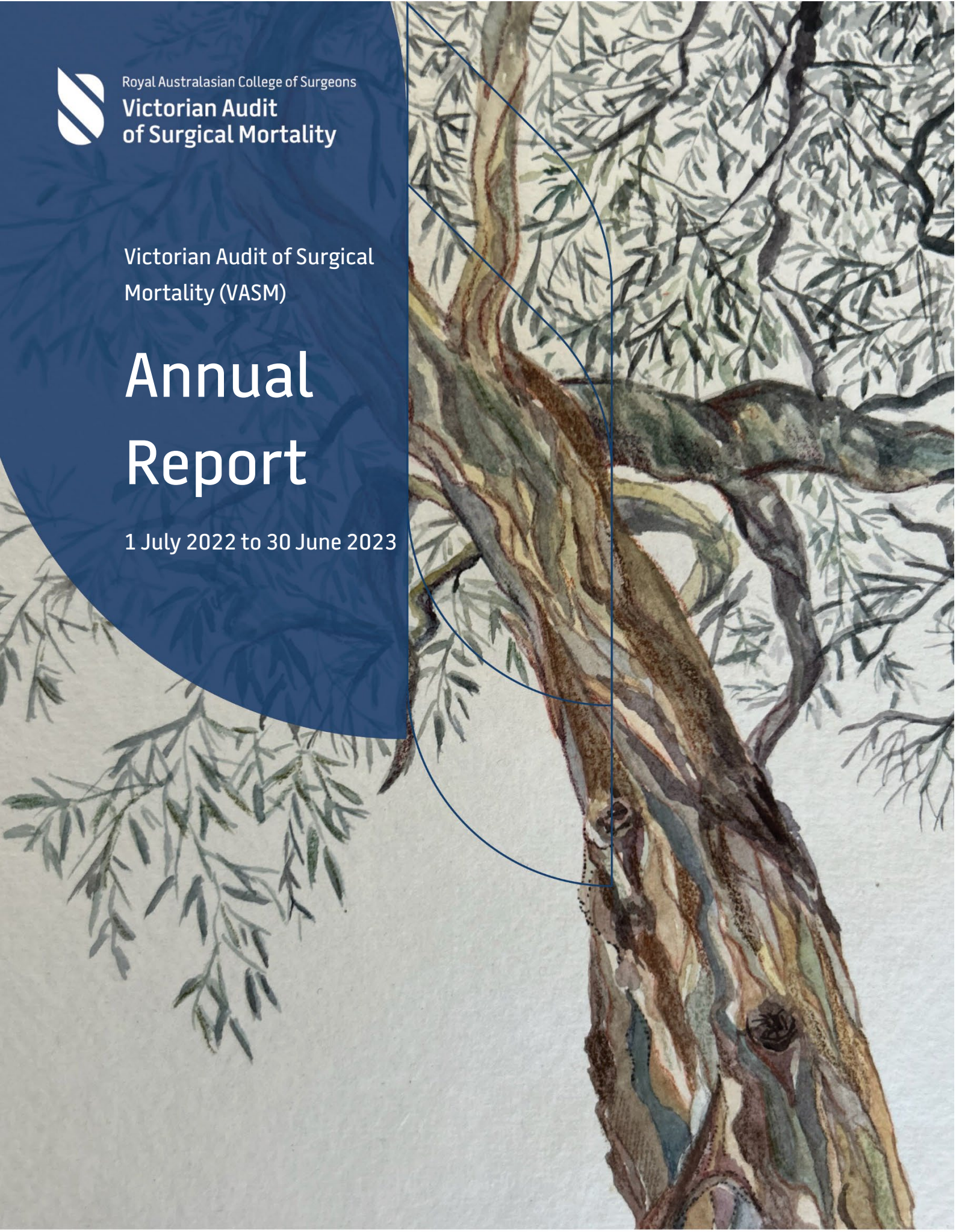
Royal Australasian College of Surgeons
Victorian Audit of Surgical Mortality

Victorian Audit of Surgical Mortality (VASM)

Annual Report

1 July 2022 to 30 June 2023



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

VICTORIA State Government | Department of Health

SCV Safer Care Victoria

Victorian Perioperative Consultative Council

RANZCOG™ Excellence in Women's Health

CONTACT DETAILS

Victorian Audit of Surgical Mortality (VASM)

Royal Australasian College of Surgeons

250–290 Spring Street

East Melbourne VIC 3002

Web: www.surgeons.org/VASM

Email: vasm@surgeons.org

Telephone: +61 3 9249 1130

Postal address:

Victorian Audit of Surgical Mortality

250–290 Spring Street

East Melbourne VIC 3002

Front cover image: '*The Silent Watcher*' by June Zhang.

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.

Contents

List of figures and tables

Foreword from VASM

We are now in the post-Covid era, which appears to be similar to the pre-Covid normal but with marked changes. Working from home, on-line meetings and greater awareness of upper respiratory tract infections will now probably always be with us, but we still yearn for face-to-face meetings, travel and, to some degree, certainty in planning. We are social creatures, but now a little more cautious about over-committing.

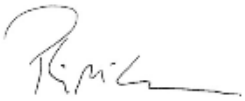
The post-Covid hangover includes cost-of-living pressures, higher interest rates and bigger government debt with associated cutbacks in spending. Safer Care Victoria (SCV), the Victorian Perioperative Consultative Council (VPCC) and the Victorian Audit of Surgical Mortality (VASM) have been impacted by these changes and the way these administrative bodies work will be different coming out the other side. Public hospital surgical waiting lists are under pressure, with expectations that, as clinicians, we make better use of limited resources in an evidence-based way. SCV and VPCC are at the forefront of these changes, with initiatives including Best Care, Best Place and Get It Right First Time (borrowed from the UK). It is reassuring that the continuing value of VASM has been acknowledged by SCV, and the relationship involving VPCC has been put forward as national best practice, but the considerable investment by SCV is expected to produce, amongst other things, more timely reporting and clearer messaging. There are currently discussions with state governments across the country on how to improve information-sharing and surgical outcomes, which will hopefully strengthen the audits of surgical mortality and support their development for the second quarter of this century.

Last year, I noted that completed VASM surgical case forms were significantly down on pre-pandemic levels. Due to major efforts from the reporting and assessing surgeons and VASM staff, the numbers on which this report is based are back to a more normal level (>1,000 cases for the first time in three years). Hidden in the details of the report are an additional 1,000+ cases that have been completed from previous years, ensuring that the database remains up-to-date and relevant. The ANZASM database is one of only two Australian surgical clinical quality registries with data collection exceeding the 95% gold standard (the Joint Replacement registry being the other), with 12 of the 17 registries failing to collect at least 60% of potential data.

As expected, the additional cases have increased the frequency of historic clinical management issues, although there has been a slight decrease in the proportion of preventable adverse events. This positive trend has continued for the current year, though the figures in next year's report may present a more accurate picture. The overall result is that surgery in Victoria remains safe.

This report depends on the time and effort of Victorian surgeons, for which VASM is extremely grateful. It also relies on the skill and dedication of the small VASM team. That team has seen a number of changes recently, and this will be the last report to which Jessele Vinluan and Ushan Vithanage contribute. I thank them for their hard work and wish them well for their future endeavours.

I look forward to keeping everyone updated on surgical mortality, and to working closely with SCV and VPCC to make future reports even more timely and relevant.



Associate Professor Philip McCahy, FRACS FRCS (Urology)

VASM Clinical Director

Foreword from VPCC

One of the key roles of the Victorian Perioperative Consultative Council (VPCC) is to identify areas of weakness within the perioperative healthcare sector and make recommendations towards improvement in safety and quality. This contributes to both clinical practice and system-level improvements. VPCC directly advises and supports Safer Care Victoria, the Department of Health and is frequently engaged with professional organisations, specialist colleges and consumers. The work of VPCC is only able to be achieved through access to reliable, timely and robust information. With regard to reviewing perioperative morbidity and mortality this is through effective case reporting and case review, from which findings can be made which lead to understanding how the healthcare 'system' can work with patients, clinicians and administrators to deliver better outcomes.

VPCC receives case-level reports from the Sentinel Events program, the Victorian Institute of Forensic Medicine (for the Coroner) and of course VASM. The relationship between VPCC and VASM is particularly important because of the comprehensive reporting and review system from surgeons who are familiar with the circumstances likely to be surrounding relevant cases. The most rapid communication VPCC receives is usually via a coronial e-Deposition, or from a Sentinel Event report. Until the last year or so, the VASM reports whilst often informative, were often well over a year behind real-time which meant that they could not contribute to those matters of interest or concern which were much more recent. VASM has addressed this in a number of ways, including responding to requests to focus on a particular area of concern, and more generally by making a significant effort to catch up on the older cases and bring reviews of more recent cases to the attention of the Perioperative Mortality Committee (PMC) and hence VPCC.

Mention should be made of the PMC process itself, because this is the pathway that enables relatively seamless discussion of cases in a confidentially 'protected' environment. It took a while to get running in an optimal way but now it is working well. Such cases are further triaged and then followed up as part of VPCC's work. As has been stated already, the PMC structure and process is an example of how effective case review and sharing can be done, and is a tribute to Prof David Watters and A/Prof Philip McCahy who established it.

I would like to thank A/Prof Philip McCahy, the VASM team, and indeed all the surgical reviewers, who have contributed to the effectiveness of VASM and PMC in working with VPCC in a way which has contributed meaningfully to safe and effective patient care in Victorian hospitals.

Professor David A Scott, FANZCA, FFPMANZCA, GChPOM

Chair, Victorian Perioperative Consultative Council

1 Victorian healthcare statistics

Surgery continues to be safe in Victoria

VASM monitors and learns from surgical deaths to inform how surgical standards can be maintained at the highest level and patients can receive the best surgical care possible. The following data are derived from audited cases from 1 July 2022–30 June 2023.

Demographic

Victorian total

Population	6.8 million

Audited mortalities

Male[1]	58.8%
Female[1]	41.2%
Median age	78
Mortality rate[2]	3.3

Admission status

Elective	13.3%
Emergency	86.7%

Transfer

Preoperative transfer	19.6%

Risk

Preoperative risk of death

Expected	9.6%
Considerable	51.7%
Moderate	23.1%
Small	10.0%
Minimal	5.2%

Most common comorbidities

Cardiovascular	57.6%
Age[3]	56.8%
Respiratory	34.6%
Renal	29.8%
Neurological	24.8%

Most common causes of death

Cardiac disease	10.6%
Multiple organ failure	9.5%
Acute abdomen	9.2%
Pneumonia	9.1%
Malignancy	8.2%

Key findings

Areas of improved patient care

- **Greater** consultant presence in theatre
- **Fewer** postoperative complications
- **Decreased** sepsis
- **Improved** patient fluid management
- **Fewer** infections during admission
- **Decreased** pneumonia

Peer review outcomes

Adverse event	5.5%	**Area for consideration**	12.2%
Area of concern	4.0%	**No issues**	78.3%

Notes: 1 = Birth sex reported by hospital; 2 = VASM-reported mortality per 1,000 surgical admissions; 3 = Victorian patients aged 75 or older comprise 59.7% (630/1,055) of audited deaths.

2 Recommendations

This year, VASM has separated its recommendations for different areas of the health sector (i.e. surgeons, hospital and health services and the Victorian Department of Health). VASM will assess uptake of these recommendations in its future reports.

Surgeons

Timely and effective communication to clarify potential benefits and reduce inappropriate inter-hospital transfers: Inter-hospital transfers are expensive and can lead to poor quality care.

- **Timely and effective communication to clarify potential benefits and reduce inappropriate inter-hospital transfers:** Inter-hospital transfers are expensive and can lead to poor quality care. All transfers should involve shared decision making, and senior medical staff at both sites discussing the potential need for transfer and the goals of care.[1] This should decrease the need for transfers and reduce futile surgery, allowing patients to be cared for closer to home and family.

Vignette: Unnecessary transfer

An elderly woman with urosepsis was transferred from a regional hospital to a metropolitan centre (>100km away). She was struggling to breathe by the time she arrived, nevertheless a urological registrar arranged for an urgent ureteric stent insertion. The patient survived the procedure but appeared to be in Cheyne–Stokes respiration when seen by the consultant. She was referred to palliative care and later died. The assessor accepted the decision to operate but felt that the transfer could have been avoided and the patient allowed to die locally without the hardship of long-distance visits by family if communication between the hospitals and the clinical assessment at the regional hospital had been better.

- **Mandatory use of preoperative risk assessment tool for emergency laparotomy:** All emergency laparotomy cases should have a National Emergency Laparotomy Audit (NELA) or similar score recorded in the patient notes and VASM should be informed of the score in the event of patient death.

Predictive mortality tools, such as NELA, have been shown to improve preoperative risk assessment and operative decision-making.[2] These are widely available and easily applied and help to avoid futile surgery.

- **Mandatory frailty assessments for patients over age 65:** A preoperative frailty assessment should be conducted and recorded in the notes and any recommendations acted on before an operation. Ideally, patients should be assessed by a suitably qualified physician prior to any planned or semi-elective surgery.

Frailty is common in patients over age 65 and is recognised as a cause of significant postoperative morbidity and mortality, independent of any other factors.[3] Acting on preoperative frailty scores can reduce the need for surgery and improve outcomes.[4] 'Pre-habilitation' while patients are awaiting planned surgery, is a novel concept that should improve patient outcomes and overall healthcare efficiency.[5]

- **Mandatory timely reporting to VASM:** All surgical case forms should be returned to VASM within 8 weeks of receipt. First-line assessments should be returned to VASM within 2 weeks of receipt and second-line assessments should be returned within 6 weeks of receipt,

otherwise VASM should be informed if this is impossible so other assessors can be approached.

All states and territories are working towards real-time reporting of health data, which will improve detection of problems and help improve patient safety. VASM is funded by Safer Care Victoria and is expected to release its reports and act on any issues found within a tight timeframe.

Hospital/Health Services

- **Mandatory participation in relevant clinical quality registries:** All health services should participate in all relevant clinical quality registries, including at least the Australian and New Zealand Emergency Laparotomy Audit – Quality Improvement (ANZELA-QI) and the Australian and New Zealand Hip Fracture Registry (ANZHFR).

Clinical quality registries are an important benchmarking tool in Australian healthcare for improving healthcare outcomes.[6] The participation rate for most registries is suboptimal; all hospitals/health services should contribute appropriate data.

- **Mandatory timely reporting to VASM:** All surgical deaths should be reported to VASM within 7 days of the death. Hospital notes should be sent to VASM within 2 weeks of receiving a request.

All states and territories are working towards real-time reporting of health data, which will improve detection of problems and help improve patient safety. VASM is funded by Safer Care Victoria and is expected to release its reports and act on any issues found within a tight timeframe.

- **Monitoring VASM compliance of surgical teams:** Health services should be aware of the continuing professional development (CPD) compliance of their surgeons as a fundamental component of clinical governance accountability requirements, particularly credentialling.

The changing requirements for Australian Health Practitioner Regulation Agency (Ahpra) registration risks non-compliance during the transition phase. All Victorian surgeons must contribute to VASM to meet their CPD compliance and avoid any potential risk of de-registration and inability to practice.

Victorian Department of Health

- **Monitoring and implementation of statewide perioperative capability frameworks to ensure the right care in the right place at the right time:** Low-volume, high-complex procedures should be included within capability frameworks to ensure hospitals are appropriately equipped and staffed for the level of surgery being performed.[7]
- **Advocate for and support health services to reach mandatory participation in relevant clinical quality registries.**[8]

3 Executive summary

Key findings are based on 1,055 peer-reviewed Victorian Audit of Surgical Mortality (VASM) cases from the audit period **1 July 2022–30 June 2023**. Comparison is made between VASM and national data from the Australian Capital Territory, Northern Territory, Queensland, South Australian, Tasmanian and Western Australian audits of surgical mortality. New South Wales data (Collaborating Hospitals Audit of Surgical Mortality) was unavailable at the census date (8 January 2024).

3.1 Hospital admission and operative patient profile

During the current audit period, 86.7% (915/1,055) of cases were emergency admissions and 13.3% (140/1,055) were elective admissions. Most admissions were to public hospitals (80.0%; 844/1,055), followed by private hospitals (20.0%; 211/1,055).

There was a high rate of surgical intervention, with 88.1% (929/1,055) of cases undergoing at least one procedure, compared with 75.7% (1,605/2,120) in other states.

The VASM cohort was elderly, with 59.7% (630/1,055) aged 75 years or older, 80.9% (854/1,055) having an ASA grade of III–IV, and risk of death according to the surgeon considered moderate to considerable for 74.8% (695/929) of cases.

A consultant was present in theatre for 85.2% (1,008/1,183) of VASM procedures (patients can undergo multiple procedures), compared with 73.3% (1,548/2,113) of national procedures.

3.2 Clinical management issues

Following completion of the VASM assessment process, no issues were found for 78.3% (826/1,055) of cases, whereas at least one area of consideration (difference in opinion) was identified for 12.2% (129/1,055) of cases, at least one area for concern (moderate criticism) identified for 4.0% (42/1,055) of cases, and an adverse event occurred for 5.5% (58/1,055) of cases. The most commonly reported clinical management issues (CMIs) were those where the operation was considered unnecessary (12.2% of CMIs; 590/4,838) or an alternative procedure should have been considered (8.4%; 408/4,838).

When assessing the pathway of surgical care for potential areas of improvement, Victorian surgeons were largely on par with their interstate colleagues.

Feedback on identified CMIs has been delivered to treating surgeons to allow considered reflection. It is important to note that not all CMIs are associated with the surgical team, as patient care is broad and complex, including preoperative, intraoperative and postoperative care delivered by multidisciplinary teams. VASM is unable to share feedback for individual cases directly with hospitals due to qualified privilege; however, it does encourage surgeons to share feedback with their colleagues and the hospital.

3.3 Potentially preventable clinical outcomes

As part of the evaluation process, assessors are asked not only to indicate the presence of CMIs but also whether any CMI was considered preventable or not. The rate of preventability for areas of concern or adverse events decreased to 6.4% (68/1,055) in 2022–2023 from 9.4% (120/1,270) in 2021–2022**.** VASM distributes clinical performance reports to each participating site, allowing healthcare services to examine their own de-identified outcomes.

The key VASM recommendations in this report align with 6 of the 8 National Safety and Quality Health Service (NSQHS) Standards that can be used by hospitals and health professionals to improve clinical practice and patient safety. Overall, VASM seeks to use the information it collects to help all surgical

Fellows and participating health organisations to improve the quality of their service and safeguard high standards of care.

4 Introduction

The Victorian Audit of Surgical Mortality (VASM) is an initiative of the Royal Australasian College of Surgeons (RACS) that facilitates independent peer-review of in-hospital mortality where surgical care was involved. Through the evaluation of these cases, VASM provides surgeons with timely case-based feedback to help ensure the highest standards of safe and comprehensive surgical care. As part of the Australian and New Zealand Audit of Surgical Mortality (ANZASM), VASM enjoys national support from the other regional surgical mortality audits in helping to maintain surgical excellence in Australian healthcare institutions. The expertise of Victorian surgeons likewise contributes to improving national outcomes.

The VASM evaluation process collects clinical and case evaluation data for cases satisfying its inclusion criteria, that is, all instances of patient mortality (in hospital or within 30 days of a surgical procedure) where:

- the patient was admitted by a surgeon, regardless of whether a procedure took place.
- the patient was admitted medically but underwent a procedure performed by a surgeon.

This allows VASM to interrogate the data to identify those areas of surgical care that require attention within the Victorian healthcare sector. It is important to note that these evaluations focus specifically on the appropriateness of the surgical care undertaken.

The current report provides key findings and recommendations for the period 1 July 2022–30 June 2023, with 5-year data (1 July 2018–30 June 2023) included in the appendix. In order to benchmark outcomes of surgical care, comparisons are made between VASM and national audit data. Data from New South Wales was not available for this report: the Clinical Excellence Commission runs a comparable but separate audit, known as the Collaborating Hospitals Audit of Surgical Mortality.

The data contained in this report are complete as of 8 January 2024.

The key recommendations and VASM audit findings summarised in this report should be used by hospitals and surgeons, in conjunction with the National Safety and Quality Health Service (NSQHS) Standards,[9] to identify potential areas for improvement.

5 Victorian surgical mortality rates

The VASM audit process depends upon receiving death notifications from participating hospitals. Each hospital submits a list of deaths for which a surgeon was involved in the care of the patient.

In parallel with the VASM audit process, hospitals must also submit data to the Victorian Admitted Episodes Dataset. This database, maintained by the Victorian Department of Health, records all admissions and procedures performed in Victorian hospitals. Individual patient care episodes are classified to a specialty-specific Australian refined diagnosis-related group (AR-DRG), which provides an alternative source of mortality data. These data are then reported to the Australian Institute of Health and Welfare (AIHW).

According to AIHW data for the period 1 July 2022 to 30 June 2023, there were 554,445 patients admitted to Victorian public and private hospitals in association with a surgical AR-DRG. Over the same period, VASM received 1,832 direct notifications of deaths associated with surgical care, providing an estimated surgical mortality rate of 0.3% (1,832/554,445) (Table A.1). Some differentiation between AIHW and VASM estimated mortality rates is to be expected, given slight differences in the way each cohort is defined.

AIHW-reported mortalities are based on the AR-DRG codes associated with the admission (and filtering based on surgical AR-DRGs), whereas VASM-reported mortalities are those for which the patient was admitted under a surgeon or had a procedure performed by a surgeon. Surgical procedure-estimated mortality rates (based on AIHW data) are difficult to provide, due to overlap in who performs a procedure (e.g. colonoscopy performed by a surgeon or non-surgeon) and the need to distinguish between these scenarios. The AIHW does not collect data on the clinicians undertaking procedures.

6 Audit participation

All hospitals in Victoria that provide surgical services are required to participate in VASM by notifying VASM of deaths that satisfy the following criteria:

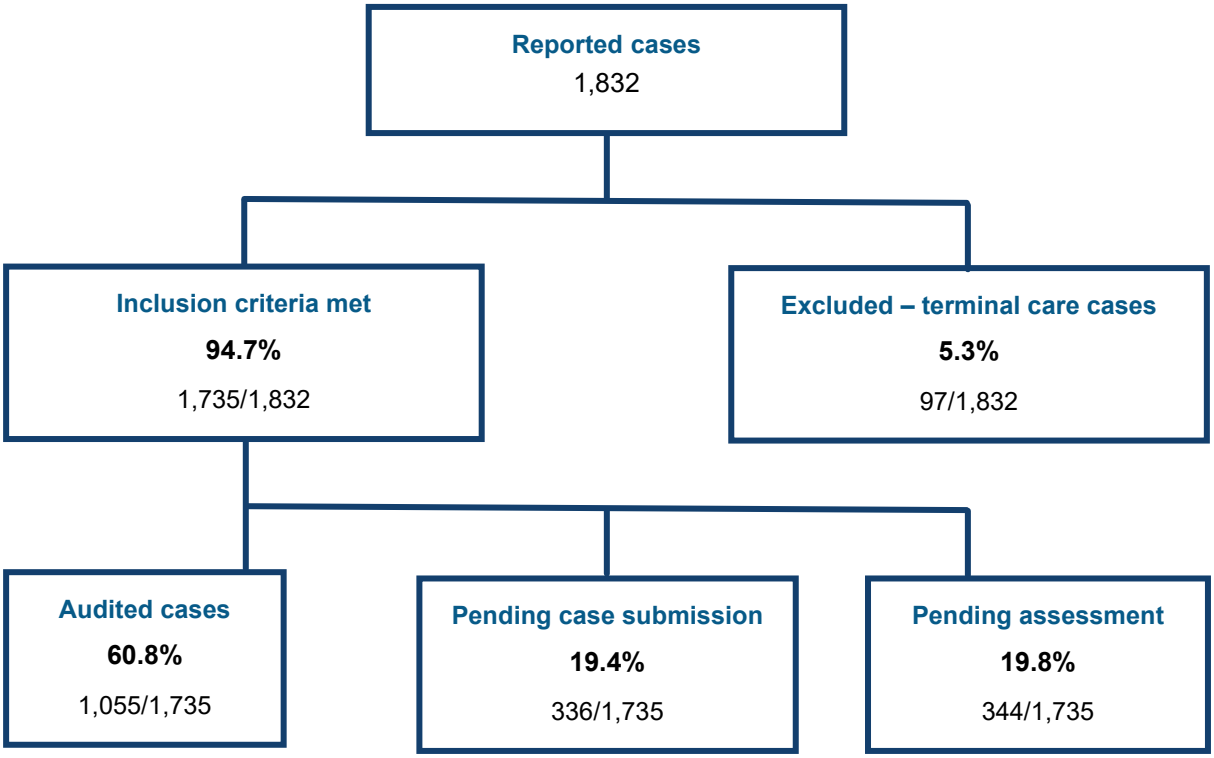
- incidents of in-hospital mortality where the patient was admitted by a surgeon, regardless of whether a procedure took place
- incidents of in-hospital mortality where the patient was admitted medically but underwent a procedure performed by a surgeon.

Death notifications to VASM may arrive from several different sources. During the period 1 July 2022–30 June 2023, VASM was notified of patient deaths from hospitals (64.8%; 1,188/1,832), from the coroner (34.6%; 633/1,832) and from individual surgeons (0.6%; 11/1,832). The time from patient death to notification was a median of 32 days (interquartile range [IQR] 20–49).

Once notified of the death of a patient for whom they were the nominated treating surgeon, Victorian surgeons took a median of 82 days (IQR 17–224) to submit a surgical case form (SCF) (this figure may change in future reports as cases are submitted). The ANZASM-recommended standard for acceptable submission of SCFs is within 60 days. Fellows of RACS or the Australian Orthopaedic Association are mandated to participate in VASM as part of their respective continuing professional development programs. Fellows of the Royal Australian and New Zealand College of Obstetricians and Gynaecologists, the Royal Australian and New Zealand College of Ophthalmologists and the Royal Australasian College of Dental Surgeons may participate in VASM on a voluntary basis (i.e. it is not a component of their continuing professional development programs, but they may choose to access independent feedback through VASM at their discretion).

Figure 1 shows the current status of cases notified to VASM (as of census date 8 January 2024). During the period 1 July 2022–30 June 2023, VASM was notified of 1,832 cases. Of these, 5.3% (97/1,832) were excluded due to being terminal care admissions, with the remaining 94.7% (1,735/1,832) satisfying VASM inclusion criteria. Of these, 60.8% (1,055/1,735) have completed the VASM audit process with feedback delivered to surgeons, 19.8% (344/1,735) are pending assessment and 19.4% (336/1,735) are still pending submission. (These figures are likely to change as more cases are submitted to VASM.) Comparing surgeons submitting cases to VASM with surgeons outside Victoria submitting to their local audit over a 5-year period (1 July 2018–30 June 2023) shows that Victorian surgeons are not clearing their cases as efficiently as compared to their interstate colleagues (Figure A.1).

Figure 1: VASM audit numbers, 2022–2023



7 Patient demographics

Demographic data for VASM cases that have completed the audit process are summarised in Table 1, with comparison against data from non-Victorian jurisdictions. The cohort characteristics are broadly similar, except for the numbers of operations that took place during admission. Victorian patients were more likely to undergo an operation during admission (88.1%; 929/1,055) compared to their non-Victorian counterparts (75.7%; 1,605/2,120). Given the overall similarity between cohorts it is unclear why this is so.

Table 1: Characteristics of audited deaths, 2022–2023

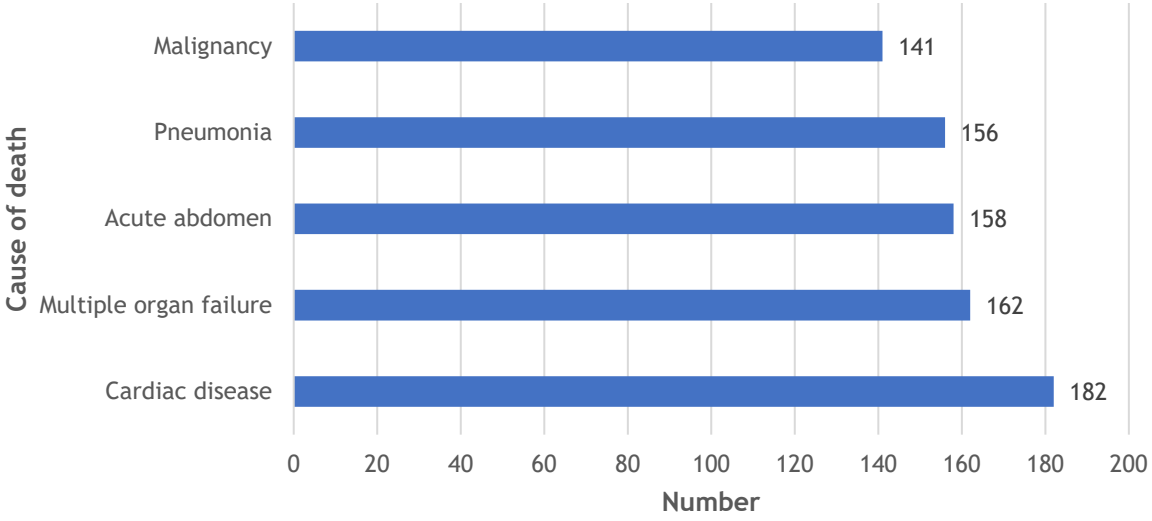
		VASM	National
Audited deaths (n)		1,055	2,120
Age (median years), (interquartile range)		78 (67–87)	77 (64–85)
Operative cases (%)		88.1	75.7
Sex[1] (%)	Male	58.8	57.8
	Female	41.2	42.2
Admission status (%)	Elective	13.3	10.7
	Emergency	86.7	89.2
ASA[2] grade (%)	ASA I–II	3.1	5.7
	ASA III	26.5	28.3
	ASA IV	54.4	47.8
	ASA V–VI	15.9	18.1
Risk of death prior to surgery[3] (%)	Expected	9.6	9.2
	Considerable	51.7	51.5
	Moderate	23.1	24.3
	Small	10.0	10.7
	Minimal	5.2	4.2
Comorbidities[4] (%)	Cardiovascular	57.6	55.9
	Age[5]	56.8	53.5
	Respiratory	34.6	31.0
	Renal	29.8	27.0
	Neurological	24.8	23.4
	Diabetes	20.9	20.1
	Advanced malignancy	20.1	19.5
	Other	17.3	21.3
	Obesity	11.0	10.9
	Hepatic	8.2	9.3
Number of procedures (%)	3 or more	4.6	5.5
	2	9.2	8.6
	1	74.2	61.7
	0	11.9	24.3

Notes: 1 = birth sex reported by hospital, 2 = American Society of Anesthesiologists (ASA) physical status classification system[10], 3 = as determined by treating surgeon, 4 = Coexisting medical conditions or disease processes additional to the primary diagnosis; 5 = Victorian patients over age 75 made up 59.7% (630/1,055) of audited deaths. Unavailable data were excluded from analysis. Each audited case can have more than one operation. National data are from other participating jurisdictions, excluding Victoria and New South Wales.

8 Cause of death

The stated cause of death is that reported by the treating surgeon (as distinct from a coronial determination). Multiple causes of death may be nominated. During the current audit period, 1,710 causes of death were identified across 1,055 cases. The 5 most frequently listed causes of death accounted for 46.7% (799/1,710) of the total reported causes of death (Figure 2).

Figure 2: Most common causes of death, 2022–2023



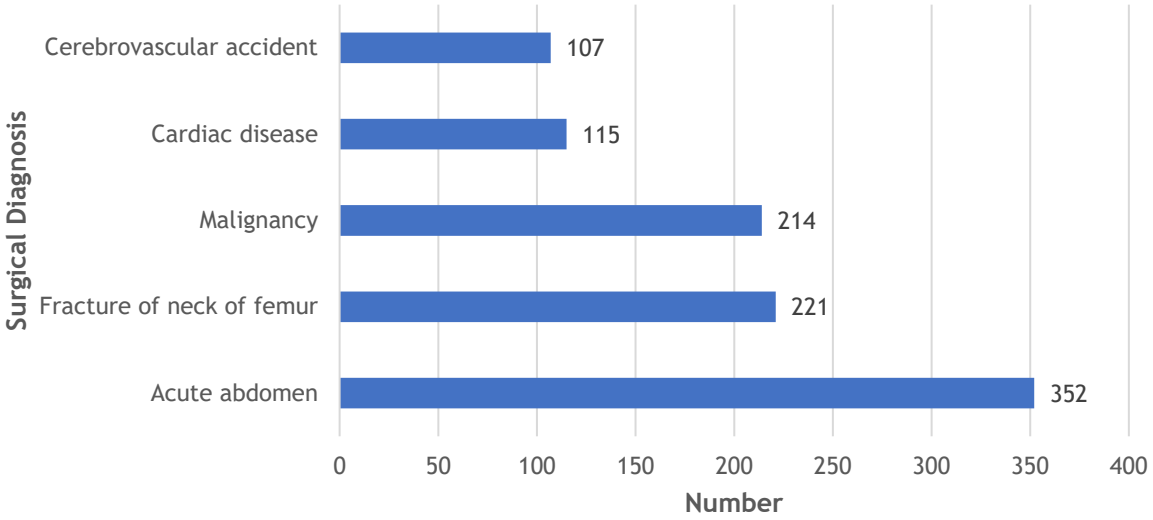
Notes: n=1,710 causes of death associated with 1,055 Victorian patients (1 July 2022–30 June 2023).

A case may be referred to the coroner when the probable cause of death cannot be determined or where an accidental death occurs in a healthcare facility.[11] 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 they should be considered as complementary assessment tools.

9 Clinical risk management

Determining the surgical diagnosis fundamentally influences the surgical care that a patient will experience. Each patient presenting to hospital may be diagnosed with multiple complex and concurrent surgical issues. During the current period, there were 1,565 surgical diagnoses for 1,055 patients. Acute abdomen was the most common diagnosis (22.5%; 352/1,565) followed by fractured neck of femur (14.1%; 221/1,565) and malignancy (13.7%; 214/1,565) (Figure 3).

Figure 3: Top 5 VASM surgical diagnoses, 2022–2023



Note: n=1,565 surgical diagnoses associated with 1,055 patients (1 July 2022–30 June 2023).

In the current audit period, the proportion of cases with malignancy identified as a comorbidity remained stable at 13.7% (214/1,565) relative to 13.8% (256/1,860) for the previous audit year (2021–2022).

9.1 Delay in surgical diagnosis

Determining the surgical diagnosis in a timely manner is critical to maximising the opportunity for achieving the best possible outcome.[12-14] Treating surgeons are asked to report when a delay has occurred in establishing a surgical diagnosis and, if possible, why the delay occurred. For the current audit period, a delay in determining the surgical diagnosis was reported in 4.5% (47/1,055) of cases, consistent with that observed in the 2020–2021 and 2021–2022 reporting periods (Figure A.2).

For cases in which a delay in determining the surgical diagnosis was reported, the local surgical unit was attributed responsibility in 31.9% (15/47) of cases. The delay was considered unavoidable in 40.4% (19/47) of cases.

Vignette: Avoidable delay in referral to neurosurgical department

A young patient presented to a general practitioner (GP) with a short history of headaches, dizziness and neck pain. The GP organised an urgent brain magnetic resonance imaging (MRI) scan, which showed a large intraventricular tumour. The GP advised the patient to attend an emergency department (ED) with the MRI report and also referred the patient to neurology. Neurology returned the referral to the GP 3 weeks later, suggesting referral to Neurosurgery. The GP tried contacting the patient but was unsuccessful. Two months later, the patient returned to the GP with headache and vomiting, and was again sent to the ED. A computed tomography (CT) scan confirmed a brain tumour and the patient was transferred to Neurosurgery. The patient's Glasgow Coma Scale score deteriorated in transit. Despite an urgent craniotomy and debulking the patient died the next day. Histology showed a neurocytoma.

The VASM assessor commended the GP, but for a variety of reasons the patient's presentation to Neurosurgery was significantly delayed, preventing any hope of survival. It is disappointing that the hospital with the initial referral showed no initiative in investigating an obvious problem.

9.2 Hospital transfers

Transfer of patients between treating institutions may be required to optimise the surgical care received, for example, transfer from remote/rural to metropolitan health services or transfer to specialty centres. However, challenges can arise when transfers occur, such as delays, inappropriate transfer or inadequate care. In 2022–2023, 207 patients were preoperatively transferred between hospitals. Delays to transfer were reported in 11.1% (23/207) of cases, slightly lower than the national average (11.6%; 69/593) (Figure A.3).

9.3 Deep vein thrombosis prophylaxis

During the 2022–2023 period, deep vein thrombosis (DVT) prophylaxis was used in 81.8% (863/1,055) of cases (Figure A.4), with heparin (84.9%; 733/863) the most common strategy employed. Following peer review, assessors approved of the use or non-use of DVT prophylaxis for 77.0% (812/1,054) of cases. They disapproved of management in only 2.0% (21/1,055) of cases (Figure A.5).

There were 14 cases (1.3%, 14/1,055) where the cause of death was attributed to the occurrence of pulmonary embolism; 4 of these cases did not receive DVT prophylaxis. Appropriate use of DVT prophylaxis is outlined in the clinical practice guideline for the prevention of venous thromboembolism in patients admitted to Australian hospitals.[15] The choice of prophylaxis strategy is subject to the judgement of clinicians caring for individual patients.

9.4 Admission to critical care units

Examining the use of critical care unit (CCU) facilities over time shows a slight decline in usage for VASM cases for 2022–2023 (57.1% of cases; 602/1,055), whereas the national trend for usage of CCU facilities is more stable (Figure A.6).

Where CCU facilities were not used during the course of patient care, surgeons and assessors were asked to reflect on whether this was appropriate. Overwhelmingly, the use or non-use of CCU facilities was considered appropriate by both surgeons (97.8% of cases; 449/453) and assessors (91.7%; 421/459) for 2022–2023. Approval rates when evaluating the use or non-use of CCU facilities have increased each year for the 5-year period 1 July 2018–30 June 2023 (data not shown).

During the course of hospital admission, patients may undergo an unplanned admission to CCU, whether due to an emergency presentation where the patient is in acute distress or potentially indicative of underlying issues in patient management. The proportion of patients with an unplanned admission to CCU has remained relatively stable over the 5-year period 1 July 2018–30 June 2023 (Figure A.7).

9.5 Unplanned readmission to hospital

The rate of unplanned readmission to hospital for the 2022–2023 period (4.2% of cases; 44/1,055) is consistent with that observed for the previous year (4.8%; 61/1,270), from a peak in 2019–2020 (5.2% [71/1,378] of cases) (Figure A.8). The rate of unplanned readmission to hospital continues to remain relatively low.

9.6 Clinically significant infection

During the 5-year period 1 July 2018–30 June 2023, the proportion of VASM cases reporting the presence of a clinically significant infection decreased from 33.3% (461/1,386) in 2018–2019 to 30.4% (321/1,055) in 2022–2023 (Figure A.9).

As summarised in Table 2, most clinically significant infections were acquired postoperatively. This observation is consistent with other states.

Table 2: Deaths with clinically significant infections acquired during admission, 2018–2023

Infection acquired	VASM 2018–2022	National 2018–2022	VASM 2022–2023	National 2022–2023
Acquired postoperatively, % (n)	69.4% (626/902)	64.2% (971/1,513)	68.7% (114/166)	62.6% (229/366)
Acquired preoperatively, % (n)	16.1% (145/902)	17.3% (261/1,513)	15.1% (25/166)	18.3% (67/366)
Other invasive site infection, % (n)	7.0% (63/902)	11.8% (178/1,513)	7.8% (13/166)	12.8% (47/366)
Surgical site infection, % (n)	7.5% (68/902)	6.8% (103/1,513)	8.4% (14/166)	6.3% (23/366)

Notes: 16.5% (1,068/6,465) of VASM cases acquired a clinically significant infection during admission (1 July 2018–30 June 2023); data not available n=10. 16.9% (1,879/11,105) of national cases acquired a clinically significant infection during admission (1 July 2018–30 June 2023); data not available n=10. National defined as other participating jurisdictions, excluding Victoria and New South Wales. The 2021–2022 data will be more complete in the next report as more cases become available for analysis.

During the 2022–2023 period, pneumonia accounted for 40.2% (129/321) of all infections; sepsis (intra-abdominal and otherwise) accounted for 41.1% (132/321). This is similar to that observed for other states, where pneumonia comprised 40.3% (283/703) of infections. Sepsis was reported for 39.7% (279/703) of national cases.

Surgical-site infections for VASM cases slightly increased over the 5-year period 1 July 2018–30 June 2023, from 8.0% (20/250) of cases in 2018–2019 to 8.4% (14/166) in 2022–2023. This is in contrast to national jurisdictions, which showed a slight decrease from 6.7% (29/431) to 6.3% (23/366) across the same period. Strategies for reducing surgical site infections have been implemented overseas and in Australia and guidelines should be followed.[16,17]

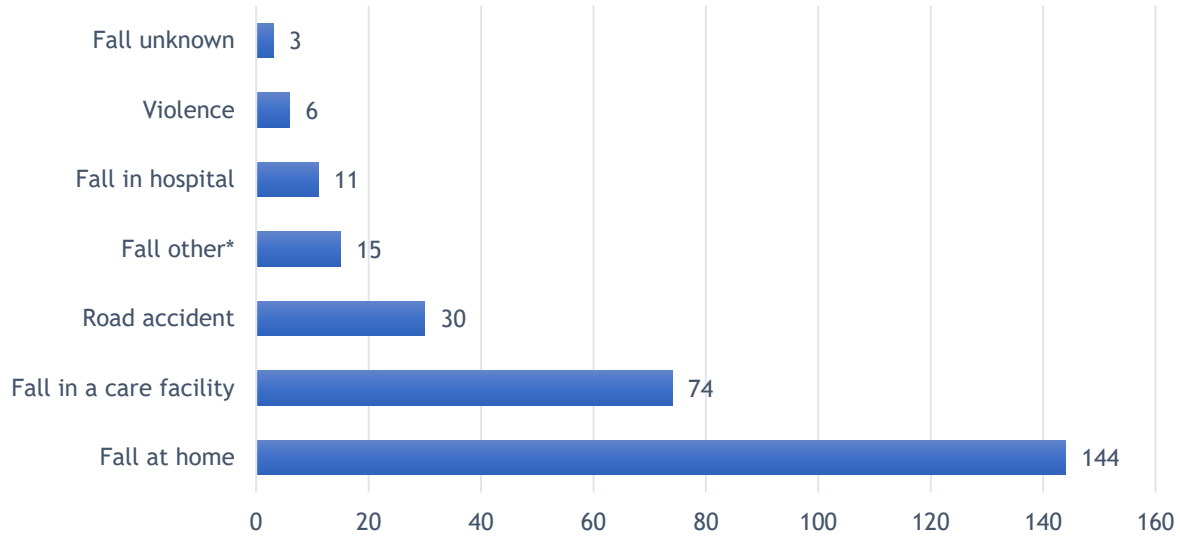
9.7 Trauma

VASM collects data on cases that arise due to trauma—falls, traffic incidents or violence. During the 2022–2023 period, 27.5% (290/1,055) of cases were reportedly due to trauma. Of these, 85.2% (247/290) were attributed to falls. Of the 290 trauma incidents reported to VASM for the 2022–2023 period, 42.1% of patients (122/290) were diagnosed with a fractured femur. The types of trauma reported to VASM are summarised in Figure 4, including classification of where falls occurred. VASM classifies a fall in hospital as an adverse event if it relates to the death of a surgical patient.

Future trend analysis of falls will help inform strategies for improvement in this aspect of patient care, especially in care facilities or hospitals.[18] VASM includes such trends in its educational programs, for example, a reduction in postoperative falls was observed among patients who participated in a preoperative education program.[19,20] Reviewing falls in trauma and orthopaedic cases can be a powerful tool for institutions to review and update current procedures to minimise risk and address issues.[21]

According to National Safety and Quality Health Service (NSQHS) Standard 5, falls in hospital causing significant injuries should be preventable. Appropriate protocols including individualised assessment are required to reduce the risk of falls.[22] During the 2022–2023 period, 2 VASM cases reported a fall in hospital causing the death of the patient. Hospitals are encouraged to review their procedures regarding falls prevention.

Figure 4: VASM deaths by causes of trauma, 2022-2023



Notes: * Includes roads and public venues. n=290 trauma cases in 1,055 Victorian audited deaths (1 July 2022–30 June 2023)

10 Profile of operative procedures

During the 2022–2023 period, 88.1% (929/1,055) of patients had at least one operative procedure, with consultants present in theatre for 85.2% (1,008/1,183) of operations. Victorian surgeons were present in theatre at a consistently higher rate than their national counterparts (Figure A.10). This appears to be driven by a markedly higher consultant presence in public hospital theatres reported for VASM cases than for national cases (Table A.2).

Vignette: Choice of operation/technical issues

A middle-aged patient with diabetes and obstructive sleep apnoea underwent a laparoscopic partial nephrectomy for a poorly functioning lower pole moiety. There was a postoperative urine leak, and a laparoscopic (converted to open) nephrectomy was performed 2 months later. During this operation, damage occurred to the renal artery with blood loss of 6 litres. In ICU after the operation, rising lactate was noted and deteriorating liver function. A laparotomy a few days later showed superior mesenteric artery occlusion from a lap hemlock clip, with ischaemic bowel and possible liver damage considered incompatible with life. The patient died the following day in ICU.

The VASM assessor felt that it would have been safer to offer this comorbid patient a nephrectomy instead of the more rarely performed and technically difficult partial nephrectomy. This could have avoided the subsequent iatrogenic complications.

10.1 Postoperative complications

The development of complications following surgery is multifactorial in nature. Patient factors, such as the comorbidity profile, the nature of the presenting complaint and the complexity of the required surgical intervention can all interact with patient management factors, influencing the risk of complications arising. During the 2022–2023 audit period, postoperative complications were reported in 21.4% (198/926) of VASM operative cases, compared with 22.3% (357/1,603) in other states. The rate of reported postoperative complications has been steadily decreasing each year in Victoria and nationally (Figure A.11).

Timely identification of postoperative complications is critical. There has been significant variation during the overall 2018–2023 period in reporting of delays in identifying the occurrence of postoperative complications. During 2018–2023, 5.1% (91/1,789) of cases reported a delay in identifying postoperative complications (3.0% [6/197] during 2022–2023 audit period).

Vignette: Postoperative bleeding not recognised in ICU

A patient aged late-60s underwent an elective open repair of an abdominal aortic aneurysm. There were no reported intraoperative problems and the patient was well in ICU until the second postoperative day. At this point, hypotension unresponsive to inotropes or fluids together with decreased haemoglobin on arterial blood gases were recorded; however, the surgical team was not informed for nearly 3 hours. The operating surgeon arranged for an immediate return to theatre, but the patient suffered a cardiac arrest before arriving and despite open cardiac massage could not be saved. A Victorian Institute of Forensic Medicine (VIFM) postmortem showed haemoperitoneum and a defect where the proximal graft joined a calcified aorta.

Both the reporting surgeon and the VASM assessor were concerned that ICU staff failed to recognise significant bleeding in a postoperative vascular patient.

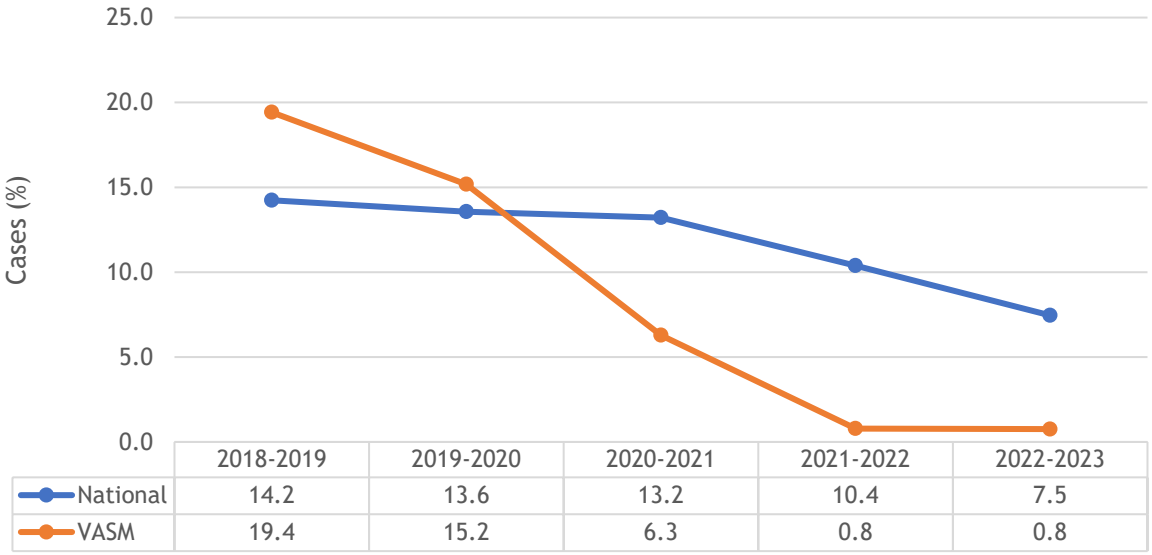
10.2 Unplanned return to theatre

Complications following surgery can be unavoidable, requiring an unplanned return to theatre (URTT). It can reflect good surgical practice when such issues are identified in a timely manner. However, a high rate of URTT for an individual surgeon or institution may warrant further investigation. During the 2022–2023 period, URTTs were reported for 9.7% (90/929) of VASM cases, considerably lower than the reported 12.5% (200/1,605) for national cases (Figure A.12). For cases reporting a postoperative complication, URTT was reported for 29.8% (59/198) of VASM cases, compared with 35.3% (126/357) of national cases. Hospitals are encouraged to review their URTT data to ascertain their failure-to-rescue rates.

11 Peer-review process

During the 2018–2023 period, 9.1% (587/6,462) of cases were required to undergo second-line assessment (SLA) as part of their evaluation. SLA may be requested when questions arise during first-line assessment (FLA) that may only be answered through medical-note review. SLAs typically reflect more complex cases. The annual proportion of cases (VASM compared with national) that have undergone SLA is summarised in Figure 5. (The apparent reduction in the rate of SLAs is indicative of cases still undergoing the review process; numbers will increase as cases progress through the audit. Delay in submission of cases to VASM correspondingly delays the subsequent assessment.)

Figure 5: Audited deaths that underwent SLA, 2018–2023



	2018-2019	2019-2020	2020-2021	2021-2022	2022-2023
National	14.2	13.6	13.2	10.4	7.5
VASM	19.4	15.2	6.3	0.8	0.8

Notes: 9.1% (587/6,462) of VASM cases were referred for SLA peer review (1 July 2018–30 June 2023). 11.8% (1,310/11,087) of national cases were referred for SLA peer review (1 July 2018–30 June 2023). National defined as other participating jurisdictions, excluding Victoria and New South Wales. The 2022–2023 data will be more complete in the next report as more cases become available for analysis.

12 Clinical management issues

During the 2022–2023 audit period, clinical management issues (CMIs) were identified in 21.7% (229/1,055) of VASM cases, compared with 14.7% (3,11/2,119) of national cases. Minor issues (areas of consideration) were most common, being reported in 12.2% (129/1,052) of VASM cases and 9.1% (192/2,119) of national cases. Moderate issues (areas of concern) were reported at a higher rate for VASM cases (4.0%; 42/1,055) than national cases (3.7%; 79/2,119). In contrast, adverse events were reported for 5.5% (58/1,055) of VASM cases compared with 1.9% (40/2,119) of national cases. A summary of the types of CMIs and their potential preventability is shown in Table A.3.

Cases can be categorised into pre-, peri- or postoperative problems. In some cases, multiple compounding issues can contribute to the death (Table A.4).

When reviewing all CMIs identified by assessors during the 2018–2023 period, the most common type of issue reported was that of an operation being considered unnecessary (12.2% of CMIs; 590/4,838), followed by that of an alternative operation being preferred (8.4% of CMIs; 408/4,838). Potentially futile surgery remains a prominent clinical issue and is a particular risk for complex patients presenting with multiple comorbidities. Alternative, less extensive interventions or conservative management should be considered if it may help reduce the rate of postoperative complications.[23] These futile operations may contribute to the overall higher rates of surgery seen in Victoria compared to the other states. Delays to initiating surgery (6.4% of CMIs; 308/4,838) and injury caused by a fall in hospital (3.6% of CMIs; 174/4,838) were also commonly reported issues.

Vignette: Communication failure with dire consequences

A frail, elderly patient was an emergency admission with acute cholecystitis. A transperitoneal pigtail drain percutaneous cholecystostomy was inserted by the interventional radiology team. A slow but steady recovery followed. After 6 weeks, the tube was capped off and the patient was sent to a rehabilitation ward. The surgical team approved the drain removal and planned for a registrar to perform this. Unfortunately, communication with the nursing staff failed and a nurse tried to extract the tube—not realising that a suture needed to be cut—resulting in trauma and pain to the patient. The patient then developed a fever and was returned to the acute hospital. Both CT and ultrasound suggested a bile leak, but goals of care had been well established and it was agreed that no operation should be performed. The patient developed acute renal failure and died 2 days later.

Both the reporting surgeon and the VASM assessor were concerned by the breakdown in communication, citing this as an obvious example of failure in non-technical skills.

12.1 Pathway of surgical care

In addition to identifying specific CMIs (if applicable), assessors are also asked to grade the pathway of surgical care for a patient, stating whether any aspects of care could have been improved. Audited cases where assessors have indicated that improvement is possible are summarised in Table 3.

Table 3: Assessor-identified areas for surgical care improvement, 2022–2023

Area for improvement	VASM (%)	National (%)	p value
Preoperative management/preparation	5.6	6.2	0.52
Decision to operate	6.6	5.4	0.20
Choice of operation	3.3	2.5	0.20
Timing of operation (too late, too soon, wrong time of day)	4.8	5.0	0.83
Intraoperative/technical management of surgery	1.8	2.7	0.12
Grade/experience of surgeon deciding	0.3	0.6	0.19
Grade/experience of surgeon operating	0.5	1.1	0.09
Postoperative care	2.2	2.5	0.63

Notes: The p value indicates the chance of a result occurring randomly. There were no statistically significant differences between VASM and national data ($p<0.05$ using χ^2 tests). National defined as other participating jurisdictions, excluding Victoria and New South Wales.

12.2 VASM and national trends in areas of clinical management

VASM collects data on key aspects of patient care that align with the NSQHS Standards. Comparisons between VASM and national data to evaluate performance against these metrics are summarised in Table A.5. During the 2022–2023 period, the presence of a consultant in theatre was significantly higher for VASM cases (85.2%; 1,008/1,183) than for national cases (73.3%; 1,548/2,113), and the rate of URTT was lower for VASM cases (9.7%; 90/929) than for national cases (12.5% [200/1,605]). The proportion of cases where assessors indicated that the DVT prophylaxis strategy employed was inappropriate was slightly higher for VASM cases (2.0%; 21/1,054) than for national cases (1.8%; 37/2,029).

13 Conclusion

From its inception in 2007 VASM has provided independent peer-review for cases of patient mortality where surgical care was involved. The case-based feedback generated throughout this time has contributed significantly to improved patient outcomes by promoting self-reflection and changes in practice by surgeons, and informing the educational activities undertaken by VASM. A broad range of workshops, seminars and webinars have been hosted by VASM that have engaged the surgical community and fostered discussion on and awareness of issues confronting surgical care. The evaluations undertaken by VASM assessors also help form the basis of the Case of the Month series, Case Note Review booklets and articles in Surgical News – what were once largely regional activities have become national programs with lessons from VASM and the other audits of surgical mortality being disseminated across Australia and New Zealand.

A strength of the VASM assessment process is that it encourages self-reflection by surgeons while also providing that independent feedback that is critical to the ongoing improvement of surgical practice. The constructive manner in which VASM has sought to convey this feedback has been one of the key reasons why VASM continues to enjoy strong engagement from the surgical community. Ideally, the feedback provided by VASM is complementary to morbidity and mortality review processes employed by hospital and health services and can help inform discussion on these issues. The RACS morbidity and mortality guidelines are recommended by VASM as an effective way to conduct these meetings.[24]

The patient cohort reported to VASM is consistent with that reported nationally, except where operative admissions are concerned: the proportion of VASM patients undergoing at least one operation during their admission remains considerably higher than that of their national counterparts. The VASM review process continues to highlight concerns around the decision to operate and delays in determining the decision to operate. Potentially futile surgery is a complex issue and one that VASM will continue to monitor. In contrast, it is reassuring that a high rate of consultant presence in theatre continues to be reported for VASM cases.

VASM, together with VPCC and with support from SCV, will continue to monitor surgical care for Victorian patients to help ensure that the highest possible standards are maintained and the best possible outcomes are achieved.

14 Acknowledgements

Many individuals and institutions have helped in the development and continued improvement of this project. VASM would like to acknowledge the support and assistance of participating Victorian RACS Fellows and International Medical Graduates, particularly those Fellows who agree to act as assessors, for their time and effort in providing detailed and valuable case note reviews. VASM also thanks SCV for funding the project, RACS for infrastructure and oversight of this project, all Victorian hospitals and their health information departments, and the following organisations:

- RACS Australian and New Zealand Audit of Surgical Mortality
- Australian and New Zealand College of Anaesthetists
- Australian Orthopaedic Association
- National Coronial Information System
- Royal Australian and New Zealand College of Obstetricians and Gynaecologists
- Victorian Perioperative Consultative Council.

14.1 VASM Management Committee

A/Prof Philip McCahy	Clinical Director, Victorian Audit of Surgical Mortality
Prof David Watters	Director of Surgery, Safer Care Victoria
Prof David A Scott	Chair, Victorian Perioperative Consultative Council, Safer Care Victoria
Dr Patrick Lo	Chair, Victorian State Committee
Dr Andrea Kattula	Representative, Australian and New Zealand College of Anaesthetists
A/Prof Jocelyn Shand	Representative, Dental Practice Board
A/Prof Michael Rasmussen	Representative, Royal Australian and New Zealand College of Obstetrics and Gynaecologists
Dr Adam Zimmet	Representative, Cardiothoracic Craft Group
Dr Ian Faragher	Representative, General Surgery
Dr Theodoros Partsalis	Representative, Australian Orthopaedics Association
Dr Amiria Lynch	Representative, Paediatric Surgery
Dr Wai-Ting Choi	Representative, Plastic Surgery
Dr Mariolyn Raj	Representative, Urological Society of Australia and New Zealand
Dr Michael Bruce	Representative, Australian Vascular Association
Denice Spence	Consumer representative
Rebecca Van Wollingen	Executive Director Operations, Safer Care Victoria
Michelle Hawke	Manager, Consultative Council Unit, Safer Care Victoria
Ryan Hon	Senior Project Officer, Victorian Perioperative Consultative Council

14.2 ANZASM Staff

Prof Wendy Babidge	General Manager, Research, Audit and Academic Surgery
Dr Helena Kopunic	Manager, Surgical Audits

14.3 VASM Staff

A/Prof Philip McCahy	Clinical Director
Dr Nathan Procter	Project Manager
Andrew Chen	Senior Project Officer
Jessele Vinluan	Senior Project Officer
Blerta Gegaj	Project Officer
Ushan Vithanage	Research Assistant
Aydan Le	RMIT Placement Student

15 Abbreviations

AIHW	Australian Institute of Health and Welfare
Ahpra	Australian Health Practitioner Regulation Agency
ANZASM	Australian and New Zealand Audit of Surgical Mortality
ANZELA-QI	Australian and New Zealand Emergency Laparotomy Audit – Quality Improvement
ANZHFR	Australian and New Zealand Hip Fracture Registry
AR-DRG	Australian refined diagnosis-related group
ASA	American Society of Anesthesiologists
CCU	critical care unit
CMI	clinical management issue
DVT	deep vein thrombosis
FLA	first-line assessment
ICU	intensive care unit
IQR	interquartile range
NELA	National Emergency Laparotomy Audit
NSQHS	National Safety and Quality Health Service
PMC	Perioperative Mortality Committee
RACS	Royal Australasian College of Surgeons
SCF	surgical case form
SCV	Safer Care Victoria
SLA	second-line assessment
URTT	unplanned return to theatre
VASM	Victorian Audit of Surgical Mortality
VPCC	Victorian Perioperative Consultative Council

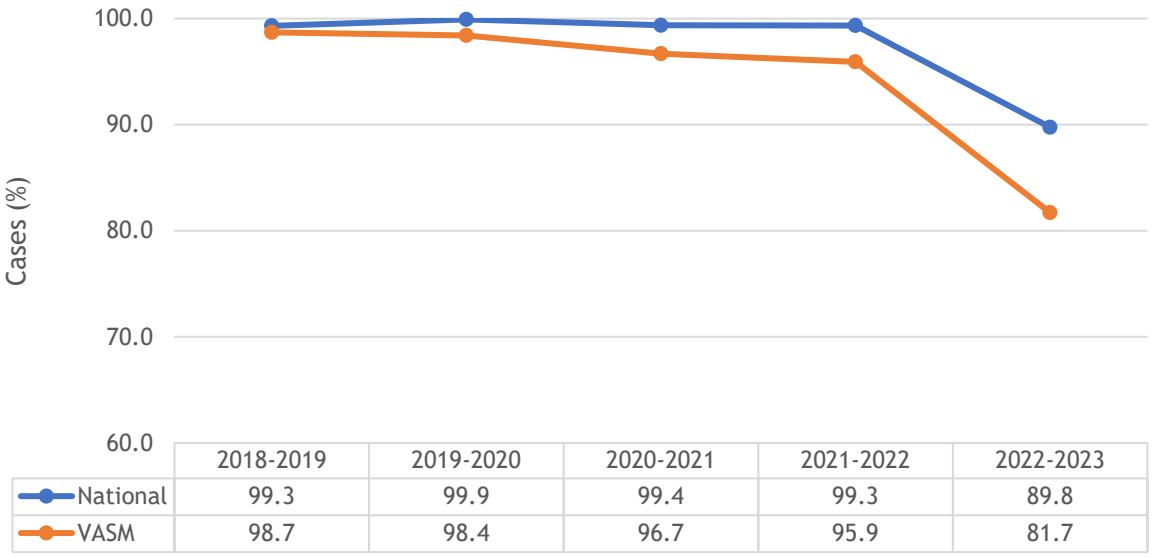
16 Appendix

Table A.1: Mortalities identified by VASM and Australian Institute of Health and Welfare, 2018–2023

Audit period	AIHW-reported surgical admissions	AIHW-reported surgical mortalities	AIHW-reported mortality per 1,000 surgical admissions	VASM-reported surgical mortalities	VASM-reported mortality per 1,000 surgical admissions
2018–2019	520,137	1,975	3.8	1,769	3.4
2019–2020	484,134	1,900	3.9	1,760	3.6
2020–2021	496,736	1,957	3.9	1,752	3.5
2021–2022	487,141	2,142	4.4	1,742	3.6
2022–2023	554,445	2,260	4.1	1,832	3.3
Total				**8,855**	

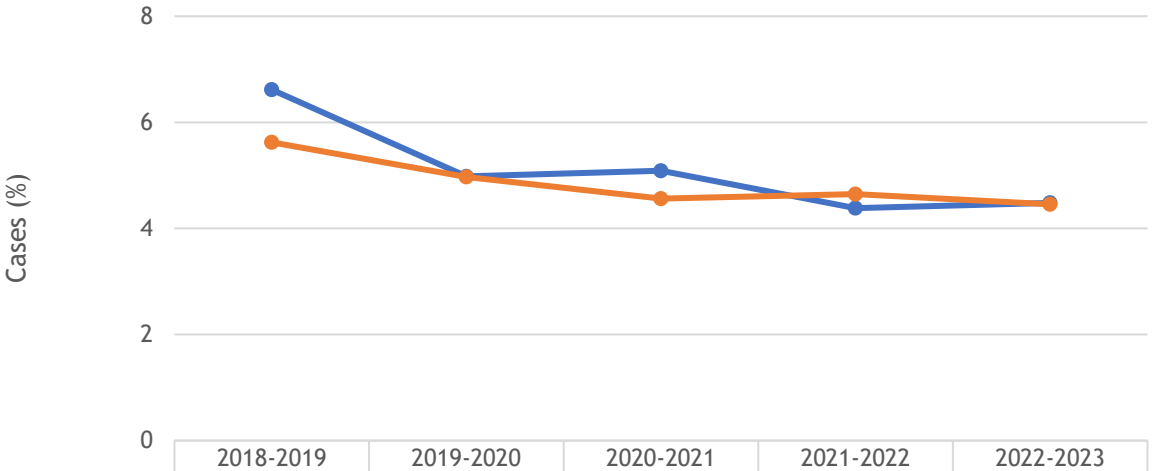
Notes: AIHW = Australian Institute of Health and Welfare.

Figure A.1: Return rate of surgical case forms, 2018–2023



Notes: n=8,340 surgical case forms (SCFs) returned from 8,855 reported cases in Victoria (1 July 2018–30 June 2023). n=13,420 SCFs returned of 13,780 reported cases from national jurisdictions (1 July 2018–30 June 2023). National defined as other participating jurisdictions, excluding Victorian and New South Wales. The percentage drop in returned SCFs for the current audit period (2022–2023) is partially due to the data extraction date. In the next report, the 2022–2023 figures will be more complete as more time is available for surgeons to return their SCFs.

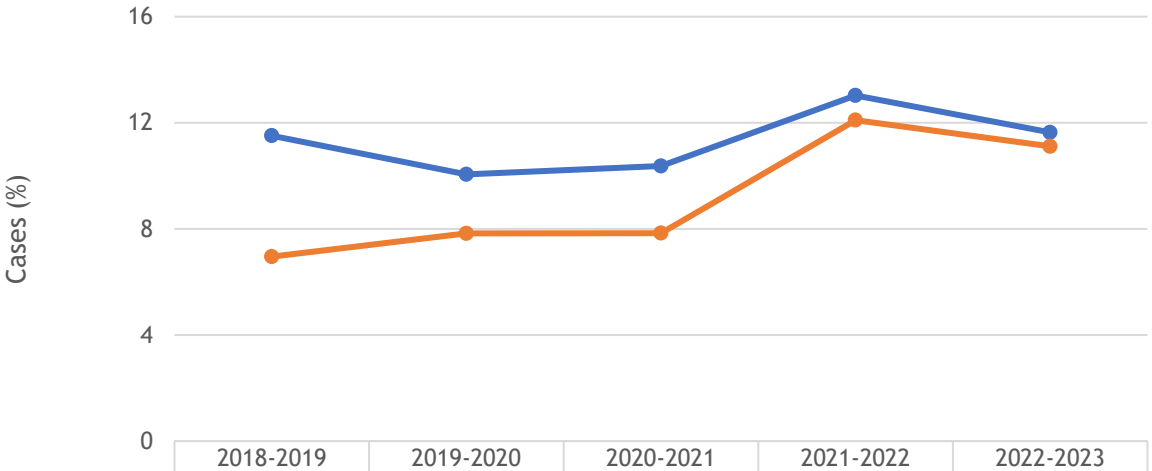
Figure A.2: Deaths with delay in surgical diagnosis, 2018–2023



	2018-2019	2019-2020	2020-2021	2021-2022	2022-2023
National	6.6	5.0	5.1	4.4	4.5
VASM	5.6	5.0	4.6	4.6	4.5

Notes: 4.9% (315/6,455) of VASM cases had delays in surgical diagnosis (1 July 2018–30 June 2023). Data not available: n=10. 5.1% (569/11,099) of national cases had delays in surgical diagnosis (1 July 2018–30 June 2023). Data not available: n=6. National defined as other participating jurisdictions, excluding Victoria and New South Wales. The 2022–2023 data will be more complete in the next report as more cases become available for analysis.

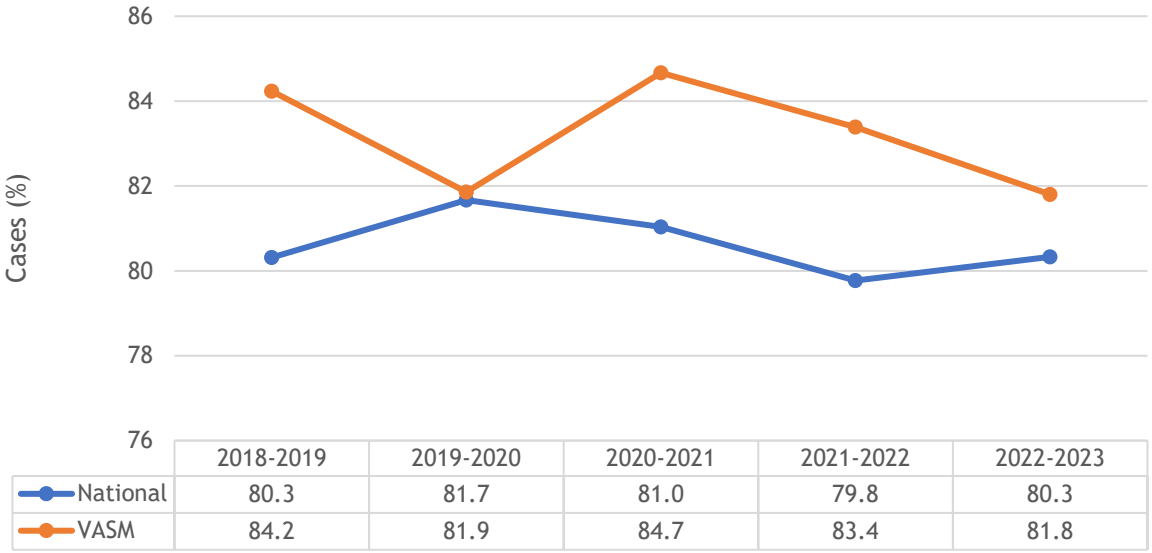
Figure A.3: Deaths with delay in hospital transfer, 2018–2023



	2018-2019	2019-2020	2020-2021	2021-2022	2022-2023
National	11.5	10.1	10.4	13.0	11.6
VASM	7.0	7.8	7.8	12.1	11.1

Notes: 9.0% (117/1,306) of VASM cases with preoperative transfer reported delays in transfer (1 July 2018–30 June 2023). Data not available: n=37. 11.3% (328/2,892) of national cases with preoperative transfer reported delays in transfer (1 July 2018–30 June 2023). Data not available: n=71. National defined as other participating jurisdictions, excluding Victoria and New South Wales. The 2022–2023 data will be more complete in the next report as more cases become available for analysis.

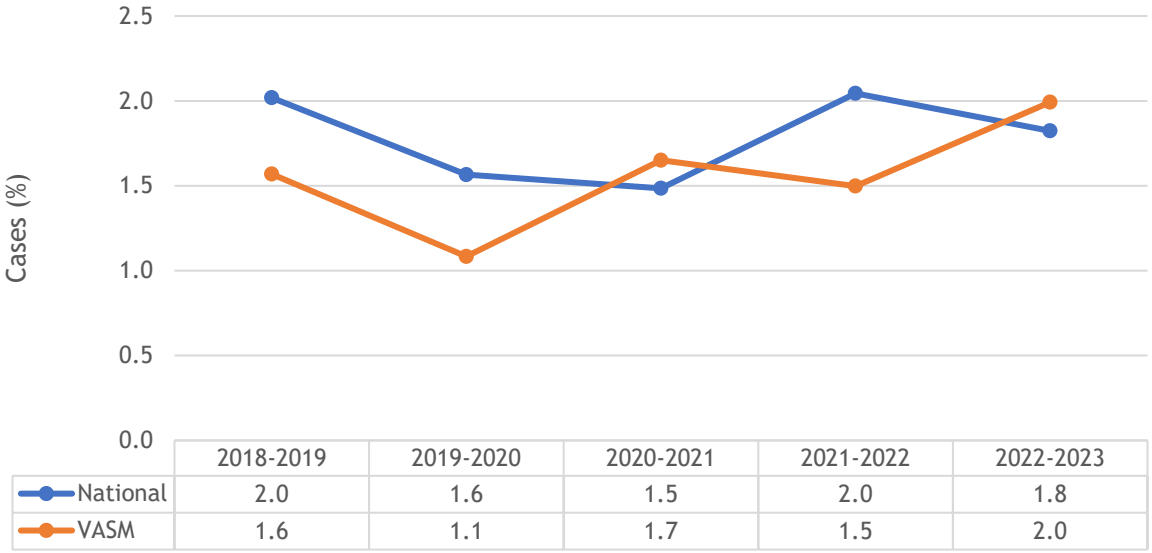
Figure A.4: Deaths with use of DVT prophylaxis, 2018–2023



	2018-2019	2019-2020	2020-2021	2021-2022	2022-2023
National	80.3	81.7	81.0	79.8	80.3
VASM	84.2	81.9	84.7	83.4	81.8

Notes: 83.2% (5,361/6,440) of VASM cases had DVT prophylaxis (1 July 2018–30 June 2023). Data not available: n=25. 80.6% (8,914/11,058) of national cases had DVT prophylaxis (1 July 2018–30 June 2023). Data not available: n=47. National defined as other participating jurisdictions, excluding Victoria and New South Wales. The 2022–2023 data will be more complete in the next report as more cases become available for analysis.

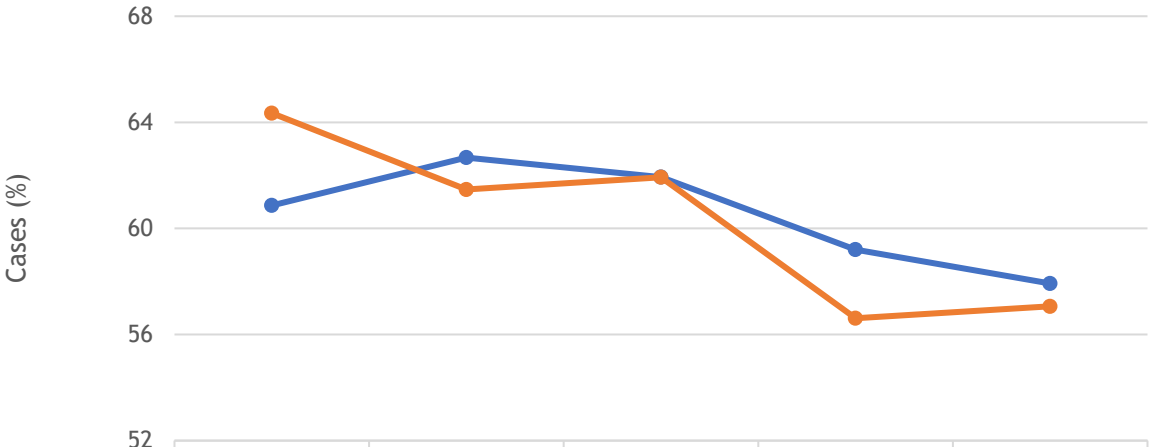
Figure A.5: Assessor finding of inappropriate choice of DVT prophylaxis, 2018–2023



	2018-2019	2019-2020	2020-2021	2021-2022	2022-2023
National	2.0	1.6	1.5	2.0	1.8
VASM	1.6	1.1	1.7	1.5	2.0

Notes: 1.5% (99/6,441) of VASM cases were considered to have an inappropriate choice of prophylaxis (1 July 2018–30 June 2023). Data not available: n=21. 1.8% (191/10,658) of national cases were considered to have an inappropriate choice of prophylaxis (1 July 2018–30 June 2023). Data not available: n=437. National defined as other participating jurisdictions, excluding Victoria and New South Wales. The 2022–2023 data will be more complete in the next report as more cases become available for analysis.

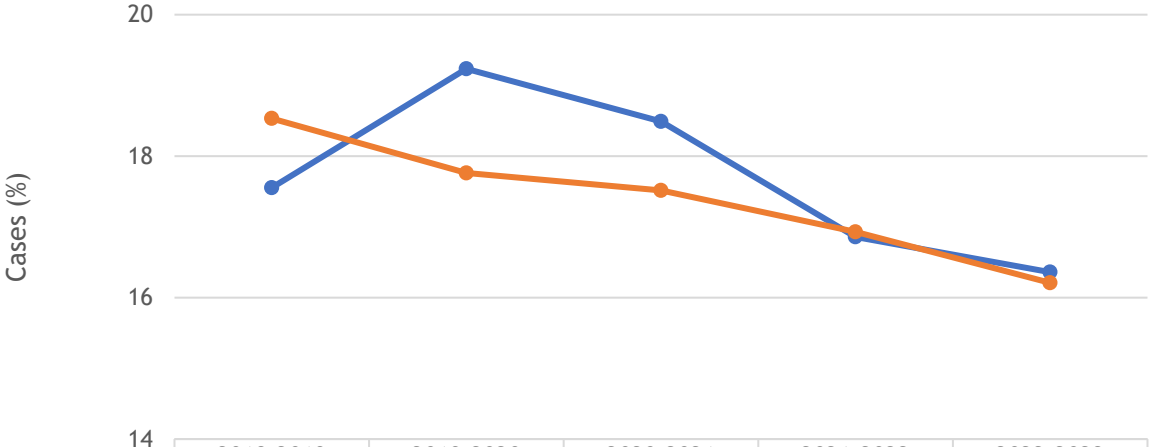
Figure A.6: Deaths with use of critical care support, 2018–2023



	2018-2019	2019-2020	2020-2021	2021-2022	2022-2023
National	60.9	62.7	61.9	59.2	57.9
VASM	64.3	61.5	61.9	56.6	57.1

Notes: 60.5% (3,910/6,461) of VASM cases received critical care support (1 July 2018–30 June 2023). Data not available: n=4. 60.5% (6,717/10,098) of national cases received critical care support (1 July 2018–30 June 2023). Data not available: n=7. National defined as other participating jurisdictions, excluding Victoria and New South Wales. The 2022–2023 data will be more complete in the next report as more cases become available for analysis.

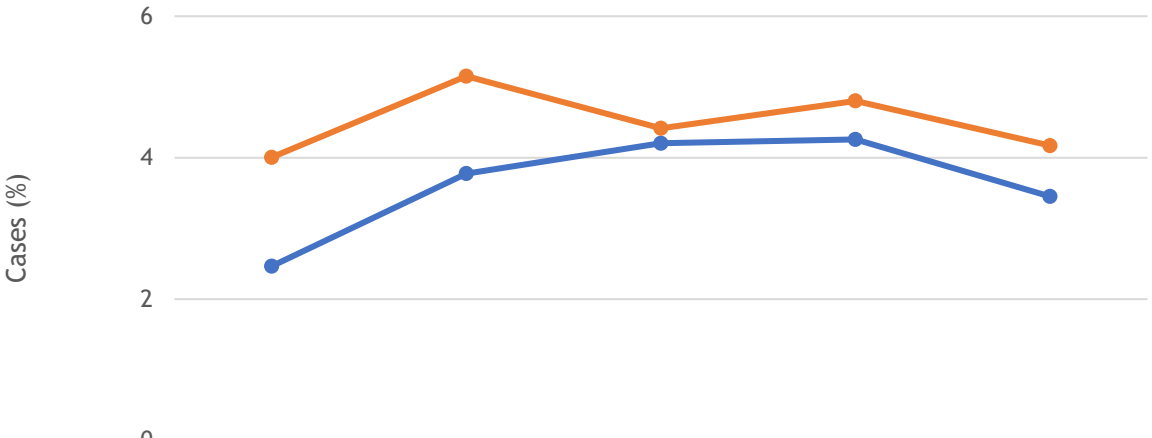
Figure A.7: Deaths with unplanned admission to CCU, 2018–2023



	2018-2019	2019-2020	2020-2021	2021-2022	2022-2023
National	17.6	19.2	18.5	16.9	16.4
VASM	18.5	17.8	17.5	16.9	16.2

Notes: 17.5% (1,126/6,449) of VASM cases had an unplanned CCU admission (1 July 2018–30 June 2023). Data not available: n=16. 17.7% (1,957/11,061) of national cases had an unplanned CCU admission (1 July 2018–30 June 2023). Data not available: n=44. National defined as other participating jurisdictions, excluding Victoria and New South Wales. The 2022–2023 data will be more complete in the next report as more cases become available for analysis.

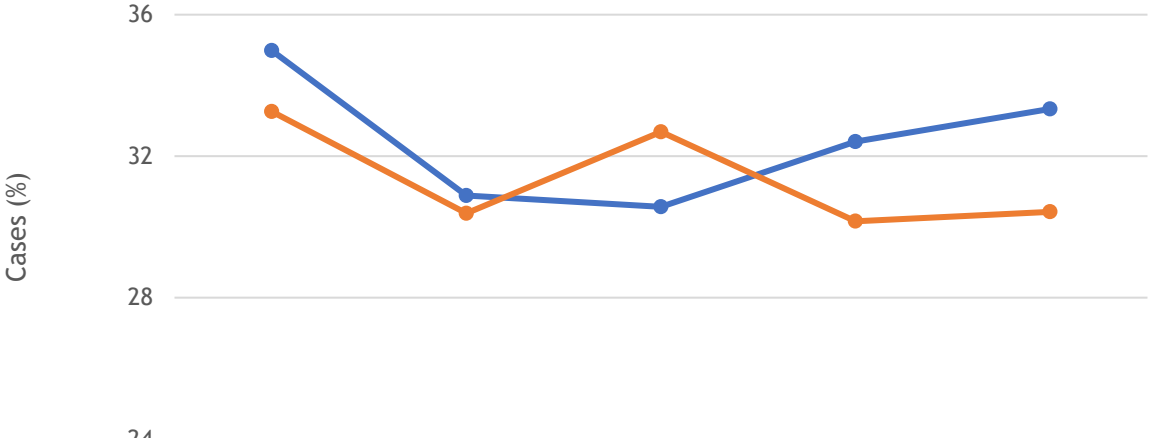
Figure A.8: Deaths with unplanned readmission, 2018–2023



	2018-2019	2019-2020	2020-2021	2021-2022	2022-2023
National	2.5	3.8	4.2	4.3	3.5
VASM	4.0	5.2	4.4	4.8	4.2

Notes: 4.5% (291/6,437) of VASM cases had an unplanned readmission (1 July 2018–30 June 2023). Data not available: n=28. 3.6% (401/11,059) of national cases had an unplanned readmission (1 July 2018–30 June 2023). Data not available: n=46. National defined as other participating jurisdictions, excluding Victoria and New South Wales. The 2022–2023 data will be more complete in the next report as more cases become available for analysis.

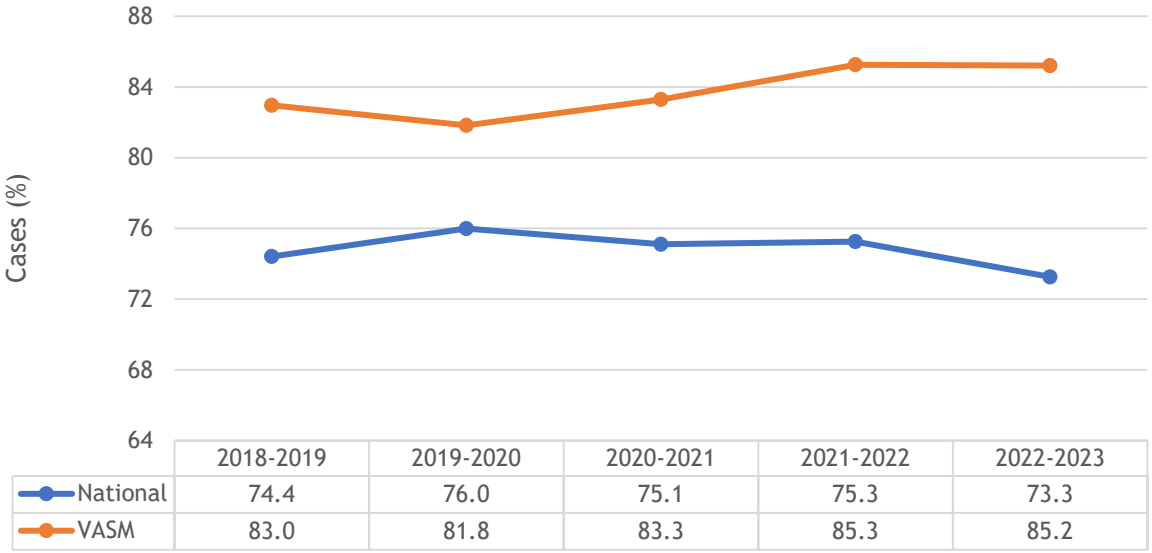
Figure A.9: Deaths with clinically significant infection, 2018–2023



	2018-2019	2019-2020	2020-2021	2021-2022	2022-2023
National	35.0	30.9	30.6	32.4	33.3
VASM	33.3	30.4	32.7	30.2	30.4

Notes: 31.4% (2,024/6,437) of VASM cases had a clinically significant infection (1 July 2018–30 June 2023). Data not available: n=28. 32.5% (3,597/11,081) of national cases had a clinically significant infection (1 July 2018–30 June 2023). Data not available: n=24. National defined as other participating jurisdictions, excluding Victoria and New South Wales. The 2022–2023 data will be more complete in the next report as more cases become available for analysis.

Figure A.10: Operative deaths with consultant surgeon present in theatre, 2018–2023



	2018-2019	2019-2020	2020-2021	2021-2022	2022-2023
National	74.4	76.0	75.1	75.3	73.3
VASM	83.0	81.8	83.3	85.3	85.2

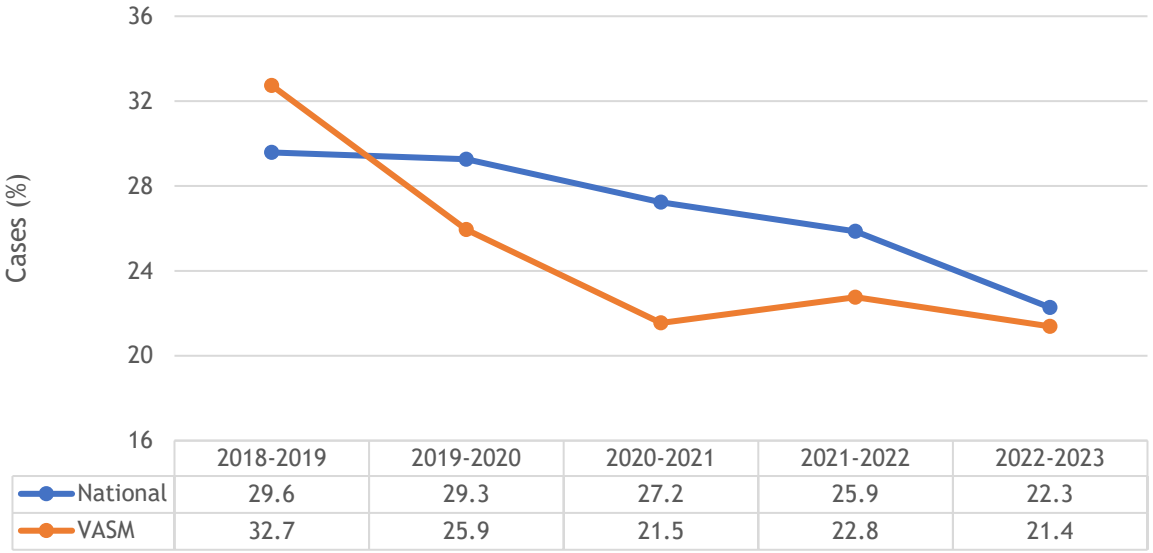
Notes: 83.6% (6,493/7,771) of operative episodes for 5,478 VASM cases had a consultant present in theatre (1 July 2018–30 June 2023). 74.8% (8,648/11,558) of operative episodes for 8,478 national cases had a consultant present in theatre (1 July 2018–30 June 2023). National defined as other participating jurisdictions, excluding Victoria and New South Wales. The 2022–2023 data will be more complete in the next report as more cases become available for analysis.

Table A.2: Consultant surgeon present in theatre by hospital status, 2018–2023

	Private		Public	
Audit period, %[1] (n)	**VASM**	**National**	**VASM**	**National**
2018–2019	91.7% (388/423)	93.1% (389/418)	80.3% (1,106/1,378)	70.7% (1,475/2,087)
2019–2020	91.3% (324/355)	97.3% (431/443)	79.4% (1,081/1,362)	70.9% (1,310/1,848)
2020–2021	95.7% (336/351)	95.0% (380/400)	79.8% (1,000/1,253)	71.1% (1,406/1,978)
2021–2022	97.4% (262/269)	93.8% (365/389)	82.5% (987/1,196)	71.4% (1,344/1,882)
2022–2023	97.0% (225/232)	94.5% (273/289)	82.3% (783/951)	69.9% (1,275/1,824)
Total	**94.2% (1,535/1,630)**	**94.8% (1,838/1,939)**	**80.7% (4,957/6,140)**	**70.8% (6,810/9,619)**

Notes: [1] Proportion of cases where at least one operation took place. National defined as other participating jurisdictions, excluding Victoria and New South Wales.

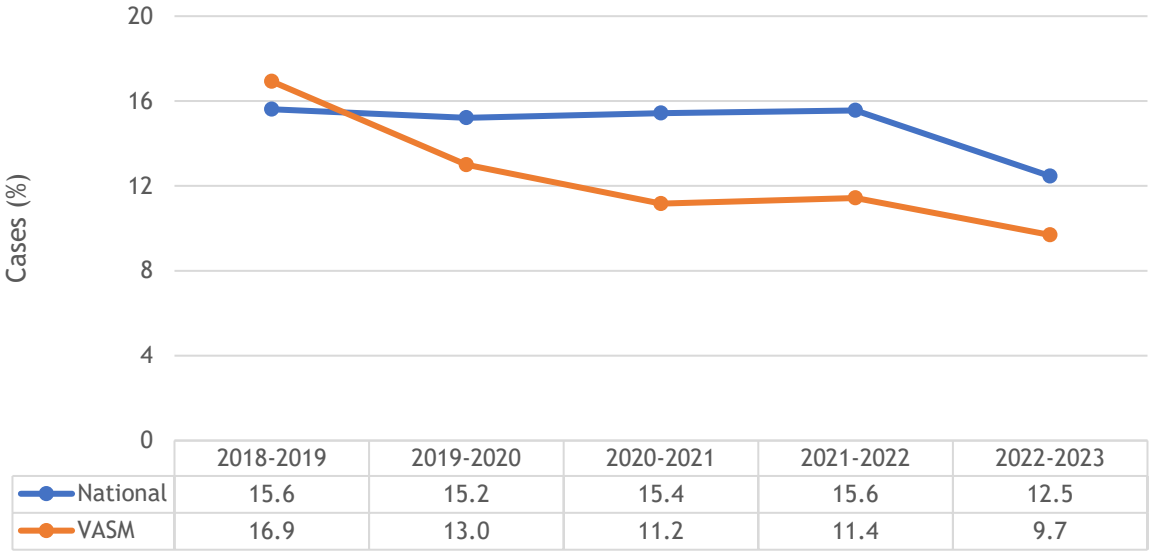
Figure A.11: Deaths with postoperative complications, 2018–2023



	2018-2019	2019-2020	2020-2021	2021-2022	2022-2023
National	29.6	29.3	27.2	25.9	22.3
VASM	32.7	25.9	21.5	22.8	21.4

Notes: 25.2% (1,468/5,831) of VASM cases had postoperative complications (1 July 2018–30 June 2023). Data not available: n=65. 26.9% (2,276/8,460) of national cases had postoperative complications (1 July 2018–30 June 2023). Data not available: n=18. National defined as other participating jurisdictions, excluding Victoria and New South Wales. The 2022–2023 data will be more complete in the next report as more cases become available for analysis.

Figure A.12: Deaths with unplanned return to theatre, 2018–2023



	2018-2019	2019-2020	2020-2021	2021-2022	2022-2023
National	15.6	15.2	15.4	15.6	12.5
VASM	16.9	13.0	11.2	11.4	9.7

Notes: 12.6% (745/5,893) of VASM cases had an unplanned return to theatre (1 July 2018–30 June 2023). Data not available: n=3. 14.9% (1,261/8,469) of national cases had an unplanned return to theatre (1 July 2018–30 June 2023). Data not available: n=9. National defined as other participating jurisdictions, excluding Victoria and New South Wales. The 2022–2023 data will be more complete in the next report as more cases become available for analysis.

Table A.3: Areas of VASM CMIs, 2018–2023

Type and preventability of CMI	2018–2019	2019–2020	2020–2021	2021–2022	2022–2023
No issues identified	69.2% (976/1,411)	70.7% (983/1,390)	75.1% (1,003/1,336)	77.9% (989/1,270)	78.3% (826/1,055)
Area of consideration	13.0% (183/1,411)	14.3% (199/1,390)	12.9% (172/1,336)	10.9% (138/1,270)	12.2% (129/1,055)
Area of concern	6.7% (95/1,411)	6.2% (86/1,390)	4.4% (59/1,336)	3.9% (49/1,270)	4.0% (42/1,055)
Adverse event	10.9% (154/1,411)	8.7% (121/1,390)	7.5% (100/1,336)	7.2% (92/1,270)	5.5% (58/1,055)
Preventable issue	18.0% (254/1,411)	16.8% (233/1,390)	14.0% (187/1,336)	14.2% (180/1,270)	11.4% (120/1,055)
Preventable adverse event or area of concern	12.5% (176/1,411)	10.6% (147/1,390)	9.0% (120/1,336)	9.4% (120/1,270)	6.4% (68/1,055)
Preventable adverse event or area of concern that contributed to death	3.8% (53/1,411)	2.8% (39/1,390)	2.5% (34/1,336)	2.7% (34/1,270)	1.3% (14/1,055)

Notes: CMI, Clinical Management Issues.

Table A.4: Assessor-identified preventable CMIs that contributed to VASM deaths, 2022–2023

Admission phase	Incident category
Preoperative	
	Oesophageal perforation
	Injury to small bowel during laparoscopic operation
Perioperative	
	Delay in transfer to surgical unit
	Preoperative assessment inadequate
	Better to have done different operation or procedure
	Delay in diagnosis
Postoperative	
	Pulmonary embolus
	Anaphylactic shock related to drug treatment
	Injury caused by fall in hospital
	Anastomotic leak after open surgery
	Unsatisfactory medical management
	Pulmonary embolus
	Aspiration pneumonia
	Perforation of colon after open surgery

Table A.5: Areas of clinical management, 2022–2023

Variable	VASM (%)	National (%)	p value
Delay in surgical diagnosis	4.5	4.5	0.94
Delay in transfer	11.1	11.6	0.84
No use of ICU or HDU	57.1	57.9	0.64
Unplanned admission to ICU	16.2	16.4	0.91
Unplanned readmission	4.2	3.5	0.31
Presence of clinically significant infection	30.4	33.3	0.10
Operation with consultant surgeon present in theatre	85.2	73.3	**<0.001***
Operative deaths with unplanned return to theatre	9.7	12.5	**0.03***
Inappropriate DVT prophylaxis treatment, as viewed by assessor	2.0	1.8	0.74
Fluid balance issues, as viewed by assessor	7.1	6.8	0.74

Abbreviations: DVT, deep vein thrombosis; HDU, high dependency unit; ICU, intensive care unit.
Notes: Denominator varies due to different criteria for each row. * = indicates statistically significant differences between VASM and national data ($p < 0.05$ using χ^2 tests). The p value indicates the chance of a result occurring randomly. National defined as other participating jurisdictions, excluding Victoria and New South Wales.

17 References

1. Watters DA, Brown WA. Promoting good practice before, during and after transfers. ANZ J Surg. 2022 Jun;92(6):1296-1297. doi: 10.1111/ans.17744. PMID: 35688640.

2. Barazanchi A, Bhat S, Palmer-Neels K, Macfater WS, Xia W, Zeng I, Taneja A, MacCormick AD, Hill AG. Evaluating and improving current risk prediction tools in emergency laparotomy. J Trauma Acute Care Surg. 2020 Aug;89(2):382-387. doi: 10.1097/TA.0000000000002745. PMID: 32301890.

3. Parmar KL, Law J, Carter B, Hewitt J, Boyle JM, Casey P, Maitra I, Farrell IS, Pearce L, Moug SJ; ELF Study Group. Frailty in Older Patients Undergoing Emergency Laparotomy: Results From the UK Observational Emergency Laparotomy and Frailty (ELF) Study. Ann Surg. 2021 Apr 1;273(4):709-718. doi: 10.1097/SLA.0000000000003402. PMID: 31188201.

4. Hewitt J, Carter B, McCarthy K, Pearce L, Law J, Wilson FV, Tay HS, McCormack C, Stechman MJ, Moug SJ, Myint PK. Frailty predicts mortality in all emergency surgical admissions regardless of age. An observational study. Age Ageing. 2019 May 1;48(3):388-394. doi: 10.1093/ageing/afy217. PMID: 30778528.

5. Riedel B, Ismail H, Dubowitz J, Watters D. Transforming surgical waiting lists into preparation opportunities: Leveraging multimodal prehabilitation to optimise surgical outcomes. ANZ J Surg. 2025;95(1-2):12-16. doi: 10.1111/ans.19307.

6. Australian Department of Health. Maximising the value of Australia's Clinical Quality Outcomes Data 2020-2030. Australian Government 2020 [Available from: https://www.health.gov.au/resources/publications/a-national-strategy-for-clinical-quality-registries-and-virtual-registries-2020-2030].

7. Victorian Department of Health. Perioperative service capability framework for Victoria. 2004 [Available from: https://www.health.vic.gov.au/health-system-design-planning/perioperative-service-capability-framework-for-victoria].

8. Australian Commission on Safety and Quality in Healthcare. Australian Framework for National Clinical Quality Registries 2024. Sydney: ACSQHC, 2024 [Available from https://www.safetyandquality.gov.au/sites/default/files/2024-09/australian-framework-for-national-clinical-quality-registries-cqr-2024.pdf].

9. ACSQHS. The NSQHS Standards: Australian Commission on Safety and Quality in Healthcare (ACSQHS); 2023 [Available from: https://www.safetyandquality.gov.au/standards/nsqhs-standards].

10. ASA. ASA Physical Status Classification System: American Society of Anesthesiologists (ASA); 2020 [Available from: https://www.asahq.org/standards-and-guidelines/asa-physical-status-classification-system].

11. CCV. Reportable deaths Victoria, Australia: Coroners Court of Victoria (CCV); 2019 [Available from: https://www.coronerscourt.vic.gov.au/report-death-or-fire/reportable-deaths].

12. Mende A, Riegel AK, Plumer L, Olotu C, Goetz AE, Kiefmann R. Determinants of Perioperative Outcome in Frail Older Patients. Dtsch Arztebl Int. 2019;116(5):73–82.

13. Al-Omary MS, Williams T, Brienesse SC, Khan A, Graffen S, Sheehan A, et al. Impact of delay in surgery on outcome in patients undergoing cardiac revascularisation surgery. Heart Lung Circ. 2021;30(6):888–95.

14. Sobolev B, Guy P, Sheehan KJ, Kuramoto L, Sutherland JM, Levy AR, et al. Mortality effects of timing alternatives for hip fracture surgery. CMAJ. 2018;190(31):E923–E32.

15. ACSQHS. Venous Thromboembolism Prevention Clinical Care Standard (ACSQHS). Australia: Australian Commission on Safety and Quality in Healthcare; 2023.

16. Khanina A, Tio SY, Ananda-Rajah MR, Kidd SE, Williams E, Chee L, et al. Consensus guidelines for antifungal stewardship, surveillance and infection prevention, 2021. Intern Med J. 2021;51 Suppl 7(Suppl 1):18–36.

17. RACS. Prevention of healthcare and associated infection in surgery: Royal Australasian College of Surgeons (RACS); 2015 [Available from: https://www.surgeons.org/about-racs/position-papers/prevention-of-healthcare-and-associated-infections].

18. Tarrant SM, Balogh ZJ. Low-energy falls. ANZ J Surg. 2015;85(4):202–3.

19. DHHS. Falls prevention in hospital Victoria, Australia: Victorian Department for Health and Human Services, (DHHS); 2015 [Available from: https://www.health.vic.gov.au/patient-care/falls-prevention-in-hospital].

20. Heng H, Jazayeri D, Shaw L, Kiegaldie D, Hill AM, Morris ME. Hospital falls prevention with patient education: a scoping review. BMC Geriatr. 2020;20(1):140.

21. Shaw L, Kiegaldie D, Farlie MK. Education interventions for health professionals on falls prevention in health care settings: a 10-year scoping review. BMC Geriatr. 2020;20(1):460.

22. Spano-Szekely L, Winkler A, Waters C, Dealmeida S, Brandt K, Williamson M, et al. Individualized fall prevention program in an acute care setting: an evidence-based practice improvement. J Nurs Care Qual. 2019;34(2):127–32.

23. RACS. End of life care: Royal Australasian College of Surgeons (RACS); 2020 [Available from: https://www.surgeons.org/about-racs/position-papers/end-of-life-care-2020].

24. RAAS. Guideline reference document for conducting effective morbidity and mortality meetings for improved patient care: Research, Audit and Academic Surgery (RAAS), 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?rev=fd66a4b343c64039ae0cb33b897aeaa7&hash=E023485659EA91045F90FDA2CACA85C7].

Royal Australasian College of Surgeons

Victorian Audit of Surgical Mortality

CONTACT DETAILS

Victorian Audit of Surgical Mortality (VASM)

Web: www.surgeons.org/VASM

Email: vasm@surgeons.org

Telephone: +61 3 9249 1130