



Royal Australasian College of Surgeons
Victorian Audit of Surgical Mortality

Victorian Audit of Surgical Mortality (VASM)

Annual Report

01-07-2016 to 30-06-2021

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Front cover image: *Mulga tree – the extension of life* by Michelle Vinluan (watercolour, April 2022).

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 24 April 2022).

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Foreword from VASM

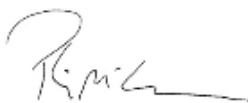
As many students of history noted in early 2020, the effects of global pandemics tend to last a number of years, and COVID-19 has proved to be no different with the health and economic insults still wreaking havoc at the time of writing. Victoria was particularly hard hit again during 2021 with numerous statewide lockdowns preventing many elective operations, and hospitals stretched with emergency admissions because of the disease and struggling to service what was coming through because of staff illness and forced isolations. The amazingly quick development of safe, effective vaccines allowed a gradual reopening of essential services and the hope of some sort of normality returning, but the ripple effects of what has gone on, and any subsequent viral variations, will be present for many years.

So 2021 was not a normal VASM year. Like 2020, elective operation numbers were down, and it seems that the lockdowns discouraged people from presenting to hospitals with urgent problems, undoubtedly causing delayed diagnosis and treatment in some cases. Reassuringly, the overall perioperative mortality remains low and is comparable to the best health systems worldwide. Surgery in Victoria is safe. The challenge will be to maintain that level of safety during the attempts to catch up with the long waiting lists.

The review of surgical safety, and in fact the practice of surgery, in Victoria has been greatly aided by the development of the Victorian Perioperative Consultative Council (VPCC). The pandemic proved to be a baptism of fire for this new body but enabled it to take on an important role in overseeing safe surgery. VASM has always worked closely with the Consultative Councils, but a recent change in Commonwealth legislation has allowed the development of a new VASM sub-committee (the Perioperative Mortality Committee), which allows sharing of information with the VPCC to help define surgical issues, review cases in a multidisciplinary manner and, hopefully, reduce workload for hospitals in that they will not need to provide information/reports to numerous different bodies. We are now able to seamlessly pull together VASM reports, coroner postmortems and investigation reports, and hospital root/cause analysis reports for sentinel events, producing a much clearer picture of events leading up to the rare surgical disasters.

The same issues that crop up each year highlight the importance of collaborating with health services and the broader multidisciplinary perioperative healthcare community to find novel approaches to address these issues. We have tried to make this year's report shorter and punchier to help the key messages stand out. This year VASM has been able to meet (virtually) with a number of hospitals to discuss individual site matters and we hope to extend this (with onsite visits) in the future. If there is to be one message from this report to improve patient safety, it would be the importance of senior medical involvement at all levels of care.

The VASM team is a small group of dedicated enthusiasts working within the Royal Australasian College of Surgeons (RACS), and they offer their help in any way to all of our stakeholders. The research work has been hit over the last 2 years because of the pandemic and being one staff member down, but a new 3-year contract with Safer Care Victoria (SCV) should allow certainty of tenure, recruitment and new projects. I am indebted to the team and would like to thank SCV, the Victorian Agency for Health Information, VPCC, RACS, Australian and New Zealand Audit of Surgical Mortality (ANZASM) and the Adelaide office, all VASM Committee members and the participating surgeons for the ongoing success of the VASM project.



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

Foreword from VPCC

During the reporting period 2020-2021 VASM and VPCC have worked closely together to identify the themes for improving perioperative care before, during and after surgery. This latest VASM report, through its meticulous review of patients who died under the care of a surgeon, has again highlighted a number of important messages that each practitioner, and each health service need to consider to improve perioperative outcomes.

Emergency and elderly patients predominate amongst those who die under the care of a surgeon. The underlying causes remain, as in previous years, fractured hip, acute abdominal conditions, cancer, head injuries, and cardiovascular disease. Victoria participates in the [ANZ hip fracture registry](#) and the [ANZ Emergency Laparotomy-Quality Improvement](#) registry both of which issue annual reports that continue to show that not only could Victorian participation be better, but also more could be done to meet the internationally recognised standards of care, reduce variation and improve patient outcomes.

Patients who died were transferred during their surgical care in 151 (17%) cases. Although a delay in transfer was reported in only 15 (8%), the quality of transition care during a transfer is dependent on good communication, clear documentation, preparedness and willingness to accept as well as timely transfer by the most appropriate method as dictated by the condition of the patient.¹ Improving transfer performance can be achieved by reviewing the appropriateness, method and effectiveness of any transfer and sharing learnings between transferring and recipient institutions.

Another theme identified is the prevention of venous thromboembolism. Patients may suffer deep venous thrombosis and pulmonary embolism after discharge from hospital and, recently, Victorian coroner's reports have warned of the need to adopt consistent strategies to mitigate this risk. There remains considerable variability in practice across the perioperative sector and such variability suggests there is an opportunity to improve and reduce the incidence of these complications. The cases who die and are reported to VASM represent only a small proportion of those who suffer from thromboembolism.

The prevention of perioperative cerebrovascular accident (stroke) is another opportunity to improve care. Patients with, or who develop, atrial fibrillation during their perioperative period are more than 10 times more likely to suffer a stroke, particularly within 30 days of surgery. The decision making around when to stop and when to re-start anticoagulation in at risk patients often requires input from physicians or cardiologists. There is always a balance and trade-off between the risk of bleeding and the risk of stroke that needs care consideration.

I congratulate VASM on their efforts to make perioperative care safer. The review of all surgical deaths in Victoria has been, and is, a key contribution to patient safety. The ability to compare our results with other States and Territories in Australia provides important reassurance as to the quality of perioperative care Victorians receive in both public and private hospitals.



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

1 Abbreviations

ANZASM	Australian and New Zealand Audit of Surgical Mortality
ASA	American Society of Anesthesiologists
CCU	critical care unit
CHASM	Collaborating Hospitals' Audit of Surgical Mortality
CMI	clinical management issue
DRG	diagnosis-related group
DVT	deep vein thrombosis
FLA	first-line assessment
ICU	intensive care unit
HDU	high dependency unit
M&M	mortality and morbidity
NSQHS	National Safety and Quality Health Service
QP	qualified privilege
RACS	Royal Australasian College of Surgeons
SCF	surgical case form
SCV	Safer Care Victoria
SLA	second-line assessment
VAED	Victorian Admitted Episodes Dataset
VASM	Victorian Audit of Surgical Mortality
VPCC	Victorian Perioperative Consultative Council

2 Executive summary

Key findings are based on 812 peer-reviewed cases from the audit period of **1 July 2020 to 30 June 2021**.

Most surgical deaths (86.2%; 700/812) in this audit period were admitted as an emergency with an acute life-threatening condition requiring surgery, which were usually elderly patients with underlying health problems.

2.1 Hospital admission and operative patient profile

From the current audit period, 76.5% (621/812) of Victorian audited deaths were admitted to public hospitals, compared to 85.7% (1,540/1,797) nationally.

The most frequent operative procedures described for VASM during the current audit period were for trauma or acute abdominal pathology. Of the patients who had an operation, surgeons classified the preoperative risk of death as being either 'small' or 'minimal' in 16.8% (124/736) cases.

In Victoria, a consultant surgeon was present in theatre in 84.0% (798/950) of operations involved in perioperative death compared to the national rate of 74.8% (1,431/1,913).

2.2 Clinical management issues

A single case identified in this review may have many clinical management issues (CMIs) identified

The peer-review process found no issues with patient management in 78.9% (641/812) of audited cases. Potential issues were found in the perioperative management of the remaining 21.1%. In 11.1% (90/812) of cases, the criticisms were mild and considered to be differences of opinion (areas of consideration). In 4.2% (34/812) of cases, the assessments were more severe (classified as areas for concern), and in 5.5% (45/812) of cases, the peer-review process concluded that adverse events had occurred.

Identified perioperative CMIs for each case have been directed to the treating surgeons to allow feedback and reflection. It is important to note that not all CMI are associated with the surgical team as perioperative 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 the hospitals due to qualified privilege (QP). However, it does encourage surgeons to share the feedback with their colleagues and the hospital.

2.3 Potentially preventable clinical outcomes

In addition to identifying CMI, clinical assessors also decide whether issues were potentially preventable. The rate of preventability of adverse events or concerns has decreased from 9.1% (107/1,172) in 2019–2020 to 7.4% (60/812) in the current audit period (Table A.4). 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. More information on this is available in the 2020 VASM Report. 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

VASM encourages surgeons, hospitals and health departments to consider the recommendations below. Existing processes and systems should be reviewed to improve the outcomes and services provided to the patients.

Patient care

- Goals of care should be clearly discussed with patients and their families and recorded for every hospital admission.
- Senior doctors must be involved in assessment and care decision-making at both the transferring and receiving hospitals. Improved coordination is required between all agencies involved in patient transfer to ensure:
 - Timeliness of transfer.
 - Appropriate clinical monitoring.
 - Appropriate level of staff involved.
 - Adequate handover of information.
 - Location and personnel of where patient will be received.
- Senior doctors, together with dedicated preoperative physicians, must be involved in decisions surrounding patient management and operations, with clear documentation from all involved.
- Surgical consent should include details of all recognised complications and should ideally be completed by the senior doctor or operation surgeon. Operations should only be performed when the perceived benefits of the procedure exceed the known risks, and only on sites with appropriate facilities and support.
- Senior doctors must be involved in postoperative care to aid timely and appropriate recognition of the deteriorating patient and escalation of care.

Clinical governance

- All surgical deaths should be discussed at unit mortality and morbidity (M&M) meetings² and the recommendations should be reported to Hospital Executive.

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 regional audits of surgical deaths that aim to ensure the highest standards of safe and comprehensive surgical care. VASM monitors trends in surgical deaths via independent peer-review assessments. These assessments identify clinical management issues (CMIs) for which strategies can be developed to manage and improve patient safety.

It is important to note that VASM is a method of case detection to identify areas for improvement in the care delivered by health services in Victoria. VASM recognises that a range of different professionals are involved in the delivery of care to surgical patients and fosters a no-blame culture of reporting. Audit findings should be used with other information to maximise the quality and safety of health care and the outcomes experienced by patients.

This report presents key findings and recommendations for the period 1 July 2020 to 30 June 2021, with tables and figures providing information from 1 July 2016 to 30 June 2021 to illustrate changes over time. This allows for significant changes to be identified and investigated further. If data have 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 were 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 3 times (2011, 2015 and 2018) by Aspex Consulting to assess its functionality. Recommendations from the 2018 Aspex Consulting review³ (Table A.1) are presented in this report as part of the key findings.

The need for hospitals and surgeons to reduce CMIs and preventable deaths (identified in Sections 11 and 12) represents a key recommendation from the current audit. VASM audit findings should be utilised to meet NSQHS Standards to identify areas for improvement.



4 Victorian healthcare statistics

Surgery continues to be safe in Victoria

VASM monitors and learns from surgical death to inform how high surgical standards can be maintained and patients can receive the best care surgical possible. The data below are derived from audited cases from 1 July 2020 to 30 June 2021.

Demographic

Victorian total

Population	6.6 million
Procedures	678,254

Audited mortalities



Males ^a	58.7%
Females ^a	41.3%
Median age	78
Mortality rate	0.3%



Admission status

Elective	13.8%
Emergency	86.2%



Transfer

Preoperative transfer	17.0%
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Risk



Preoperative risk of death

Expected	10.0%
Considerable	47.7%
Moderate	25.4%
Small	11.3%
Minimal	5.6%



Most common comorbidities

Cardiovascular	20.6%
Age ^b	19.7%
Respiratory	10.9%
Renal	10.7%
Advanced malignancy	8.3%



Most common causes of death

Multiple organ failure	9.3%
Septicaemia	9.3%
Pneumonia	8.0%
Cardiac event	6.5%
Respiratory failure	6.4%

Key findings



Areas of improved patient care

Improved fluid balance management	Improved consultant presence in operations
Decreased postoperative complications	Decreased adverse events
Decreased unplanned readmissions	Decreased surgical site infections



Peer review outcomes

Adverse event	5.5%	Area for consideration	11.1%
Area of concern	4.2%	No issues	78.9%

Notes: a = Birth sex reported by hospital.
b = Victorian patients over the age of 80 made up 43.0% (349/812) of audited deaths.

5 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 where 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 (VAED). This database records all admissions and procedures performed in hospitals and is maintained by the Department of Health, providing case mix information required for hospital activity-based funding.⁴ The VAED is able to provide a denominator on the number of procedures being performed in Victoria, as well as the number of patients being admitted. 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 2020 to 30 June 2021 indicates that 678,254 interventional procedures were provided to 539,380 patients in Victorian public and private hospitals. Of these, 0.4% (1,982/539,380) resulted in reportable mortalities to VAED. Over the same time period, VASM received 1,754 direct notifications of deaths associated with surgical care (Table A.2).

As the VAED reported mortalities are 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; these procedures are not captured by the VASM program (Table A.2).



6 Audit compliance

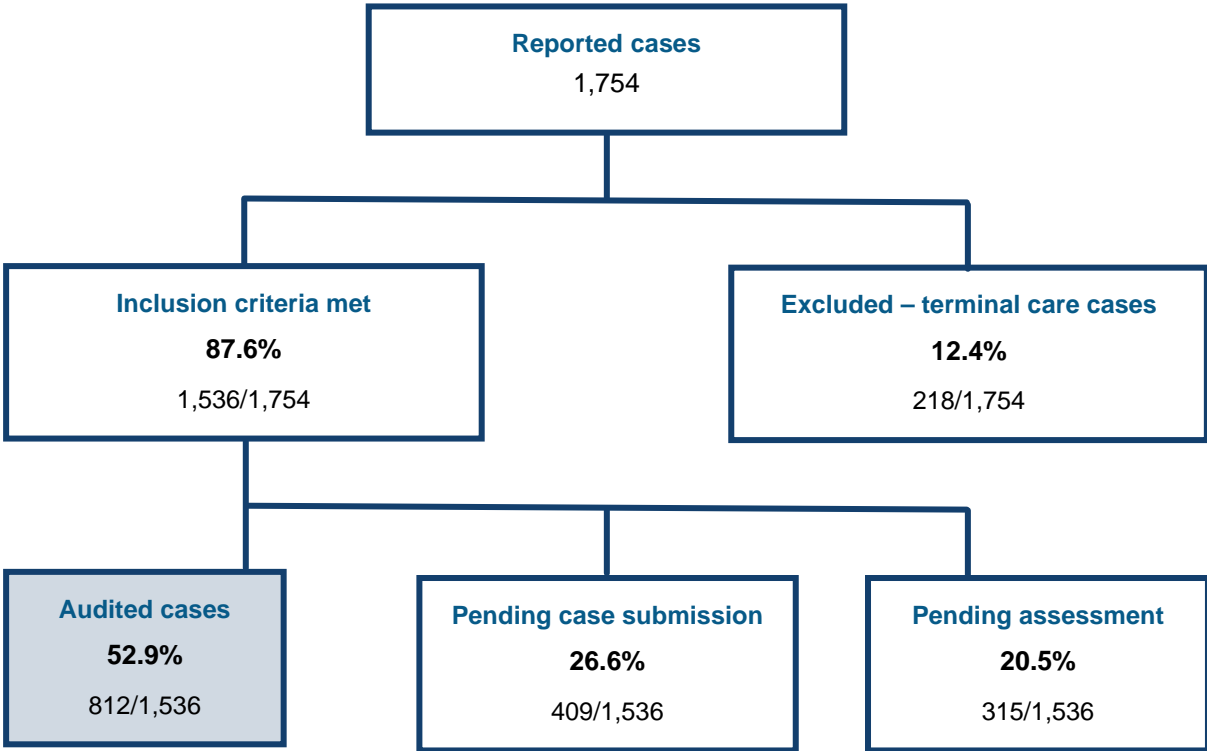
All hospitals providing surgical services are expected to either participate in the audit or comply with the audit requirements. Regular reporting of mortalities from hospitals launches the audit process but to comply, RACS Fellows must return completed surgical case forms (SCFs) and assessment forms in a timely and accurate manner (Figure 1). Thus, there is a difference between surgeon participation and compliance. Surgeons in Victoria completed the SCFs in 76.7% (1,345/1,754) of the notified deaths in 2020–2021. The remainder of cases are still in progress, and compliance for this period will be monitored by VASM (Figure A.1).

Of the reported mortalities in the current audit year, 12.4% (218/1,754) were excluded from further analysis due to them being terminal care admissions. Of the 1,536 cases that met the audit inclusion criteria, 52.9% (812/1,536) have been audited, assessments are underway for 20.5% (315/1,536) of cases, with the remaining 26.6% (409/1,536) pending the return of the SCF (Figure 1). The peer-assessment rate for 2020–2021 data will increase as pending cases undergo the full audit process, and they will be reported in future publications.

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 4 months for complex cases. VASM is working with hospitals to explore methods to speed up the process.

Board members of Royal Australian and New Zealand College of Obstetricians and Gynaecologists, Australian Orthopaedic Association and Australian and New Zealand College of Anaesthetists 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.

Figure 1: VASM audit numbers, 2020–2021



7 Characteristics of audited deaths

Table 1 shows that the demographic data for Victoria were 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 57.7% (425/736) in Victoria and 61.2% (840/1,372) 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 percentages 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, 2020–2021

		VASM	National
Number of audited deaths		812	1,797
Median age of patient in years (interquartile range)		78 (66–86)	76 (64–85)
Operative cases		92.4%	76.7%
Sex^a	Male	58.7%	58.6%
	Female	41.3%	41.4%
Admission status	Elective	13.8%	11.6%
	Emergency	86.2%	88.4%
ASA grades	ASA 1–2	5.3%	7.8%
	ASA 3	26.5%	26.6%
	ASA 4	51.4%	46.0%
	ASA 5	16.8%	19.6%
Risk of death prior to surgery	Expected	10.0%	10.0%
	Considerable	47.7%	51.2%
	Moderate	25.4%	24.6%
	Small	11.3%	10.9%
	Minimal	5.6%	3.3%
Most common comorbid factors	Cardiovascular	20.6%	20.5%
	Age ^b	19.7%	19.6%
	Respiratory	10.9%	11.0%
	Renal	10.7%	10.3%
	Advanced malignancy	8.3%	7.3%
	Diabetes	7.6%	7.7%
	Neurological	7.6%	8.1%
	Other	7.2%	8.5%
	Obesity	4.0%	3.9%
	Hepatic	3.4%	3.1%
Number of operative procedures performed	3 or more	5.1%	5.8%
	2	10.1%	9.1%
	1	77.2%	61.6%
	0	7.6%	23.5%

Notes:

a = Birth sex reported by hospital.

b = Victorian patients over the age of 80 made up 43.0% (349/812) of audited deaths.

The American Society of Anesthesiologists ASA grade is an international measure of patient risk used by anaesthetists.⁵

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

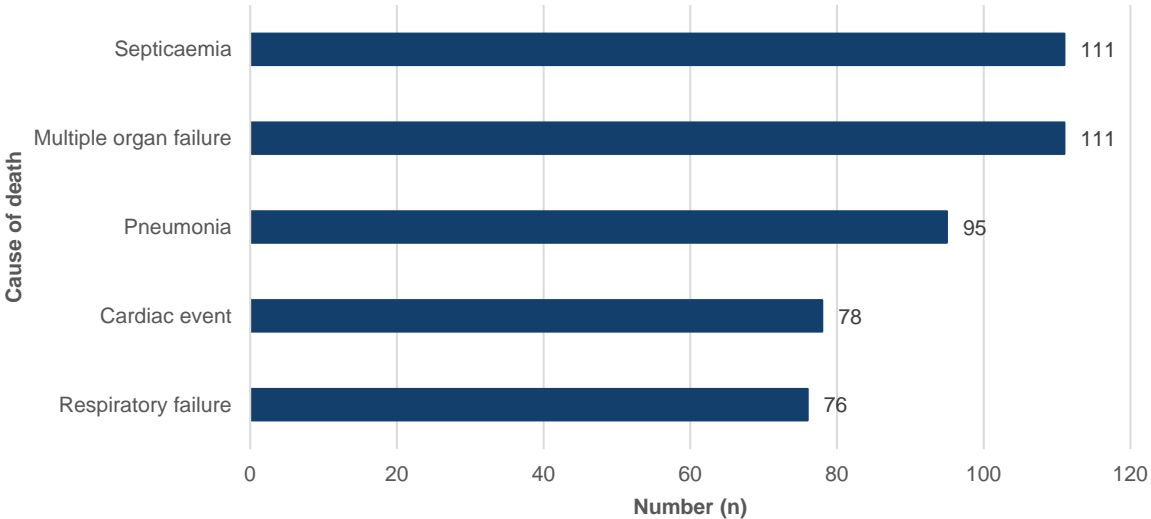
Unavailable data were excluded from analysis. Each audited case can have more than one operation.

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

8 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 2020 to 30 June 2021, 1,194 causes of death were identified across 812 cases. Of the 327 conditions perceived to have caused death, the top 5 accounted for 39.4% (471/1,194) of the total reported causes of death (Figure 2).

Figure 2: Top 5 causes of death, 2020–2021



Notes: n=1,194 causes of death associated with 812 Victorian patients (1 July 2020 to 30 June 2021).

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.⁶

There are several reasons for cases to be referred to the coroner, including when the probable cause of death cannot be determined, or where an accidental death occurs in a healthcare facility.⁷ 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.

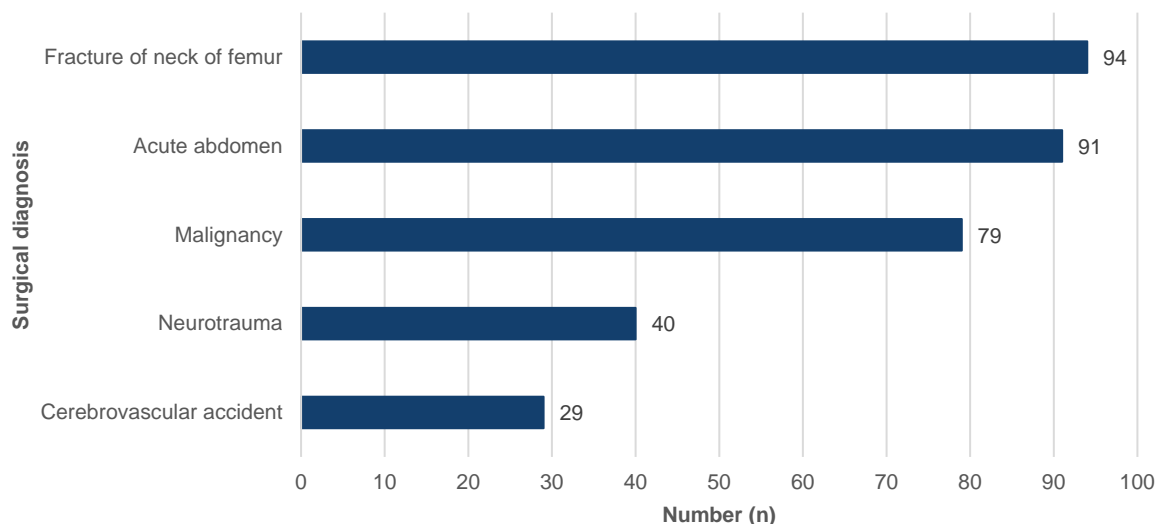


9 Clinical risk management

9.1 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 1,194 surgical diagnoses associated with 812 cases from 1 July 2020 to 30 June 2021. The top 5 surgical diagnoses account for 27.9% (333/1,194) of the total reported surgical diagnoses (Figure 3).

Figure 3: Top 5 VASM surgical diagnoses, 2020–2021



Notes: n=1,194 surgical diagnoses associated with 812 patients (1 July 2020 to 30 June 2021).

In the current audit period, the proportion of cases with malignancies identified as a comorbidity remains stable at 22.8% (185/812) relative to 19.5% (230/1,177) for the previous audit year (2019–2020).

9.2 Delay in surgical diagnosis

Early diagnosis is critical in preventing surgical complications or deterioration, particularly in a frail population.⁸ Delays in treatment are known to increase the risk of death.⁹⁻¹⁰ 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, the rate of delays in establishing a diagnosis was 5.0% (41/812) which represents an improvement over the life of the audit (Figure A.2).

Vignette: Need for timely assessment of diagnosis

A patient (age early-70s) underwent urgent coronary artery bypass graft after non-ST-segment myocardial infarction (NSTEMI). The patient was being worked up for renal transplant, and months earlier had a positive stress test that was not followed up. It was a straightforward operation with 5 grafts, but the patient could not be weaned from cardiopulmonary bypass and, despite inotropes, venoarterial extracorporeal membrane oxygenation (VA-ECMO) and intensive care unit (ICU) support, developed coagulopathy and died from significant haemorrhage.

The assessor felt that the most significant factor in the death was the delay in assessing the extent of the coronary artery disease. The patient should have had a coronary arteriogram shortly after the positive stress test.

It is important to note that delays are not always attributable to the surgical team; for example, late referral to specialist (as above) or late patient presentation (including transfer delays) may have occurred.

9.3 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 2020–2021, 151 patients were transferred between hospitals preoperatively and 8.6% (13/151) of them were reported to have had delays in the transfer, which was comparable to the national average (10.1%; 47/465; Figure A.3). Data on postoperative transfers have not routinely been collected by the audit, but the surgical case form has been amended to capture these important events.

9.4 Deep vein thrombosis prophylaxis

There were 12 cases (1.5%; 12/812) associated with postoperative pulmonary emboli reported to the audit in the current year, where 3 of the cases did not receive deep vein thrombosis (DVT) prophylaxis. The appropriate use of DVT prophylaxis is outlined in the Clinical Practice Guideline for the Prevention of Venous Thromboembolism in Patients Admitted to Australian Hospitals.¹¹ The choice of prophylaxis is subject to the judgement of clinicians caring for individual patients and has changed little since 2012.

In the current audit year, less than 1.4% (11/776) of cases were found by the assessors to have received an inappropriate choice of DVT prophylaxis, which is consistent with previous years (Figure A.4).

In Victoria, there was a slight increase in the use of DVT prophylaxis from 81.8% (960/1,174) in 2019–2020 to 83.7% (680/812) in 2020–2021 (Figure A.5).

A decision by the treating team to actively withhold DVT prophylaxis within the operative pool of Victorian patients increased from 25.1% (43/171) in 2019–2020 to 31.9% (36/113) in 2020–2021.

From the Victorian peer reviews, assessors agreed with the use or non-use of DVT prophylaxis in 76.2% (591/776) of cases in 2020–2021, a decrease from 79.8% (922/1,155) in 2019–2020.

9.5 Adequacy of provision of critical care support to patients

Over the course of the audit period (2016–2021), 64.5% (3,844/5,961) of Victorian cases have involved the use of critical care support (Figure A.6). Assessors reviewed the appropriateness of the use of critical care facilities. The assessors reported that, over the period 2016–2021, 7.1% (138/1,940) of patients who did not receive critical care support were likely to have benefited from it. This number, although small, was more than four times that identified by the treating surgeon, who perceived that a lack of critical care support was potentially an issue in only 1.7% (34/2,022) 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, 17.1% (139/812) of patients had an unplanned CCU admission. This is lower than both previous reports and national figures (Figure A.7).

9.6 Unplanned readmission to hospital

In the current reporting period, there has been a decrease in unplanned readmission from 5.4% (63/1,165) in 2019–2020 to 3.9% (32/811) in 2020–2021. Over the course of the audit, Victoria has been consistently higher than the national findings of a 3.0% average (Figure A.8). It is pleasing to see this reduction as the high Victorian rates have been noted in previous VASM reports.

9.7 Significant infection

At the time of death, approximately one-third of audited surgical patients had an infection associated with the mortality, which may be acquired before or during the admission (Figure A.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 71.4% (90/126) of infection cases, compared with 60.7% (181/298) nationally. The audit data do not define the infections as being acquired intraoperatively.

Table 2: Deaths with clinically significant infections acquired during admission, VASM compared to national data, 2016–2021

Infection acquired	VASM 2016–2020	National 2016–2020	VASM 2020–2021	National 2020–2021
Acquired postoperatively	69.6% (649/933)	67.0% (1,064/1,588)	71.4% (90/126)	60.7% (181/298)
Acquired preoperatively	15.6% (146/933)	16.9% (269/1,588)	15.9% (20/126)	19.8% (59/298)
Other invasive site infection	6.6% (62/933)	9.4% (150/1,588)	7.1% (9/126)	13.1% (39/298)
Surgical site infection	8.1% (76/933)	6.6% (105/1,588)	5.6% (7/126)	6.4% (19/298)

Notes:

n=1,059 out of 5,970 Victorian audited deaths acquired a clinically significant infection during admission (1 July 2016 to 30 June 2021).

Data not available: n=23.

n=1,886 out of 10,916 national audited deaths acquired a clinically significant infection during admission (1 July 2016 to 30 June 2021).

Data not available: n=49.

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

The 2020–2021 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 67.3% (169/251) of the reported Victorian cases of infection. The infective organism was identified in 40.4% (101/250) of the infection cohort, with *E. coli* being the most frequent at 17.8% (18/101). Strategies for reducing surgical site infections have been implemented overseas and in Australia,¹²⁻¹³ and guidelines should be followed.

Vignette: Need for timely response to infection diagnosis

A patient (age mid-50s) with a background of type 1 diabetes and a history of smoking presented with signs and symptoms of infected aorto-bifemoral bypass graft. The patient was admitted for a number of weeks to optimise condition before graft exploration. The graft was explanted without revascularisation with a view to offering bilateral above-knee amputations. The patient refused this and subsequently developed severe pain in the abdomen and legs with evidence of sepsis and an acute abdomen. Faecal material was draining from the groin wound during the eventual palliation.

The assessor acknowledged that surgery for infected vascular grafts is fraught with difficulty and has a high mortality. It appeared that the diagnosis of infection was delayed and that an earlier admission may have had a better outcome. Revascularisation should have been considered, and not acting on the acute abdomen and the probable faecal peritonitis contributed to the death.

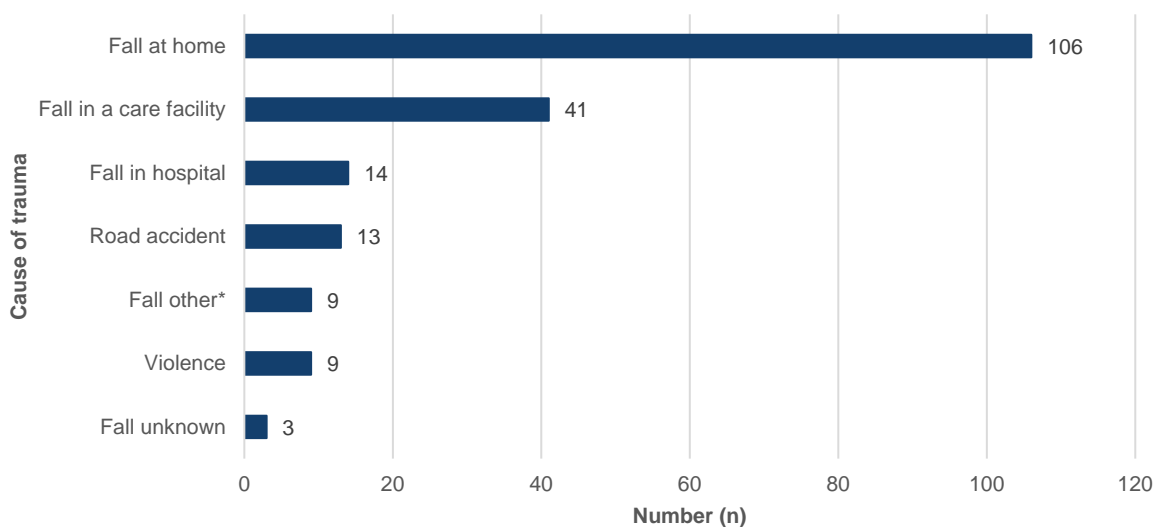
The average rate of surgical site infections for patients in Victoria for the period 2016–2020 was 8.1% (76/933), which decreased to 5.6% (7/126) in the current audit period. The national findings show a decrease from 6.8% (105/1,588) to 6.4% (19/298) over the same time periods, respectively.

9.8 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 88.7% (173/195) of cases for the 2020–2021 audit period. Of the 195 trauma cases reported to VASM, 30.3% (59/195) were admitted to hospital with a fractured neck of femur. Figure 4 describes the types of trauma events experienced by Victorian patients, including a breakdown of falls. VASM classifies a fall in hospital 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.¹⁴ 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.¹⁵⁻¹⁶ 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.¹⁷

Figure 4: VASM deaths by causes of trauma, 2020–2021



Notes:

n=195 trauma cases in 812 Victorian audited deaths (1 July 2020 to 30 June 2021). Data not available: n=2.

*Includes roads and public venues.



10 Profile of operative procedures

In the current audit period, 92.4% (750/812) of patients had at least one operative procedure. Consultants were present in theatre for 84.0% (798/950) of operations, with Victorian surgeons consistently having a greater presence than their national counterparts (Figure A.10). This can be further broken down to the consultants being present in theatre in 80.5% (590/733) of operations in public hospitals, compared to 95.9% (208/217) in the private sector (Table A.3). 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 2019–2020 (59.6%; 525/881) to 2020–2021 (59.6%; 379/636).

10.1 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 (2020–2021), 79.0% (580/734) of audited Victorian deaths had no complications, which is slightly higher than the national rate (72.8%; 999/1,372; Figure A.11).

Victorian surgeons reported delays in recognising postoperative complications in 2.6% (4/154) of deaths over the period 2020–2021. This highlights the need to have adequate postoperative assessment procedures in place in order for complications to be identified in a timely manner.

10.2 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.

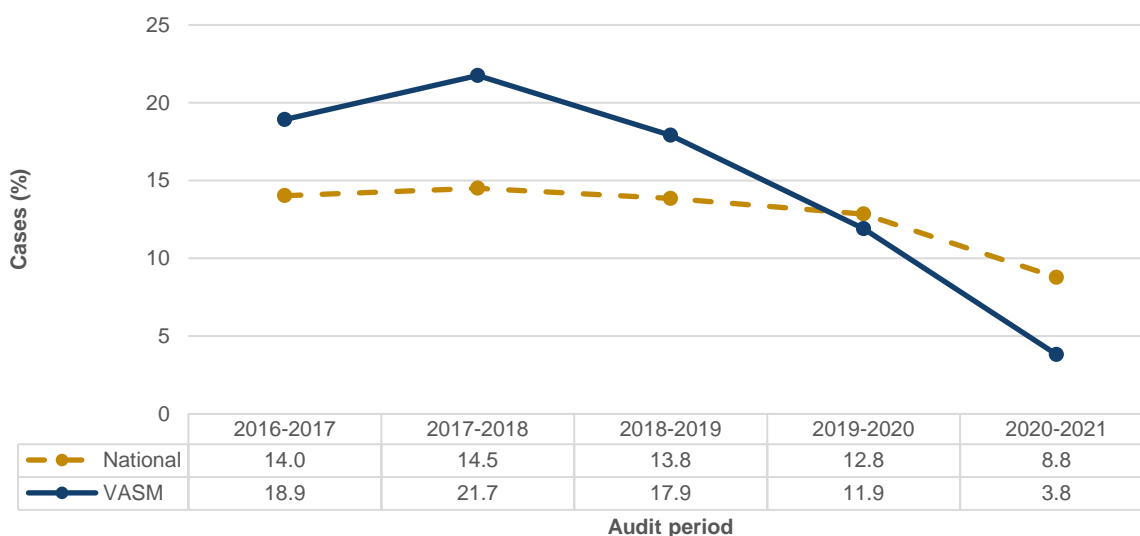
In the current audit year, surgeons reported a lower rate of 10.3% (77/750) of operative deaths following an unplanned return to theatre in Victoria, compared with the national rate of 15.0% (206/1,374; Figure A.12).



11 Peer-review process

Since 2016, FLAs have been completed for 5,969 VASM cases, with 15.9% (949/5,969) requiring an in-depth SLA during the complete audit period. Figure 5 details the percentage of cases that went for SLA review. The reduction in SLA referral rate for 2020–2021 was due to more complex cases still undergoing review; data for these cases will be included in future reports.

Figure 5: Audited deaths that underwent SLA, VASM compared to national data, 2016–2021



Notes:

n=949 cases out of 5,939 Victorian audited deaths were referred for SLA peer review (1 July 2016 to 30 June 2021).

n=1,418 cases out of 10,902 national audited deaths were referred for SLA peer review (1 July 2016 to 30 June 2021).

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

The 2020-2021 data will be more complete in the next report as more cases become available for analysis.

Each first-line assessor was asked to indicate whether 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 (2020–2021), the majority (74.2%; 23/31) of VASM cases sent for second-line peer review were sent due to insufficient information, an increase from 62.9% (88/140) in 2019–2020. The first-line assessor identified issues that required further investigation in the remaining 8 cases (1.0%; 8/812 total cases).

Greater attention to detail in completing the SCF would help reduce the workload of assessors as well as facilitate a more efficient audit process. Processes are being altered both at ANZASM and RACS to encourage compliance.

For the current audit period, assessors perceived that CMIs occurred in 21.1% (171/812) of cases. Minor issues (areas of consideration) were perceived to have occurred in 11.1% (90/812) of cases; areas of concern were identified in 4.2% (34/812) of cases; and 5.5% (45/812) of cases were categorised as an adverse event. Adverse events or areas of concern classified as definitely or probably preventable have decreased from 9.1% (107/1,172) in 2019–2020 to 7.4% (60/812) in 2020–2021 (Table A.4).

12 Preventable clinical management issues

Of the 812 patients audited in 2020–2021, assessors identified a total of 19 (2.3%) CMIs as being preventable that caused to the death of the patient.

Cases can be broken down into pre/peri/postoperative problems, but in some cases multiple compounding issues can contribute to the death (Table A.5).

Vignette: Importance of appropriate postoperative follow-up

A patient (age late-70s) was admitted with a 2-week history of presumed cholecystitis. A difficult laparoscopic cholecystectomy was performed urgently with stones noted in the common bile duct (CBD). The postoperative course was complicated by a small bile leak, sepsis and rapid deterioration requiring ICU support. A laparotomy was planned but the patient deteriorated and died.

The assessor was concerned that alternatives to cholecystectomy (e.g. Endoscopic retrograde cholangiopancreatography (ERCP) or cholecystotomy) were not considered and that the CBD stones were not dealt with. There was no indication in the hospital notes that the surgeon saw the patient during the deterioration, with all decisions made via phone calls. As a consequence, there may have been avoidable delay in assessment and treatment.

Falls in hospital causing significant injuries should be preventable (NSQHS Standard 5) and are over-represented in the current data (3 instances). Appropriate protocols need to be in place that seek to reduce the risk of falls. An individualised falls prevention plan of care should be developed and implemented on the findings of a falls screen or assessment.¹⁸

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.¹⁹

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.

12.1 Areas for improvement in surgical care management

Table 3 identifies the point of surgical care at which assessors considered that care management could have been improved in Victoria and nationally.

In Victoria, CMIs relating to the 'decision to operate at all' have been significantly greater than the national figures (Table 3) which may contribute to the previously noted difference in patients receiving operative intervention (Table 1).



Table 3: Areas for surgical care improvements identified by assessors, VASM and national data, 2020–2021

Area for improvement	VASM	National	p value
Preoperative management/preparation	6.5%	6.7%	0.825
Decision to operate at all	7.6%	5.2%	0.020
Choice of operation	3.7%	3.4%	0.667
Timing of operation (too late, too soon, wrong time of day)	4.3%	4.6%	0.733
Intraoperative/technical management of surgery	2.3%	3.3%	0.193
Grade/experience of surgeon deciding	0.4%	0.8%	0.278
Grade/experience of surgeon operating	0.8%	0.9%	0.810
Postoperative care	1.9%	3.8%	0.014

Notes:

Audit period 1 July 2020 to 30 June 2021.

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.

Vignette: Importance of considering all indicators before performing any procedures

A patient (age late-60s) was admitted electively for endovascular flow diversion to incidentally found 2 mm posterior communicating and ophthalmic segment aneurysms. Five hours post procedure, the patient developed headache with drowsiness and a subsequent computed tomography (CT) of the brain showed subarachnoid haemorrhage with moderate hydrocephalus. An external ventricular drain (EVD) was inserted with an initial good result but subsequent drainage was heavily bloodstained, and the patient became confused with dropping Glasgow coma score (GCS). Further endovascular treatment did not retrieve the situation, and despite later posterior fossa craniectomy the patient was declared brain dead.

The assessor felt that there was no indication to treat an incidental, small aneurysm and some clinicians may consider such a finding a variation of normal. The devastating, recognised complication would not then have been an issue. All procedures carry risks and must only be carried with appropriate indications.

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, hospital visits, 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 that 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. VASM also encourages health services to increase their level of perioperative mortality and morbidity review, using the RACS M&M guidelines,² thus providing better opportunities to address system issues affecting the safety and quality of provided services.

12.2 VASM and national trends in areas of clinical management

Outcomes from VASM and national trends in areas of clinical management can be a catalyst to change clinical governance management in surgical health services as per the NSQHS Standards. Victorian findings in clinical management areas are compared with national data (Table A.6). The presence of an operating surgeon in theatre has consistently been higher in Victoria (82.7%; 6,334/7,660), when compared with national (73.5%; 8,562/11,656) data since 2016. The only other statistical difference was that fewer Victorian cases had an unplanned return to theatre.

12.3 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. The performance-monitoring method is currently being reviewed to ensure the data being produced are relevant.

VASM meets with hospitals identified in this quality assurance analysis to discuss the CMIs identified at their site and to suggest ways to improve performance. Most sites that were flagged in the 2016–2021 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 Review 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, as well as clinical areas requiring immediate improvements.



13 Conclusion

Since the audit was introduced, annual reports produced by VASM continue to identify trends in CMIs related to surgical deaths.

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 senior clinical leadership in providing clear patient-management pathways and treatment plans that are understood by all those involved in the patient's care. Multidisciplinary collaboration is 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 CMIs as a helpful measure for ensuring the highest standard of safe and comprehensive surgical care in Victoria.

14 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:

- all Victorian hospitals
- Australian and New Zealand Audit of Surgical Mortality
- Australian and New Zealand College of Anaesthetists
- Australian Orthopaedic Association
- Fellows who have acted as assessors, for the time and effort in providing detailed and valuable case note reviews
- hospital health information departments
- National Coronial Information System
- participating Victorian Fellows and International Medical Graduates
- Royal Australasian College of Surgeons, for infrastructure and oversight of this project
- Royal Australian and New Zealand College of Obstetricians and Gynaecologists
- Safer Care Victoria, for funding the project
- Victorian Perioperative Consultative Council.

14.1 VASM Management Committee

A/Prof Philip McCahy	Clinical Director, Victorian Audit of Surgical Mortality
Megan Goadby	Acting Director, Centre of Patient Safety and Experience, Safer Care Victoria
Dr Shirin Anil	Manager, Consultative Council Unit, Safer Care Victoria
Prof David Watters	Chair, Victorian Perioperative Consultative Council, Safer Care Victoria
Adina Hamilton	Acting Executive General Manager, Victorian Agency for Health Information
Dr Wai-Ting Choi	Representative, Plastic Surgery
Dr Ian Faragher	Representative, General Surgery
Dr Debjyoti Karmakar	Representative, Royal Australian and New Zealand College of Obstetrics and Gynaecologists
Dr Andrea Kattula	Representative, Australian and New Zealand College of Anaesthetists
Dr Patrick Lo	Representative, Neurosurgical Society of Australasia
Dr Amiria Lynch	Representative, Paediatric Surgery
Dr Theodoros Partsalis	Representative, Australian Orthopaedics Association
A/Prof Jocelyn Shand	Representative, Dental Practice Board
Denice Spence	Consumer representative
Dr Mariolyn Raj	Representative, Urological Society of Australia and New Zealand
Dr Timothy Wagner	Representative, Australian Vascular Association
Dr Katherine Worsley	Representative, Royal Australian College of Medical Administrators
Dr Adam Zimmet	Representative, Cardiothoracic Craft Group

14.2 ANZASM Staff

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

14.3 VASM Staff

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Andrew Chen	Acting Project Manager
Jessele Vinluan	Senior Project Officer
Ushan Vithanage	Research Assistant
Dylan Hansen	Research Assistant/Data Analyst
Martha Abiel	RMIT Placement Student

15 Appendix

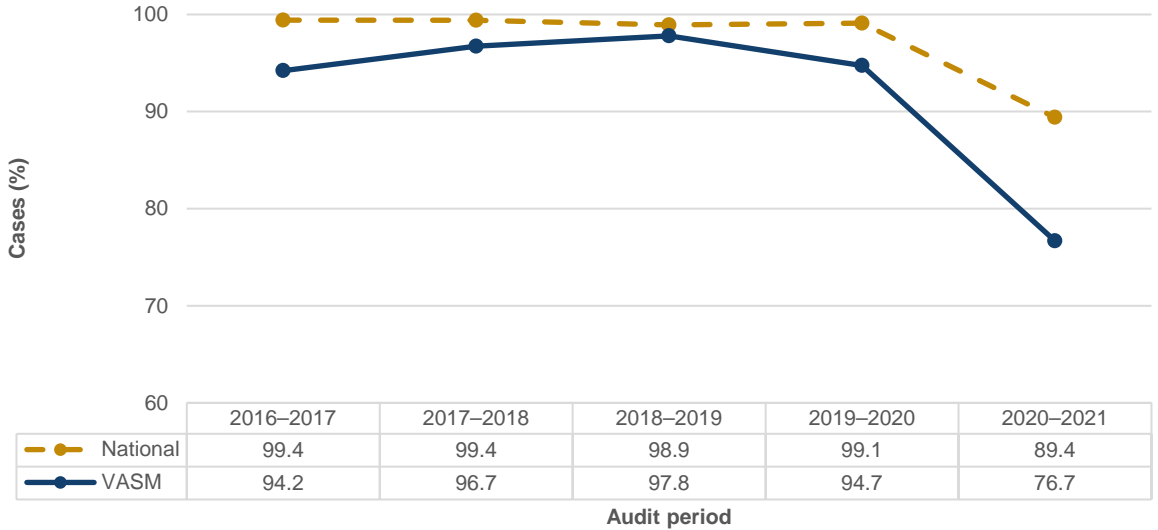
Table A.1: Aspex recommendations and progress

Aspex recommendation	Progress
VASM works with SCV and the department to develop appropriate qualified privilege arrangements for the sharing of information in Victoria.	Completed. VPCC recognised under QP – registered 30 June 2021.
Additional information be included in the published objectives of VASM to emphasise that: <ol style="list-style-type: none"> the audit is a method of case detection to identify areas for improvement in the care delivered by health services in Victoria; the audit recognises a range of different professionals are involved in the delivery of care to surgical patients and fosters a no-blame culture of reporting and the audit findings are used with other information to maximise the quality and safety of healthcare and the outcomes experienced by patients. 	Completed. Added to the VASM webpage.
Requirements for de-identification of hospital records are removed in order to streamline provision of information by health services to VASM, and the forwarding of information to surgeons undertaking second-line assessments.	Completed. VASM's de-identification processes removed in 2019. The responsibility now falls on the individual health services.
VASM develops a system of identifying flags in case reports and expediting 'flagged' cases for more urgent review.	Completed. Cases are flagged for discussion with the Perioperative Mortality Committee (PMC), which will identify cases to be triaged for escalation to SLA.
VASM develops a method of recognising clusters of potentially preventable adverse events that are characterised by common underlying issues.	Completed. Reported in Table 5.
VASM undertakes further analysis and reporting of information about the care pathway in feedback provided to individual surgeons, hospitals and other stakeholders.	In progress.
Surgeons are asked directly about any changes in clinical management that have been implemented (by themselves or others) in response to the outcomes of each case.	Completed. Feedback evaluation survey implemented allowing surgeons to respond to the feedback received.
All cases in which potentially preventable events are considered to have caused the death of a patient are referred for assessment by an independent panel of reviewers.	Completed. A PMC has been established to screen cases for multidisciplinary review.
Reports provided by VASM to surgeons, hospitals and other stakeholders are restructured to convey a narrative outlining: <ol style="list-style-type: none"> the objectives of VASM; a description of the types of patients receiving surgical care in Victoria; an outline of the proportion of surgical procedures resulting in patient mortality and how this has changed over time (including non-preventable and potentially preventable deaths); an outline of the main stages of care delivered to patients and a summary of potentially preventable events identified at each stage; the sequence of major steps that happen within each stage and number of potentially preventable events identified in each step; and any trends identified in each main stage of the patient journey (from year to year) to demonstrate that issues are monitored on an ongoing basis. 	Completed. Reports produced by VASM have been restructured to incorporate the suggested areas of interest, except for point c), which will be present in the next report.
Annual comparisons of public hospitals are undertaken and reported by VASM to identify unexpected variations in outcomes across the Victorian health system.	Completed. Individualised hospital reports are produced and discussed with public and private hospitals.

Table A.2: Mortalities identified by VAED and VASM, 2016–2021

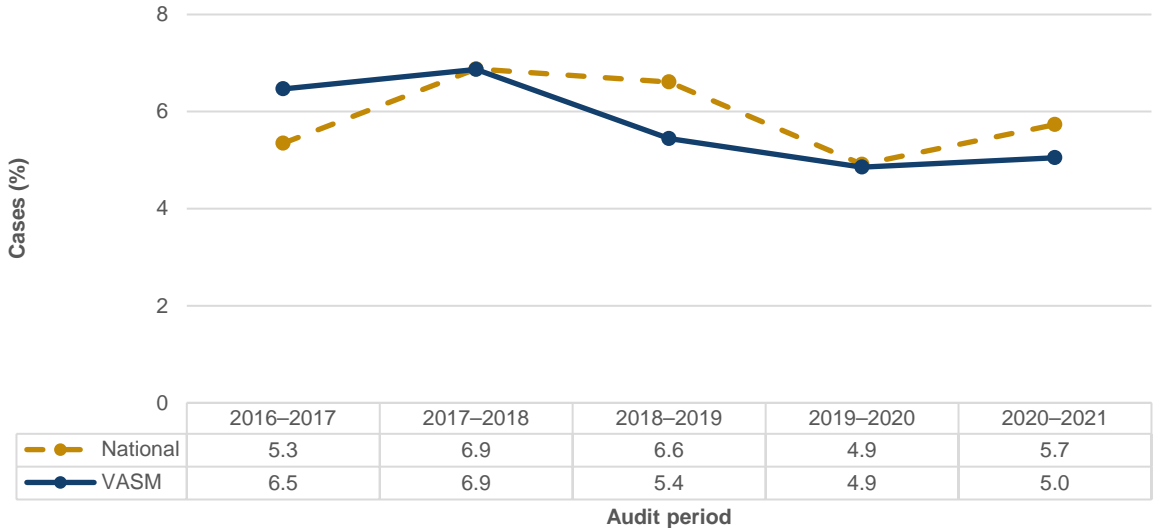
Audit period	Total interventional procedures	VAED-reported interventional mortalities	VASM-reported surgical mortalities	VASM-reported mortality per 1,000 interventional procedures
2016–2017	693,970	2,018	1,728	2.49
2017–2018	703,530	2,041	1,774	2.52
2018–2019	709,906	1,989	1,769	2.49
2019–2020	660,583	1,901	1,770	2.68
2020–2021	678,254	1,982	1,754	2.59
Total	3,446,243	9,931	8,795	2.55

Figure A.1: Return rate of SCFs, VASM compared to national data, 2016–2021



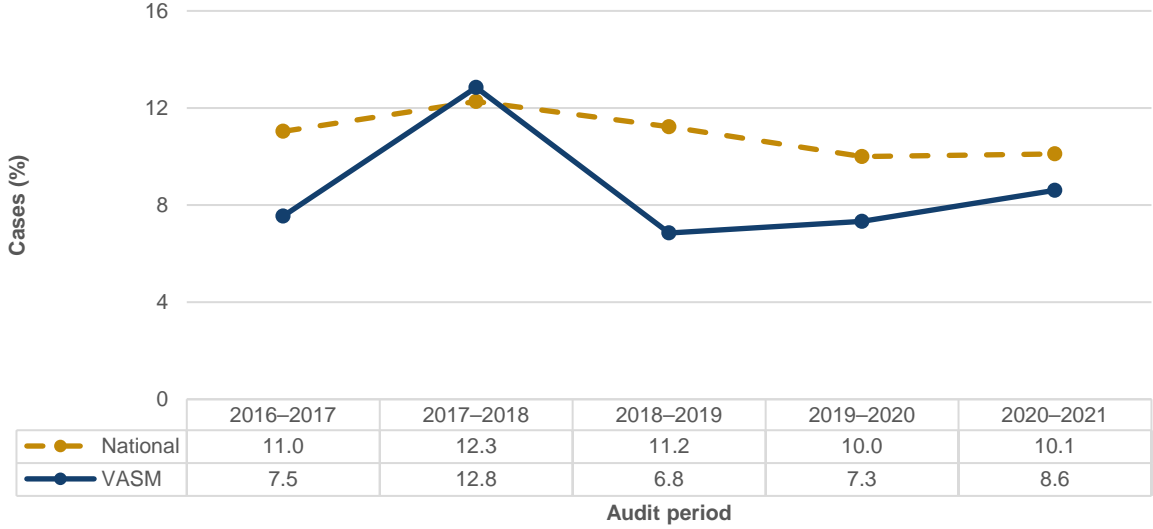
Notes:
 n=8,094 SCFs returned out of 8,793 reported cases in Victoria (1 July 2016 to 30 June 2021).
 n=13,220 SCFs returned out of 13,590 reported cases reported nationally (1 July 2016 to 30 June 2021).
 National is defined as other participating jurisdictions, exclusive of Victoria and New South Wales data.
 The percentage drop in returned SCFs for the current audit period (2020–2021) is due to the data extraction date. In the next report, the 2020–2021 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, VASM compared to national data, 2016–2021



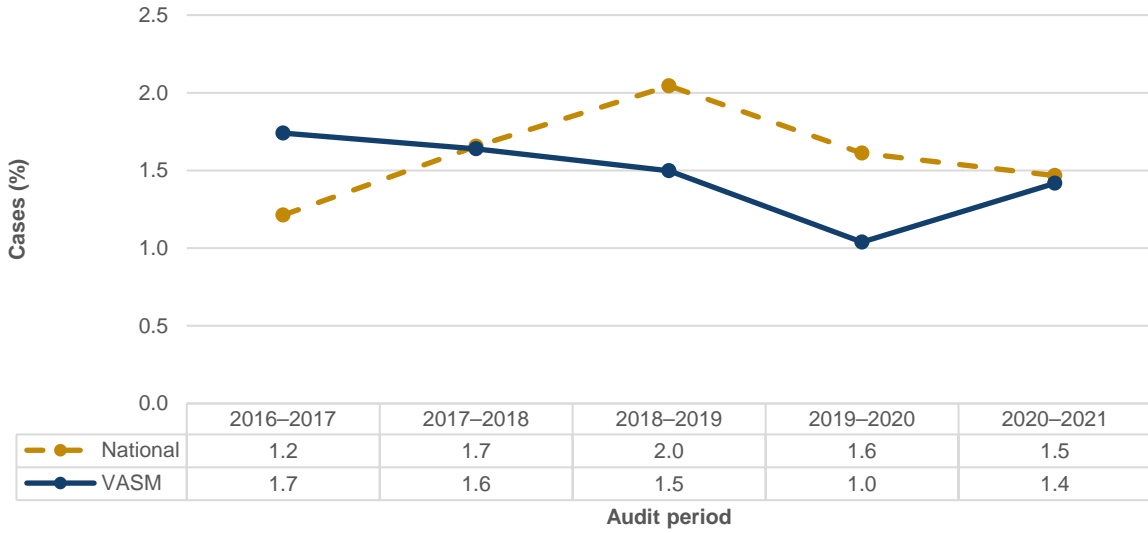
Notes:
 n=346 out of 5,949 Victorian audited deaths had delays in surgical diagnosis (1 July 2016 to 30 June 2021). Data not available: n=21.
 n=646 cases out of 10,891 national audited deaths had delays in surgical diagnosis (1 July 2012 to 30 June 2020). Data not available: n=25.
 From 12 March 2015, data collection changed from gathering data on both delay and errors in surgical diagnosis, to focus only on delay.
 National is defined as other participating jurisdictions, exclusive of Victoria and New South Wales data.
 The 2020–2021 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, VASM compared to national data, 2016–2021



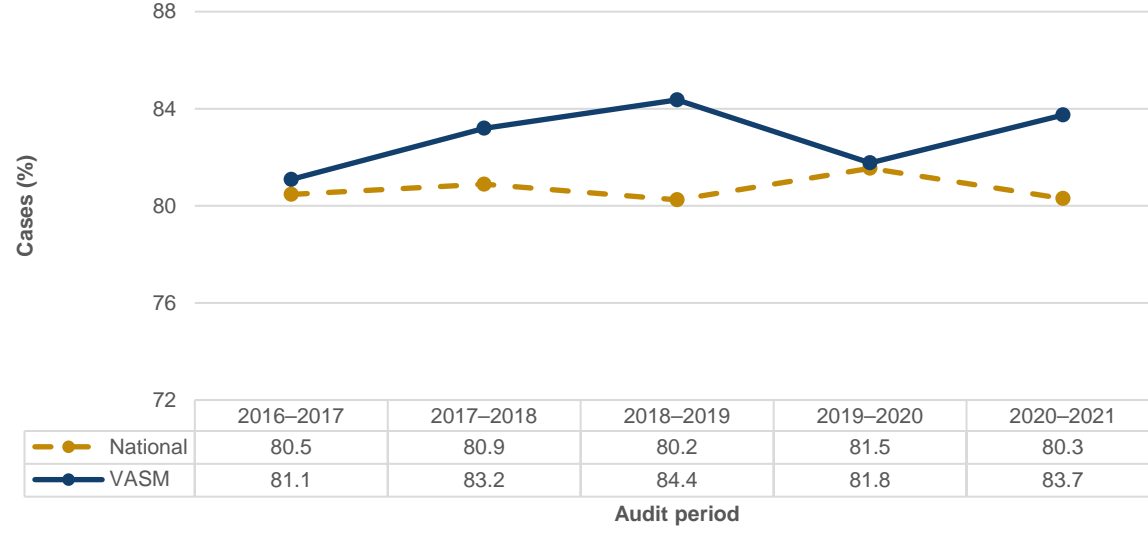
Notes:
 n=107 audited deaths out of 1,228 Victorian patients with delays in transfer (1 July 2016 to 30 June 2021). Data not available: n=78.
 n=305 audited deaths out of 2,777 national patients with delays in transfer (1 July 2016 to 30 June 2021). Data not available: n=147.
 National is defined as other participating jurisdictions, exclusive of Victoria and New South Wales data.
 The 2020–2021 data will be more complete in the next report as more cases become available for analysis.

Figure A.4: Assessor finding of inappropriate choice of DVT prophylaxis, VASM compared to national data, 2016–2021



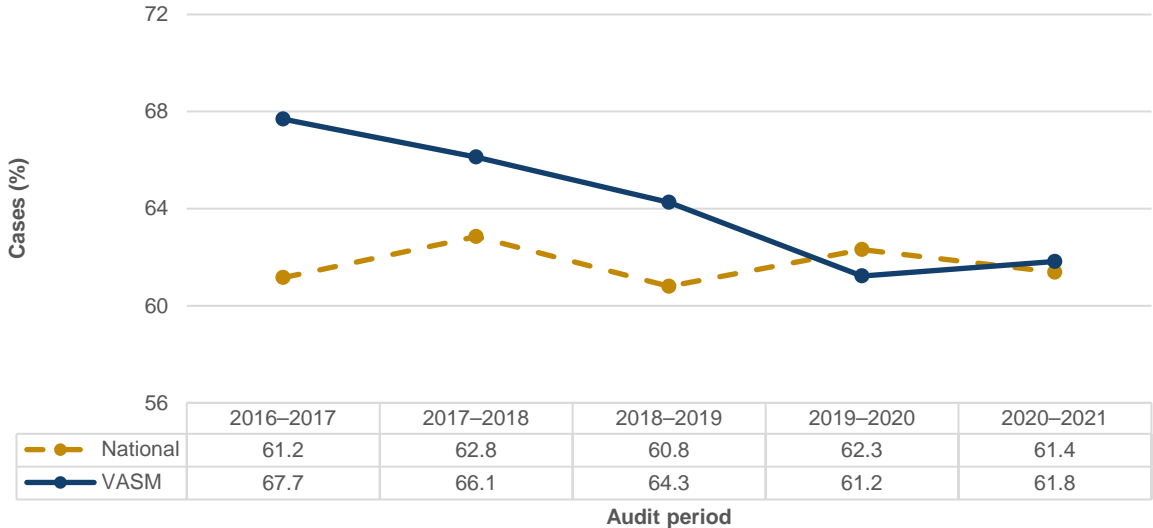
Notes:
 n=87 out of 5,872 Victorian audited deaths were considered to have an inappropriate choice of prophylaxis (1 July 2016 to 30 June 2021). Data not available: n=43.
 n=167 out of 10,412 national audited deaths were considered to have an inappropriate choice of prophylaxis (1 July 2016 to 30 June 2021). Data not available: n=469.
 National is defined as other participating jurisdictions, exclusive of Victoria and New South Wales data.
 The 2020–2021 data will be more complete in the next report as more cases become available for analysis

Figure A.5: Deaths with use of DVT prophylaxis, VASM compared to national data, 2016–2021



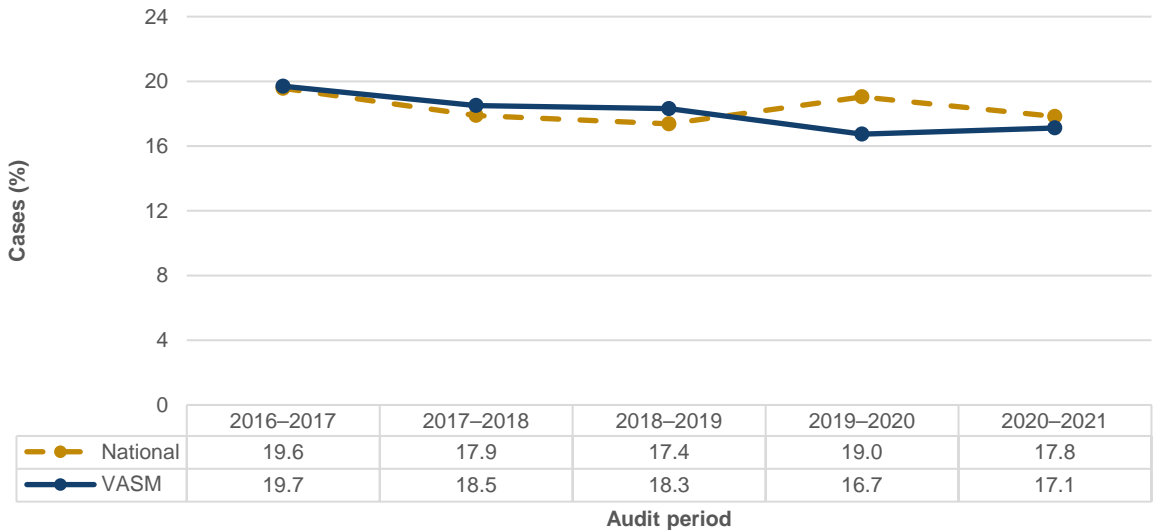
Notes:
 n=4,873 out of 5,885 Victorian audited deaths had DVT prophylaxis (1 July 2016 to 30 June 2021). Data not available: n=85.
 n=8,698 out of 10,779 national audited deaths had DVT prophylaxis (1 July 2016 to 30 June 2021). Data not available: n=137.
 National is defined as other participating jurisdictions, exclusive of Victoria and New South Wales data.
 The 2020–2021 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, VASM compared to national data, 2016–2021



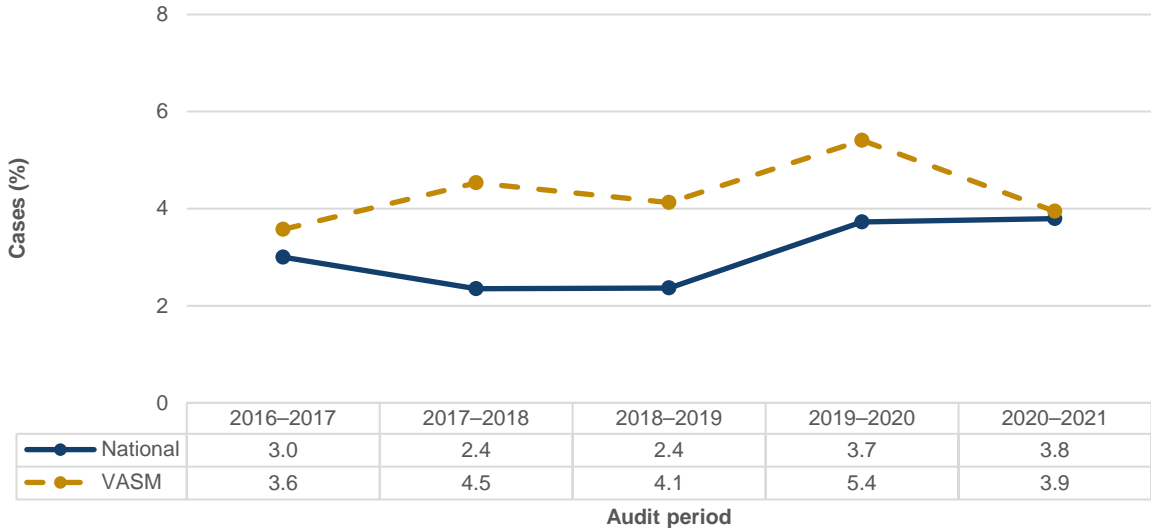
Notes:
 n=3,844 out of 5,961 Victorian audited deaths received critical care support (1 July 2016 to 30 June 2021). Data not available: n=9.
 n=6,726 out of 10,899 national audited deaths received critical care support (1 July 2016 to 30 June 2021). Data not available: n=17.
 National is defined as other participating jurisdictions, exclusive of Victoria and New South Wales data.
 The 2020–2021 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, VASM compared to national data, 2016–2021



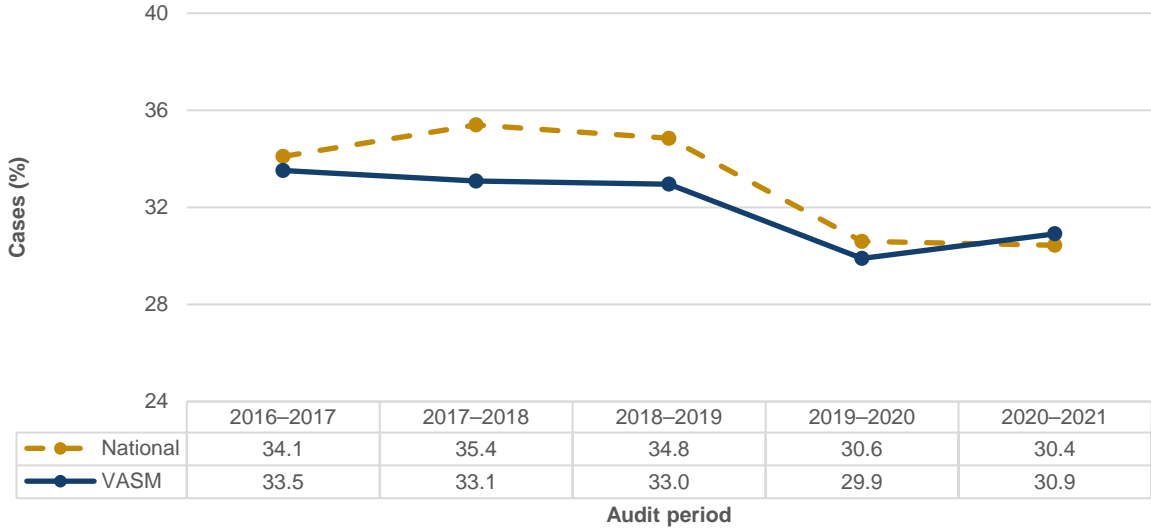
Notes:
 n=1,079 out of 5,936 Victorian audited deaths had an unplanned CCU admission (1 July 2016 to 30 June 2021). Data not available: n=34.
 n=1,988 out of 10,835 national audited deaths had an unplanned CCU admission (1 July 2016 to 30 June 2021). Data not available: n=81.
 National is defined as other participating jurisdictions, exclusive of Victoria and New South Wales data.
 The 2020–2021 data will be more complete in the next report as more cases become available for analysis.

Figure A.8: Deaths with unplanned readmission, VASM compared to national data, 2016–2021



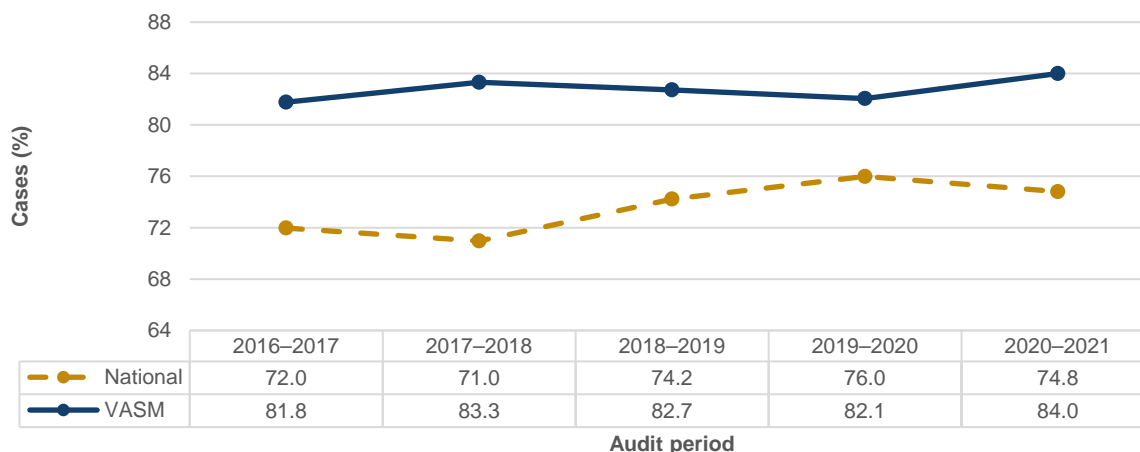
Notes:
 n=256 out of 5,914 Victorian audited deaths had an unplanned readmission (1 July 2016 to 30 June 2021). Data not available: n=56.
 n=324 out of 10,824 national audited deaths had an unplanned readmission (1 July 2016 to 30 June 2021). Data not available: n=92.
 National is defined as other participating jurisdictions, exclusive of Victoria and New South Wales data.
 The 2020–2021 data will be more complete in the next report as more cases become available for analysis.

Figure A.9: Deaths with clinically significant infection, VASM compared to national data, 2016–2021



Notes:
 n=1,903 out of 5,907 Victorian audited deaths had a clinically significant infection (1 July 2012 to 30 June 2020). Data not available: n=63.
 n=3,612 out of 10,857 national audited deaths had a clinically significant infection (1 July 2012 to 30 June 2020). Data not available: n=59.
 National is defined as other participating jurisdictions, exclusive of Victoria and New South Wales data.
 The 2020–2021 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, VASM compared to national data, 2016–2021



Notes:

n=6,334 out of 7,660 operative episodes for 5,526 operative Victorian patients had a consultant present in theatre (1 July 2016 to 30 June 2021).

n=8,562 out of 11,656 operative episodes for 8,330 operative national patients had a consultant present in theatre (1 July 2016 to 30 June 2021).

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.

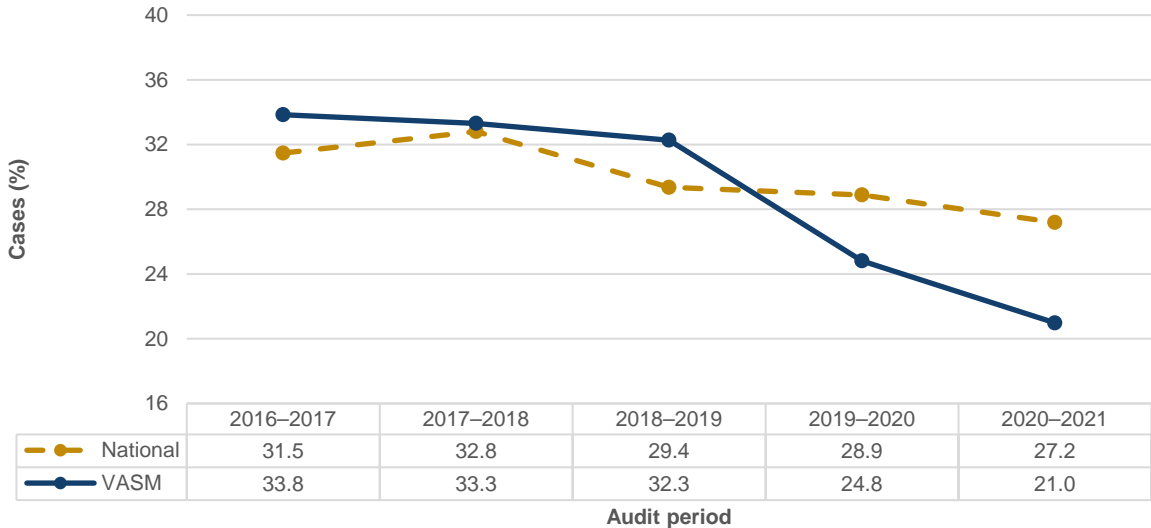
Table A.3: Operative deaths with consultant surgeon present in theatre by hospital status, VASM compared to national data, 2016–2021

Audit period	Private		Public	
	VASM	National	VASM	National
2016–2017	88.1% (384/436)	89.9% (356/396)	79.4% (977/1,230)	68.6% (1,402/2,044)
2017–2018	94.3% (416/441)	90.8% (432/476)	80.0% (1,129/1,411)	66.5% (1,417/2,130)
2018–2019	91.5% (376/411)	93.0% (387/416)	80.0% (1,050/1,313)	70.4% (1,445/2,052)
2019–2020	92.5% (258/279)	97.4% (419/430)	79.6% (926/1,164)	70.8% (1,271/1,794)
2020–2021	95.9% (208/217)	94.1% (288/306)	80.5% (590/733)	71.1% (1,143/1,607)
Total	92.0% (1,642/1,784)	93.0% (1,882/2,024)	79.8% (4,672/5,851)	69.4% (6,678/9,627)

Note:

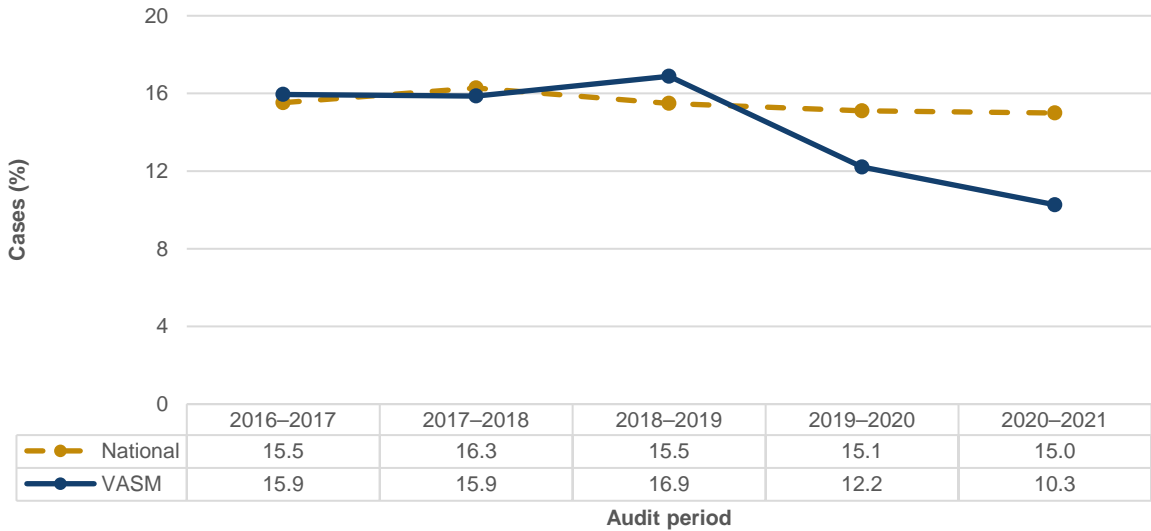
National is defined as other participating jurisdictions, exclusive of Victoria and New South Wales data.

Figure A.11: Deaths with postoperative complications, VASM compared to national data, 2016–2021



Notes:
 n=1,631 out of 5,460 Victorian audited deaths had postoperative complications (1 July 2016 to 30 June 2021). Data not available: n=66.
 n=2,494 out of 8,282 national audited deaths patients had postoperative complications (1 July 2016 to 30 June 2021). Data not available: n=48.
 National is defined as other participating jurisdictions, exclusive of Victoria and New South Wales data.
 The 2020–2021 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, VASM compared to national data, 2016–2021



Notes:
 n=807 out of 5,515 Victorian audited deaths had an unplanned return to theatre (1 July 2016 to 30 June 2021). Data not available: n=11.
 n=1,289 out of 8,308 national audited deaths had an unplanned return to theatre (1 July 2016 to 30 June 2021). Data not available: n=22.
 National is defined as other participating jurisdictions, exclusive of Victoria and New South Wales data.
 The 2020–2021 data will be more complete in the next report as more cases become available for analysis.

Table A.4: Areas of VASM CMIs, 2016–2021

Year	2016–2017	2017–2018	2018–2019	2019–2020	2020–2021
No issues identified	70.0% (884/1,262)	68.5% (929/1,356)	70.1% (940/1,341)	73.4% (860/1,172)	78.9% (641/812)
Area of consideration	14.7% (186/1,262)	15.0% (204/1,356)	12.9% (173/1,341)	13.1% (153/1,172)	11.1% (90/812)
Area of concern	8.9% (112/1,262)	8.4% (114/1,356)	6.3% (85/1,341)	5.5% (65/1,172)	4.2% (34/812)
Adverse event	5.9% (74/1,262)	8.0% (108/1,356)	10.5% (141/1,341)	7.9% (93/1,172)	5.5% (45/812)
Preventable issues	17.2% (217/1,262)	18.8% (255/1,356)	17.3% (232/1,341)	14.2% (167/1,172)	11.2% (91/812)
Adverse event or concern that was preventable	11.3% (142/1,262)	12.6% (171/1,356)	12.0% (161/1,341)	9.1% (107/1,172)	7.4% (60/812)
Adverse event or concern that was preventable that contributed to the death	3.4% (43/1,262)	3.0% (41/1,356)	3.4% (46/1,341)	2.3% (27/1,172)	2.3% (19/812)

Table A.5: Preventable CMIs that caused VASM deaths identified by assessors, 2020–2021

Admission phase	Incident category
Preoperative	
	Decision to operate
	Delay in diagnosis
	Delay in transfer to tertiary hospital
	Operation should not have been done or was unnecessary
Perioperative	
	Arterial bleeding related to open surgery
	Arterial complication of radiological operation
	Heart complication
	Naso gastric tube not used
	Perforation of colon during endoscopic operation
	Theatre acquired infection
Postoperative	
	Anastomotic leak after open surgery
	Aspiration pneumonia
	Delay in recognising complications
	Injury caused by fall in hospital (3 instances)
	Post-operative bleed after laparoscopic operation
	Secondary haemorrhage
	Wound infection

Table A.6: Areas of clinical management, VASM and national data, 2020–2021

Variable	VASM	National	p value
Audited deaths with delay in surgical diagnosis	5.0%	5.7%	0.480
Audited deaths with delay in transfer	8.6%	10.1%	0.590
Audited deaths without use of intensive care (ICU) or high dependency unit (HDU)	61.8%	61.4%	0.830
Audited deaths with unplanned admission to intensive care (ICU)	17.1%	17.8%	0.660
Audited deaths with unplanned readmission	3.9%	3.8%	0.853
Audited deaths with a clinically significant infection	30.9%	30.4%	0.809
Operation with the consultant surgeon present in theatre	84.0%	82.1%	<0.001
Audited operative deaths with unplanned return to theatre	10.3%	15.0%	0.002
Inappropriate DVT prophylaxis treatment as viewed by the assessor	1.4%	1.5%	0.905
Audited deaths with fluid balance issues as viewed by the assessor	7.1%	6.0%	0.296

Notes:

Audit period 1 July 2020 to 30 June 2021.

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.

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