



Royal Australasian College of Surgeons  
Victorian Audit of Surgical Mortality

Victorian Audit of Surgical Mortality (VASM)

# Annual Report

1 July 2021 to 30 June 2022

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Front cover image: *'The Great Ada Tree'* by Michelle Vinluan.

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

Whilst the COVID-19 pandemic attracted less attention in the 2021-22 financial year its significant effects were still felt in the health sector during 2022-23. More deaths from COVID-19 were reported in this year than the previous 2 combined and being exposed to the virus (and having to cope with the consequences), became the norm. Health services tried to catch-up on previously cancelled work in a climate where vital hospital staff were already worn-out by the stresses caused by the pandemic and suffering from almost inevitable COVID-19 infections. Such infected staff had to self-isolate for at least a week and were then at risk of long COVID-19, the full effects of which are still unknown. The new 'COVID normal' bore little resemblance to the pre-COVID normal.

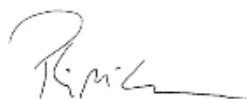
The resultant burn-out is reflected in this latest VASM report. Using Victorian Admitted Episodes Database (VAED) figures there was a 5-7% drop in recorded procedures over the previous two years in Victoria. The total number of annual deaths reported to VASM remained about the same over the pandemic – over the last 4 years the numbers have ranged from 1736 to 1770 - reflecting that most surgical deaths are related to emergency care.

This year's report details only 679 cases that have completed the audit, which is a 16% drop compared to last year and a 36% fall on the 2020 report. Over a third of the cases were awaiting completion of forms by the operating surgeon (this is usually between 12-20%), and nearly a quarter were delayed because the surgical assessment had not been received. This has increased from 9.8% in 2019 to 15.7% in 2020 and 20.5% in 2021.

Anecdotally, surgeons are struggling to keep up with demands. Consulting takes longer with more complicated patients and pathology. Hospitals are expecting more commitments, often at shorter notice because of the 'Zoomification' of meetings. The increasing complexity of information technology, and cyber security, be it in the clinical environment or at home, counter-intuitively adds to stress and takes significant amounts of time<sup>1</sup>. A good example is the increasing use of Electronic Medical Records (EMR) in hospitals. Where previously a shorthand-written note was all that was required either for clinic records, or operation notes, now a login is required before adding a keyboard delivered record often with multiple tick-boxes for various coding reasons. Review of EMR required for filling in VASM forms, or for providing an external assessment, involves wading through thousands of pages of mostly meaningless data to get to the important descriptors of what actually happened. Numerous assessors have complained about the additional work EMRs are creating and the State Coroner's office have reported similar issues.

The reduced numbers for this year's report makes any meaningful analysis difficult. Comparison to previous years is limited as the more complex cases which have been assigned to a second line assessment (SLA) have not yet been reviewed and are therefore not included. The SLA rate of 0.1% (Section 11, Figure 5) is usually between 10-15% at the time of datalock (it was 8.8% last year). Efforts are being made to catchup with this backlog and the VASM team are ensuring that individual assessors are not swamped with cases by encouraging new Fellows to become assessors or by shifting some of the cases interstate.

One area that has been reported in both this and previous VASM reports is the increased number of cases that have at least one operation performed in the final admission in Victoria compared to the other states. Some interesting work by Dr James Aitken in Western Australia has shown that the standardised mortality rate (SMR) in Victoria has remained fairly static over the last decade compared to improvements in the other jurisdictions.<sup>2</sup> One of the constant messages from the Australian and New Zealand Audit of Surgical Mortality (ANZASM) is that futile surgery should be avoided and there is some evidence that this message has been acted on in the other states but less so in Victoria. This would have an effect on the SMR and I would encourage my colleagues to seriously consider whether an operation will really prevent an inevitable death. Particular areas of concern are the acute abdomen and hip fractures. VASM would encourage all health services to enrol in the Australian and New Zealand Emergency Laparotomy Audit (ANZELA) and the well-established Australian and New Zealand Hip Fracture Registry (ANZHFR).



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



*Legend (left to right): Andrew Chen, Ushan Vithanage, Kathy Tran, Jessele Vinluan, A/Prof Philip McCahy.*

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## Foreword from VPCC

The Victorian Perioperative Consultative Council (VPCC) has as its primary role the identification of preventable patterns of perioperative morbidity and mortality. It is a legislated council which was formed in 2019 when it subsumed the roles of the then Victorian Consultative Council for Anaesthetic Morbidity and Mortality (VCCAMM) and the Victorian Surgical Consultative Council (VSCC) to integrate and broaden their scope of review.

In reviewing perioperative morbidity and mortality, VPCC relies on a number of sources of information. These include Sentinel Event reports, Coronial eDepositions and referrals, direct reporting, and importantly, VASM. In the same way that all VPCC reviews and information is protected under legislation, communication between VASM and VPCC is protected respectively under strict federal and state confidentiality provisions. A joint review committee has been established to identify cases considered by VASM that might be of interest to the work of VPCC. When such cases are referred, the clinical notes and other hospital records are sought from the relevant hospitals. VPCC shares challenges faced by VASM in getting timely access to case reports and background data and having sufficient resources to undertake case reviews.

The work of VASM is a key element in providing quality review and feedback to practitioners and healthcare organisations regarding deaths associated with surgery. The ability of VASM reviews to be fed back to surgeons creates a sound learning environment and the potential for individual improvements in practice. VPCC complements and adds to this outcome by working to identify patterns of preventable harm at a hospital or system level. Such patterns may include mortality and/or morbidity. Once identified, recommendations are able to be made to professional bodies (such as RACS or ANZCA), healthcare organisations, the Department of Health, or directly to the Minister of Health.

Shared themes identified in this report include assessment and management of perioperative risk, implementation of appropriate thromboprophylaxis, and avoidance of 'futile' surgery.

'Closing the loop' for healthcare related incidents in a timely manner is important for improving safety and quality of health care for our patients and ensuring that healthcare providers are able to practice in the most effective and efficient environments. The support of VASM for the work of VPCC is an essential part of this work and is acknowledged with appreciation.



Professor David A Scott, FANZCA, FFPMANZCA, DipPOM  
Chair, Victorian Perioperative Consultative Council

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# 1 Abbreviations

|        |  |
|--------|--|
| ANZASM | Australian and New Zealand Audit of Surgical Mortality |
| ANZCA  | Australian and New Zealand College of Anaesthetists    |
| ANZELA | Australian and New Zealand Emergency Laparotomy Audit  |
| ANZHFR | Australian and New Zealand Hip Fracture Registry       |
| ASA    | American Society of Anesthesiologists                  |
| CCU    | critical care unit                                     |
| CHASM  | Collaborating Hospitals Audit of Surgical Mortality    |
| CMI    | clinical management issue                              |
| CT     | computed tomography                                    |
| DRG    | diagnosis-related group                                |
| DVT    | deep vein thrombosis                                   |
| EMR    | electronic medical records                             |
| FLA    | first-line assessment                                  |
| ICU    | intensive care unit                                    |
| IQR    | interquartile range                                    |
| HDU    | high dependency unit                                   |
| M&M    | mortality and morbidity                                |
| MRI    | magnetic resonance imaging                             |
| 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                                 |
| URTT   | unplanned return to theatre                            |
| VAED   | Victorian Admitted Episodes Dataset                    |
| VAHI   | Victorian Agency of Health Information                 |
| VASM   | Victorian Audit of Surgical Mortality                  |
| VPCC   | Victorian Perioperative Consultative Council           |



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## 2 Executive summary

Key findings are based on 679 peer-reviewed Victorian Audit of Surgical Mortality (VASM) cases from the audit period **1 July 2021–30 June 2022**. Comparison has been made between VASM and 'national' data (national data being 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 (30 September 2022).

### 2.1 Hospital admission and operative patient profile

During the current audit period 89.2% (606/679) of cases were emergency admissions and 10.8% (73/679) were elective admissions. Most admissions were to public hospitals (81.7% [555/679]), followed by private hospitals (18.3% [124/679]).

There was a high rate of surgical intervention, with 90.3% (613/679) of cases undergoing at least one procedure, compared with 74.4% (1207/1,620) in other states.

The VASM cohort was elderly, with 60.8% (413/679) being age 75 years or older; 76.4% (519/679) had an ASA grade of 3–4, with risk of death according to the surgeon considered moderate to considerable for 77.4% (473/611) of cases.

A consultant was present in theatre for 86.1% (668/776) of VASM procedures, compared with 74.5% (1,218/1,635) of national procedures.

### 2.2 Clinical management issues

Following completion of the VASM assessment process, no issues were found for 79.6% (540/678) of cases, whereas at least one area of consideration (differences in opinion) was identified for 10.3% (70/678) of cases, at least 1 area for concern (moderate criticism) was identified for 3.1% (21/678) of cases and an adverse event occurred for 6.8% (46/678) of cases. The most commonly reported clinical management issues (CMIs) were where the operation was considered unnecessary (12.8% CMIs [668/5,224]) or an alternative procedure should have been considered (9.8% CMIs [510/5,224]).

When assessing the pathway of surgical care for potential areas of improvement, Victorian surgeons were largely on par with their interstate colleagues. Notably, Victorian surgeons received higher rates of approval (97.1% [659/679] vs 94.8% [1,479/1,560]) for the timing of operations (when they occurred) than 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 the feedback with their colleagues and the hospital.

### 2.3 Potentially preventable clinical outcomes

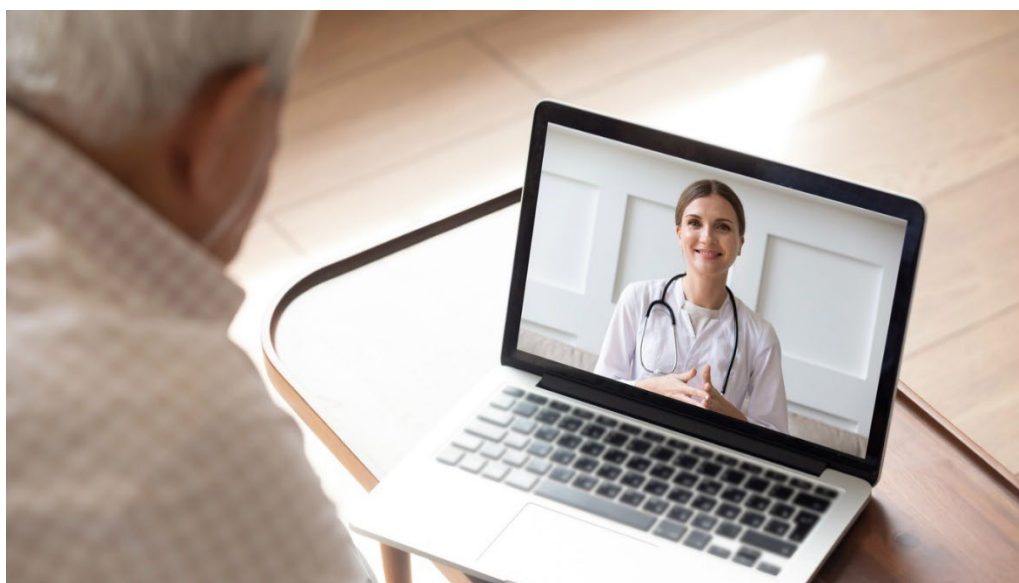
As part of the evaluation process, assessors are not only asked to indicate the presence of CMIs but also whether any CMI was considered preventable or not. The rate of preventability for areas of concern or adverse events remained relatively unchanged at 8.4% (57/678) for 2021–2022 compared with 7.9% (86/1,086) for 2020–2021. 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.

## 2.4 Recommendations

The limited number of cases reviewed this year make specific patient-based recommendations difficult. VASM has therefore made more broad-based suggestions to improve data collection and hopefully streamline processes with the ultimate aim of improving patient care without burning out health service workers. Implementing these will require the provision of additional resources.

- All Victorian hospitals should be contributing to available surgical based data registries. At a minimum, hospitals should be involved in ANZELA and ANZHFR.
- Where electronic medical records are used, hospitals should be developing review friendly editing tools to avoid 'data dumps' and overwork of those required to review individual cases.
- Hospitals need to ensure that appropriate staff in their data departments are aware of the VASM inclusion criteria and, for larger organisations, have dedicated staff that are able to liaise with the VASM office.
- Health services should be regularly auditing (e.g. comparing against clinical data) data sent to VASM and the Victorian Agency for Health Information.
- All surgical departments should have regular mortality and morbidity (M&M) meetings based on the RACS guidelines<sup>3</sup> with recommendations reported to Hospital Executive.



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## 3 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 a 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 in 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 2021–30 June 2022, with 5-year data (1 July 2017–30 June 2022) included in the appendix. In order to benchmark outcomes of surgical care, comparisons have been made between VASM and national audit data. Data from New South Wales has not been included (the Clinical Excellence Commission runs a comparable but separate audit, known as the Collaborating Hospitals Audit of Surgical Mortality). These data were unavailable for this report. The data contained in this report are accurate as of 30 September 2022.

The key recommendations and VASM audit findings summarised in this report should be used by hospitals and surgeons in conjunction with the NSQHS Standards<sup>4</sup> to identify potential areas for improvement.



## 4 Victorian healthcare statistics

### Surgery continues to be safe in Victoria

VASM monitors and learns from surgical death 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 2021–30 June 2022.

#### Demographic

##### Victorian total

Population 6.6 million

##### Audited mortalities



Male<sup>1</sup> 55.4%  
 Female<sup>1</sup> 44.6%  
 Median age 78  
 Mortality rate<sup>3</sup> 4.36



##### Admission status

Elective 10.8%  
 Emergency 89.2%



##### Transfer

Preoperative transfer 18.7%

#### Risk



##### Preoperative risk of death

Expected 9.0%  
 Considerable 55.3%  
 Moderate 22.1%  
 Small 9.0%  
 Minimal 4.6%



##### Most common comorbidities

Cardiovascular 20.7%  
 Age<sup>2</sup> 20.3%  
 Respiratory 11.7%  
 Renal 10.5%  
 Neurological 8.6%



##### Most common causes of death

Cardiovascular 16.5%  
 Neurological 13.8%  
 Respiratory 8.4%  
 Malignancy 8.2%  
 Septicaemia 7.9%

#### Key findings



##### Areas of improved patient care

Improved consultant presence in theatre  
 Improved patient fluid management  
 Decreased postoperative complications  
 Decreased infections during admission  
 Decreased septicaemia  
 Decreased pneumonia



##### Peer review outcomes

Adverse event 6.8%  
 Area for consideration 10.3%  
 Area of concern 3.1%  
 No issues 79.6%

**Notes:** 1 = Birth sex reported by hospital, 2 = Victorian patients age 75 or older comprise 60.8% (413/679) of audited deaths, 3 = VASM-reported mortality per 1,000 interventional episodes.

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## 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.<sup>4</sup> Individual patient care episodes are classified to diagnosis-related groups (DRGs) that are specialty specific, which provides an alternative source of mortality data.

According to VAED data for the 1 July 2021 to 30 June 2022 there were 381,550 patients admitted to Victorian public and private hospitals in association with a surgical DRG. Of these, 2,141 resulted in reportable mortalities to VAED, providing an estimated surgical mortality rate of 0.6% (2,141/381,550). Over the same period, VASM received 1,665 direct notifications of deaths associated with surgical care, providing an estimated surgical mortality rate of 0.4% (1,665/381,550) (Table A.1). Some differentiation between VAED and VASM estimated mortality rates is to be expected given the slight differences in the way each cohort is defined.

VAED reported mortalities are based on the DRG codes associated with the admission (and filtering based on surgical DRGs), whereas VASM reported mortalities are those where the patient was admitted under a surgeon or had a procedure performed by a surgeon. It is worth noting that surgical procedure estimated mortality rates (based on VAED data) are difficult to provide due to overlaps in who performs a procedure (e.g., colonoscopy performed by surgeon or non-surgeon) and the need to distinguish between these scenarios.



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## 6 Audit participation

All hospitals in Victoria that provide surgical services are required to participate in VASM. Participation is defined as providing notifications to VASM of deaths that satisfy the following criteria:

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

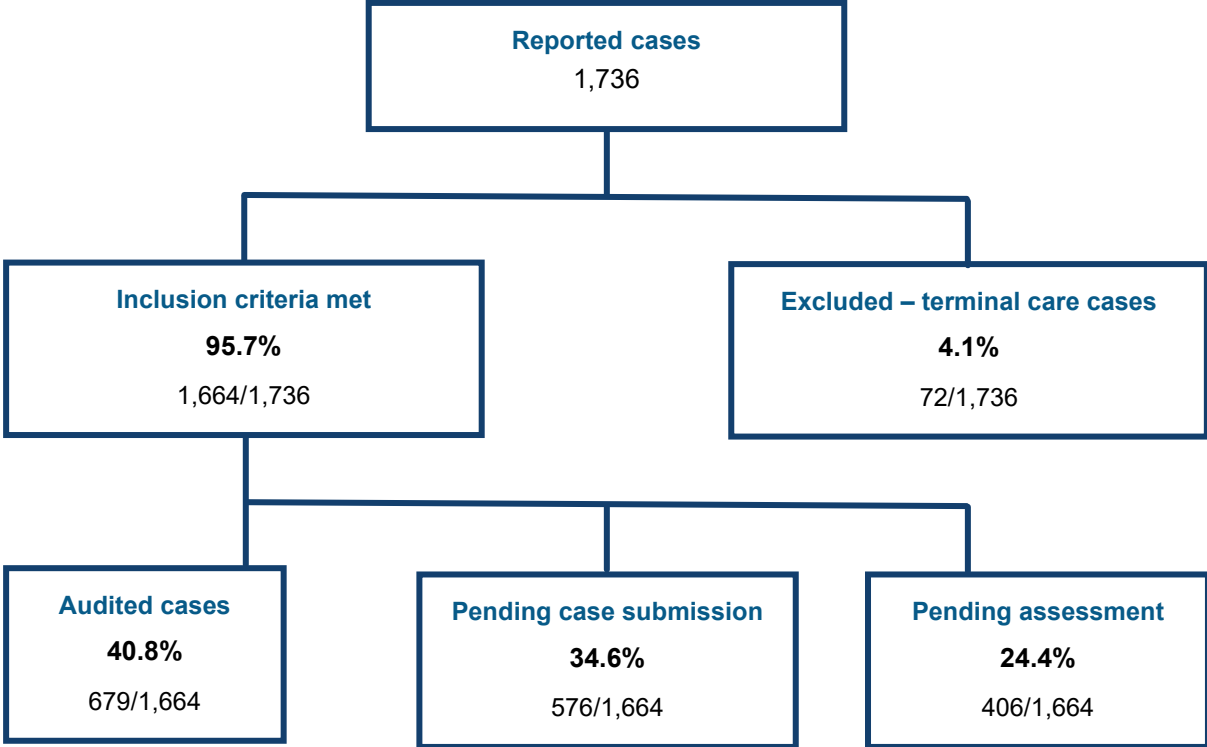
Notifications of death to VASM may arrive from a number of different sources. During the period 1 July 2021–30 June 2022 VASM was notified of patient deaths from hospitals (61.2% [416/679]), from the coroner (37.1% [252/679]) and from surgeons themselves (0.1% [9/679]). The time from patient death for these notifications to occur was a median of 34 days (interquartile range [IQR] 20–51).

Once notified of the death of a patient death for whom they were the nominated treating surgeon, Victorian surgeons took a median of 36 days (IQR 6–111) to submit their surgical case form (SCF) (note that this figure is subject to change 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 are able to participate in VASM on a voluntary basis.

Figure 1 shows the current status (as of the census date) of cases notified to VASM. During the period 1 July 2021–30 June 2022 VASM was notified of 1,736 cases. Of these, 4.1% (72/1,736) were excluded due to being terminal care admissions\*, with the remaining 95.9% (1,664/1,736) satisfying VASM inclusion criteria. Of these, 40.8% (679/1,664) have completed the VASM audit process with feedback delivered to surgeons, 24.4% (406/1,664) are pending assessment and 34.6% (576/1,664) are still pending submission. (These figures are likely to change as more cases are submitted to VASM.) A comparison of surgeons submitting cases to VASM vs. surgeons outside Victoria submitting to their local audit over a 5-year period (1 July 2017–30 June 2022) shows that Victorian surgeons have been comparatively poor at submitting their cases compared with their interstate colleagues (Figure A.1).

**Note:** \* This is decreased compared with 2020–2021 data (12.6% [221/1,752]) due to VASM actively reviewing terminal care admission declarations.

Figure 1: VASM audit numbers, 2021–2022



## 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 (90.3%, [613/679]) compared to their non-Victorian counterparts (74.4%, [1,207/1,620]). Given the overall similarity between cohorts it is unclear why this is so.

### Vignette: Futile surgery

An elderly patient was admitted due to general deterioration with known metastatic malignancy (undergoing palliative chemotherapy) and ureteric obstruction managed with a long-term stent. Computed tomography (CT) scan indicated that the metastatic disease had significantly progressed with worsening hydronephrosis despite the stent. Initial management was medical before a ureteric stent change was performed in an effort to improve renal function. Postoperatively the renal function did not improve, and the patient was palliated. The assessors felt the procedure was futile, and that earlier consideration should have been given to palliative care.

**Table 1: Characteristics of audited deaths, 2021–2022**

|  | VASM       | National   |
|--|------------|------------|
| <b>Audited deaths, (n)</b>                             | 679        | 1,620      |
| <b>Age (years), median (interquartile range)</b>       | 78 (68–87) | 78 (64–85) |
| <b>Operative cases, (%)</b>                            | 90.3       | 74.4       |
| <b>Sex<sup>1</sup>, (%)</b>                            |            |            |
| Male   | 55.4       | 56.0       |
| Female   | 44.6       | 44.0       |
| <b>Admission status, (%)</b>                           |            |            |
| Elective   | 10.8       | 11.4       |
| Emergency  | 89.2       | 88.6       |
| <b>ASA<sup>2</sup> grade, (%)</b>                      |            |            |
| ASA 1–2  | 5.7        | 7.5        |
| ASA 3  | 25.3       | 26.1       |
| ASA 4  | 51.1       | 47.1       |
| ASA 5–6  | 17.8       | 19.2       |
| <b>Risk of death prior to surgery<sup>3</sup>, (%)</b> |            |            |
| Expected   | 9.0        | 9.2        |
| Considerable   | 55.3       | 53.2       |
| Moderate   | 22.1       | 24.2       |
| Small  | 9.0        | 9.9        |
| Minimal  | 4.6        | 3.6        |
| <b>Comorbidities<sup>4</sup>, (%)</b>                  |            |            |
| Cardiovascular   | 20.7       | 20.4       |
| Age <sup>5</sup>                                       | 20.3       | 19.6       |
| Respiratory  | 11.7       | 11.3       |
| Renal  | 10.5       | 9.4        |
| Advanced malignancy                                    | 8.6        | 8.5        |
| Diabetes   | 7.7        | 8.3        |
| Other  | 7.6        | 7.5        |
| Neurological   | 6.5        | 7.7        |
| Obesity  | 3.6        | 4.2        |



|                                  |           |      |      |
|----------------------------------|-----------|------|------|
|                                  | Hepatic   | 3.0  | 3.3  |
| <b>Number of procedures, (%)</b> | 3 or more | 5.6  | 5.6  |
|                                  | 2         | 9.3  | 9.1  |
|                                  | 1         | 75.4 | 59.6 |
|                                  | 0         | 9.7  | 25.6 |

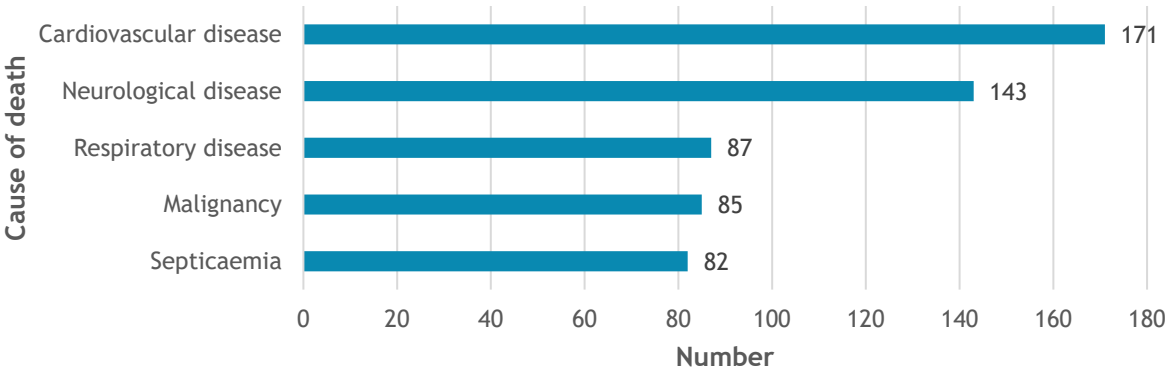
**Notes:** 1 = birth sex reported by hospital, 2 = American Society of Anesthesiologists (ASA) physical status classification system<sup>5</sup>, 3 = as determined by treating surgeon, 4 = Coexisting medical conditions or disease processes additional to the primary diagnosis; 5 = Victorian patients over age 75 made up 60.8% (413/679) 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 period, 1,036 causes of death were identified across 679 cases. The 5 most frequently listed causes of death accounted for half (4.8% [568/1,036]) of the total reported causes of death (Figure 2).

**Figure 2: Most common causes of death, 2021–2022**



**Notes:** n=1,036 causes of death associated with 679 Victorian patients (1 July 2021–30 June 2022).

When the probable cause of death cannot be determined, or where an accidental death occurs in a healthcare facility, the case may be referred to the coroner.<sup>6</sup> 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.

**Vignette: Anticoagulation issues in orthopaedic case. Missed sepsis discovered by Coroner.**

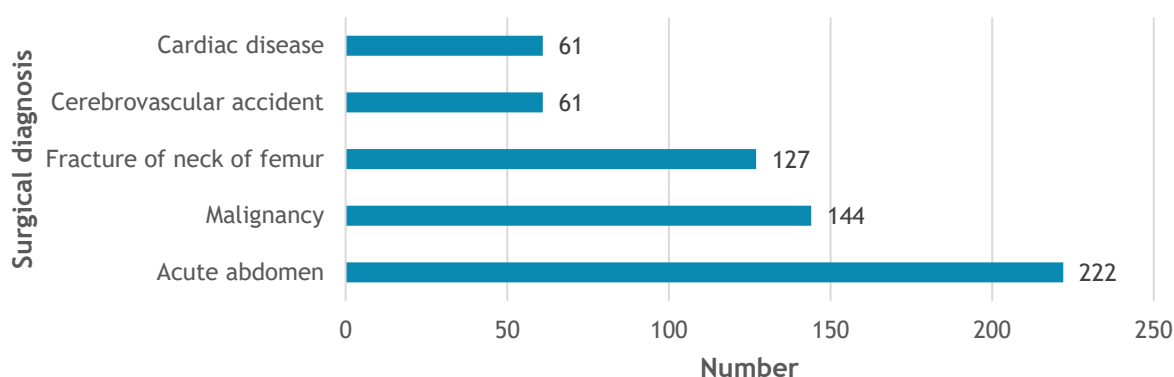
An elderly patient fell down 5 steps fracturing their neck of femur and upper humerus. They were known to have mitral valve replacement and be on warfarin. International normalised ratio on admission was 4.5, delaying treatment for 4 days during which time a large thigh haematoma developed. Patient was also noted to be incontinent of urine. An intramedullary nail was inserted under spinal anaesthesia with a plan to fix humerus 7–10 days later. At time of operation a urinary catheter was noted but the following day no catheter was present. Over the next week, the patient had further problems with bleeding into thigh and on day 10 became suddenly unwell. Proteus was cultured from urine and the patient started on antibiotics. Initial recovery but then fatal collapse occurred, thought to be due to a cardiac event. Coroner’s postmortem found a large wound haematoma and a distended bladder with 1300 mls of cloudy urine and bilateral hydroureter/hydronephrosis with cause of death as urosepsis complicating bladder outlet obstruction. The assessor noted that a urinary catheter would have prevented the death.

## 9 Clinical risk management

### 9.1 Establishing the surgical diagnosis

Determining the surgical diagnosis effectively will fundamentally influence the surgical care that a patient will experience. Individual patients presenting to hospital may be diagnosed with multiple complex and concurrent surgical issues. During the current period there were 970 surgical diagnoses describing 679 patients. Acute abdomen was the most common diagnosis (23.7% [230/970]) followed by malignancy (14.3% [139/970]) and fractured neck of femur (13.1% [127/970]) (Figure 3).

**Figure 3: Top 5 VASM surgical diagnoses, 2021–2022**



**Notes:** n=970 surgical diagnoses associated with 679 patients (1 July 2021–30 June 2022).

In the current audit period, the proportion of cases with malignancy identified as a comorbidity remains stable at 20.2% (137/679) relative to 21.9% (238/1,087) for the previous audit year (2020–2021).

### 9.2 Delay in surgical diagnosis

Determining the surgical diagnosis in a timely manner is critical in maximising the opportunity for achieving the best possible outcome.<sup>7-9</sup> 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 5.2% (35/679) of cases, consistent with those observed in the 2019–2020 and 2020–2021 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 22.9% (8/35) of cases. The delay was considered unavoidable in 48.6% (17/35) of cases.

#### Vignette: Delay in diagnosis due to COVID-19

An elderly, obese patient presented with shortness of breath and 1 week history of epigastric pain and nausea. Initially care was under the medical unit as suspected COVID-19 but the patient had a negative test. After 4 days CT scan identified incarcerated and obstructed right inguinal hernia. The surgical team discussed the high risk of surgery and performed the McEvedy approach for “femoral” hernia with difficulty closing abdomen. A second team took over care and arranged return to theatre 2 days later where it was evident that the incarcerated inguinal hernia was still present, and a laparotomy was required to reduce the hernia. The patient’s respiratory function continued to fail and death followed due to multi-organ failure. The surgical assessor went through over 640 pages of notes finding that there was a delay in diagnosis, partly related to the concerns about Covid-19, and that the approach to the initial operation was incorrect. Both errors delayed definitive surgery which resulted in death.

### 9.3 Hospital transfers

Transfer of patients between treating institutions may be required in order to optimise the surgical care received. For example, transfer from remote/rural to metropolitan health services or transfer to access specialty centres. However, challenges can arise when transfers occur, such as delays, inappropriate transfer or inadequate care. In 2021–2022, 127 patients were preoperatively transferred between hospitals. Delays to transfer were reported in 12.8% (16/125; data not available n=2) of cases, which was slightly lower than the national average (15.7% [56/357]; Figure A.3).

#### Vignette: Inappropriate transfer of a septic patient with small bowel obstruction

An elderly patient was transferred from another hospital with a small bowel obstruction secondary to an unresectable desmoid tumour. She had previously undergone femoral-femoral crossover prosthetic grafting, as the tumour had encased the femoral artery, causing left limb ischaemia. During transfer the patient became septic. A fistula from the small bowel loop was determined to be causing the bowel and graft obstruction with subsequent critical limb ischaemia needing an above-knee amputation. Despite maximal medical intervention the patient rapidly declined. Both surgeon and assessor agreed that transfer had essentially been futile, and that stronger consideration should have been given to palliative therapy.

### 9.4 Deep vein thrombosis prophylaxis

During the 2021–2022 period, deep vein thrombosis (DVT) prophylaxis was used in 83.1% (564/679) of cases (Figure A.4), with heparin (84.0% [474/564]) the most common strategy employed. Following peer review, assessors approved of the use or non-use of DVT prophylaxis for 76.9% (522/679) of cases; they disapproved of management in only 1.5% (10/679) of cases (Figure A.5).

There were 15 cases (2.2% [15/679]) where the cause of death was attributed to the occurrence of pulmonary embolism; 1 of these cases did not receive 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.<sup>10</sup> The choice of prophylaxis strategy is subject to the judgement of clinicians caring for individual patients.

### 9.5 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 (56.4% [383/679] of cases for 2021–2022), whereas the national trend for usage of CCU facilities has been 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 (99.7% [295/296] of cases) and assessors (95.2% [278/292] of cases; data not available n=4) for 2021–2022.

During the course of hospital admission patients may undergo an unplanned admission to CCU, whether it be 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 2017–30 June 2022 (Figure A.7).

### 9.6 Unplanned readmission to hospital

The rate of unplanned readmission to hospital for the 2021–2022 period (3.7% [25/679] of cases) is consistent with that observed for the previous year (4.0% [43/1,086] of cases), from an apparent peak in 2019–2020 (5.3% [67/1264] of cases) (Figure A.8). The rate of unplanned readmission to hospital continues to remain relatively low.

## 9.7 Clinically significant infection

During the 5-year period 1 July 2017–30 June 2022, the proportion of VASM cases that reported the presence of a clinically significant infection has decreased from 33.1% (445/1,345) in 2017–2018 to 27.8% (189/679) in 2021–2022 (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, 2017–2022**

| Infection acquired                   | VASM 2017–2022 | National 2017–2022 | VASM 2021–2022 | National 2021–2022 |
|--------------------------------------|----------------|--------------------|----------------|--------------------|
| Acquired postoperatively, % (n)      | 69.1 (670/970) | 65.4 (1,172/1,793) | 67.8 (61/90)   | 60.0 (141/235)     |
| Acquired preoperatively, % (n)       | 15.9 (154/970) | 17.6 (315/1,793)   | 17.8 (16/90)   | 17.9 (42/235)      |
| Other invasive site infection, % (n) | 7.4 (72/970)   | 10.7 (192/1,793)   | 10.0 (9/90)    | 14.5 (34/235)      |
| Surgical site infection, % (n)       | 7.6 (74/970)   | 6.4 (114/1,793)    | 4.4 (4/90)     | 7.7 (18/235)       |

**Notes:** 16.8% (970/5,771) of VASM cases acquired a clinically significant infection during admission (1 July 2017–30 June 2022). Data not available: n=15. 16.9% (1,793/10,622) of national cases acquired a clinically significant infection during admission (1 July 2017–30 June 2022). Data not available: n=27. National defined as other participating jurisdictions, exclusive of Victoria and New South Wales data. The 2021–2022 data will be more complete in the next report as more cases become available for analysis.

During the 2021–2022 period, pneumonia accounted for 40.2% (76/189) of all infections, as did intra-abdominal sepsis and septicaemia. This is higher than that observed for other states, where pneumonia comprised 36.8% (189/514) of infections. Intra-abdominal sepsis and septicaemia were reported for 44.9% (231/514) of national cases.

### Vignette: Delayed intervention while awaiting COVID-19 result

An elderly patient was seen in the emergency department after a 2-month history of lower limb symptoms that suddenly and rapidly deteriorated with associated incontinence. The patient was admitted with additional lung symptoms requiring COVID-19 testing. The negative result caused a delay of nearly 24 hours in obtaining an Magnetic Resonance Imaging (MRI) (by which time neurology had deteriorated further) which confirmed conus medullaris syndrome and the presence of a T10 - L1 epidural tumour. Subsequent urgent decompressive surgery occurred that went without complications and transient improvement in neurological symptoms. Medical/surgical oncology became involved, and urgent treatment discussed as there was rapid metastatic disease progression (confirmed by repeat imaging). However, the neurological condition began to decline, and the patient developed hospital-acquired pneumonia, resulting in palliation. The assessors noted that in other circumstances a delay of 24 hours while awaiting the results of a COVID-19 test could have been catastrophic.

Of those VASM cases where a clinically significant infection was reported, surgical-site infections have decreased over the 5-year period 1 July 2017–30 June 2022, from 9.3% (24/258) of cases in 2017–2018 to 4.4% (4/90) of cases in 2021–2022. This is in contrast to national jurisdictions which have witnessed an increase from 5.9% (25/427) to 7.7% (18/235) across the same period. Strategies for reducing surgical site infections have been implemented overseas and in Australia and guidelines should be followed.<sup>11, 12</sup>

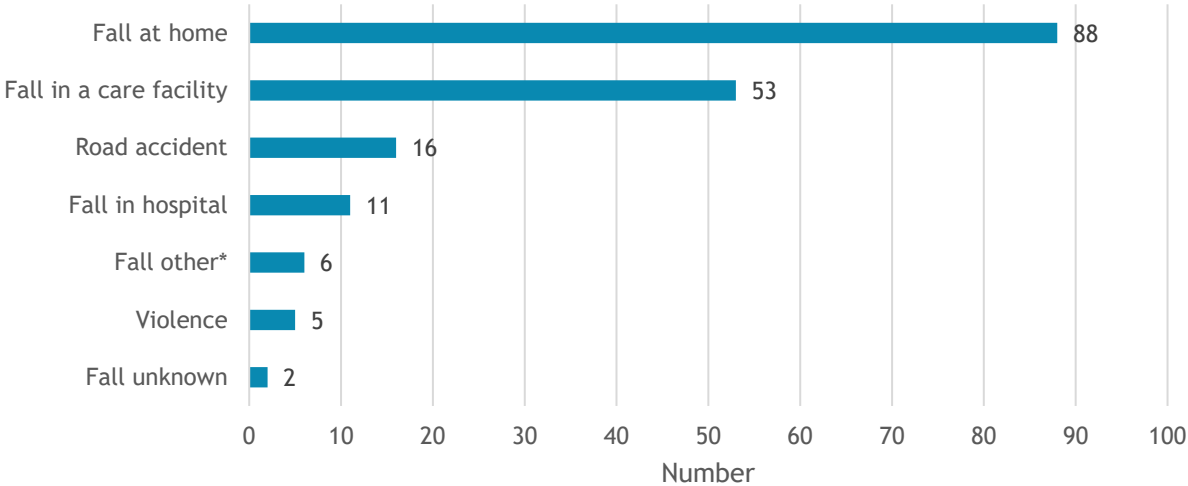
### 9.8 Trauma

VASM collects data on cases that arise due to trauma—falls, traffic incidents or violence. During the 2021–2022 period 27.4% (186/678) of cases were reportedly due to trauma. Of these, 86.0% (160/186) were attributed to falls. From the 186 trauma incidents reported to VASM for the 2021–2022 period 60.2% of patients (112/186) were diagnosed with a fractured femur. The types of trauma reported to VASM are summarised in Figure 4, including classification of where falls occur. 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.<sup>13</sup> VASM includes such trends in its educational programs, for example, a reduction in postoperative falls was observed in patients who participated in a preoperative education program.<sup>14, 15</sup> 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.<sup>16</sup>

According to 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.<sup>17</sup> During the 2021–2022 period, 5 VASM cases reported a fall in hospital resulting in serious injury. Hospitals are encouraged to review their procedures regarding falls prevention.

**Figure 4: VASM deaths by causes of trauma, 2021–2022**



**Notes:** n=186 trauma cases in 679 Victorian audited deaths (1 July 2021–30 June 2022). Data not available: n=1. \* = Includes roads and public venues.

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## 10 Profile of operative procedures

During the 2021–2022 period, 90.3% (613/679) of patients had at least one operative procedure, with consultants present in theatre for 86.1% (668/776) 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 markedly higher consultant presence in public hospital theatres reported for VASM cases than for national cases (Table A.2).

### 10.1 Postoperative complications

The development of complications following surgery is multi-factorial 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 2021–2022 audit period, postoperative complications were reported in 20.5% (125/611; data not available n=2) of VASM operative cases, compared with 24.7% (297/1,204) in other states. The rate of reported postoperative complications has been steadily decreasing each year, as depicted in Figure A.11.

Timely identification of postoperative complications is critical. There has been marked variation during the overall 2017–2022 period in reporting of delays in identifying the occurrence of postoperative complications. For example, during 2020–2021, 2.9% (6/207) of cases reported a delay in identifying postoperative complications compared to 6.5% (8/124) during 2021–2022 audit period (data not shown).

#### Vignette: Postoperative complications due iatrogenic injury with delayed return to theatre

A middle-aged patient underwent an elective lap to open right radical nephrectomy and retroperitoneal lymph node resection for T3N1 papillary renal cell carcinoma. The patient postoperatively developed ischaemic hepatitis and acute renal dysfunction, which were attributed to an intraoperative iatrogenic hepatic artery injury. In consultation with hepatobiliary surgery and gastroenterology it was decided to manage this conservatively. Over two weeks the patient had sustained runs of supraventricular tachycardia and progressive renal dysfunction and was transferred to the intensive care unit of another hospital. Condition continued to deteriorate with ascites, aspiration pneumonia (precipitating respiratory failure) and *E coli* septicaemia. The patient eventually underwent a relook laparotomy where extensive small bowel ischaemia incompatible with life was found. In hindsight it was noted that the hepatic artery injury should have been addressed surgically.

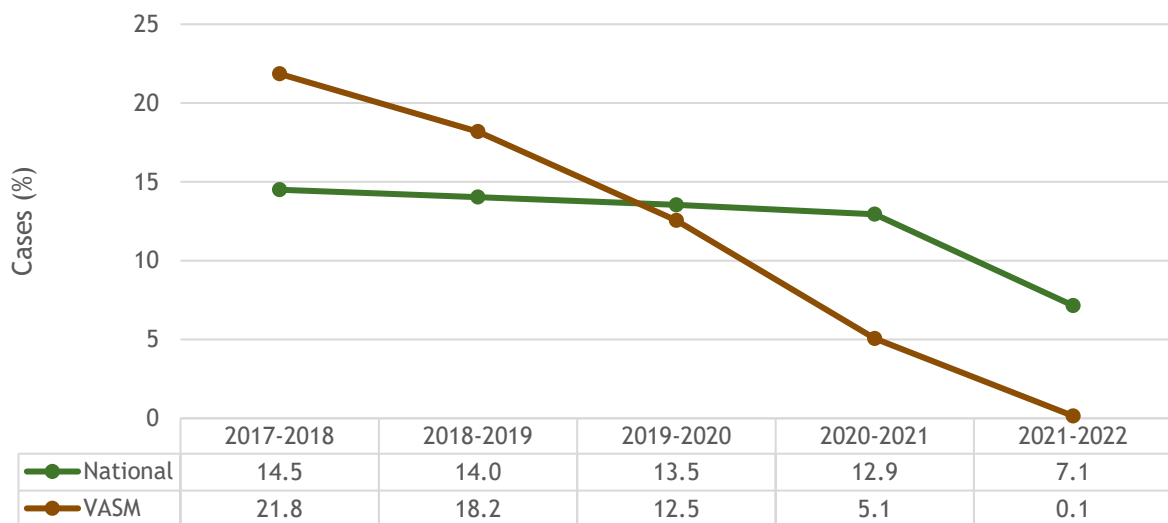
### 10.2 Unplanned return to theatre

Complications following surgery can be unavoidable and require an unplanned return to theatre (URTT), which can reflect good surgical practice when these 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 2021–2022 period, URTT were reported for 10.1% (62/613) of VASM cases, which is considerably lower than the reported 15.0% (181/1,207) for national cases (Figure A.12). For those cases where a postoperative complication was reported a URTT was also reported for 26.4% (33/125) of VASM cases, compared with 35.7% (106/297) of national cases. Hospitals are encouraged to review their data on URTT to ascertain their failure to rescue rates.

## 11 Peer-review process

During the 2017–2022 period 13.2% (762/5,769) 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. It's also important to note that delay in submission of cases to VASM will correspondingly delay the subsequent assessment.

**Figure 5: Audited deaths that underwent SLA, 2017–2022**



**Notes:** 13.2% (762/5,769) of VASM cases were referred for SLA peer review (1 July 2017–30 June 2022). 12.8% (1,354/10,606) of national cases were referred for SLA peer review (1 July 2017–30 June 2022). National defined as other participating jurisdictions, exclusive of Victoria and New South Wales data. The 2021–2022 data will be more complete in the next report as more cases become available for analysis.



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## 12 Clinical management issues

During the 2021–2022 audit period clinical management issues (CMIs) were identified in 20.4% (138/678) of VASM cases, compared with 15.2% (246/1,621) of national cases. Minor issues (areas of consideration) were most common, being reported in 10.3% (70/678) of VASM cases and 8.9% (145/1,621) of national cases. Moderate issues (areas of concern) were reported at a much lower rate for VASM cases (3.1% [21/678]) compared with national cases (4.3% [70/1,621]). In contrast, adverse events were reported for 6.8% (46/678) of VASM cases compared with 1.9% (30/1,621) 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).

### Vignette: Delays to initial patient review and subsequent surgical intervention

An 87-year-old man presented to the emergency department with non-specific symptoms for biliary sepsis. He was afebrile at presentation. There had been lower abdominal pain for the preceding 3 days, though nowhere prominent in the right iliac fossa, which was accompanied with constipation. He was reviewed medically 7.5 hours after initial presentation, which resulted in a computed tomography (CT) scan and blood tests being ordered. These indicated acute cholecystitis and acute kidney injury. At this point he was tachycardic though normotensive with raised C-reactive protein (CRP) and white cell count. Antibiotics were commenced. Two hours after medical review, he was reviewed surgically. He was now febrile and in septic shock, with hypotension and tachycardia, and was agitated and in respiratory distress. Continuous positive airway pressure (CPAP) therapy, noradrenaline and crystalloid fluid infusion, and tazocin antibiotics were ordered. He was prepared for theatre however, further delays ensued due to cases already underway. Pre-operative resuscitation was required, and the patient transferred to the intensive care unit (ICU) where he was intubated. He eventually underwent laparoscopic cholecystectomy and intraoperative cholangiography without complication. Despite this he progressed into multi-organ failure and was palliated. The two separate delays were noted by surgeon and assessor, and it has been noted that the hospital concerned undertook their own review and have implemented changes.

When reviewing all CMIs identified by assessors during the 2017–2022 period, the most common type of issue reported was that of an operation being considered unnecessary (12.8% of CMIs [668/5,224]), followed by that of an alternative operation being preferred (9.8% of CMIs [510/5,224]). 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.<sup>18</sup> These futile operations may contribute to the overall higher rates of surgery seen in Victoria compared to the other states. Unsatisfactory medical management (7.9% of CMIs [415/5,224]) and delays to initiating surgery (7.9% of CMIs [411/5,224]) were also commonly reported issues.

### 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, nominating whether any aspects of care could have been improved. The proportions of audited cases where assessors have indicated that improvement is possible are summarised in Table 3.

VASM and national data were mostly similar, except for the categories of timing of surgical intervention, grade/experience of the surgeon deciding whether to operate and grade/experience of surgeon performing the operation.

**Table 3: Assessor-identified areas for surgical care improvements, 2021–2022**

| Area for improvement  | VASM (%) | National (%) | p value |
|---|----------|--------------|---------|
| Preoperative management/preparation                         | 5.0      | 6.6          | 0.147   |
| Decision to operate   | 4.3      | 5.6          | 0.203   |
| Choice of operation   | 2.9      | 2.9          | 0.937   |
| Timing of operation (too late, too soon, wrong time of day) | 2.9      | 5.2          | 0.019*  |
| Intraoperative/technical management of surgery              | 2.4      | 2.3          | 0.947   |
| Grade/experience of surgeon deciding                        | 0.1      | 0.7          | 0.096   |
| Grade/experience of surgeon operating                       | 0.1      | 0.8          | 0.076   |
| Postoperative care  | 2.4      | 3.1          | 0.309   |

**Notes:** \* = statistically significant differences between VASM and national data ( $p < 0.05$  using  $\chi^2$  tests). The 'p' value indicates the chance of a result occurring randomly. National defined as other participating jurisdictions, exclusive of Victoria and New South Wales data.



## 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 is summarised in Table A.5. During the 2021–2022 period, the presence of a consultant in theatre was significantly higher for VASM cases (86.1% [668/776]) than for national cases (74.5% [1,218/1,635]), whereas the rate of unplanned returns to theatre was lower for VASM cases (10.1% [62/613]) than for national cases (15.0% [181/1,207]). The proportion of cases where assessors indicated the DVT prophylactic strategy employed was inappropriate was also lower for VASM cases (1.5% [10/679]) than for national cases (1.6% [25/1,557]).



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## 13 Conclusion

From the moment it was launched in 2007, VASM has contributed to improving surgical outcomes for Victorian patients, primarily through the provision of case-based feedback for surgery-related deaths in Victorian hospitals. Analysis of VASM data collected over time has enabled the identification of issues confronting the field of surgery. This has resulted in the development of workshops, seminars and, more recently, webinars to address these issues and foster discussion among the surgical community. Through the constructive efforts of our assessors, VASM also contributes to the National Case Note Review Booklets, the Case of the Month series and other educational activities that are consistently well received.

Data from this report underscore the current and ongoing need for the independent peer-review VASM can provide. The COVID-19 pandemic has impacted upon the timely collection of mortality and assessment data in this report, which will be updated and reanalysed over the catch-up period. VASM is concerned about the quality of some data being generated by health services and encourages regular data audit by hospitals.

While the VASM submission process encourages self-reflection by surgeons, independent evaluation is critical. Assessors consistently identify the presence of CMIs in the cases they evaluate more readily than do the surgeons who submitted the cases. Conveying this feedback to surgeons in a constructive manner continues to be a key focus for VASM. The audit also encourages health services to increase their level of perioperative morbidity and mortality review using the RACS morbidity and mortality guidelines, thus providing better opportunities to address system issues affecting the safety and quality of services provided.<sup>3</sup>

From this report we can determine the cohort of patients being notified to VASM is broadly similar to that reported to national jurisdictions. However, the proportion of VASM patients undergoing at least one operation during their admission is considerably higher than that of their national counterparts. When this is considered in conjunction with the fact the most common type of CMI identified concerns the decision to operate, a potentially concerning trend regarding futile surgery is highlighted. This is an issue 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 the VPCC and support from Safer Care Victoria, 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.

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## 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 Safer Care Victoria for funding the project, RACS for infrastructure and oversight of this project, all Victorian hospitals and their health information departments, and the following organisations:

- 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   |
| Dr Debjyoti Karmakar   | 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   |
| Dr Shirin Anil         | Manager, Consultative Council Unit, Safer Care Victoria                                   |
| Joanna Gaston          | Manager, Consultative Council Unit, Safer Care Victoria                                   |
| Angela Baxter          | Senior Project Officer, Consultative Council Unit, Safer Care Victoria                    |
| Erin Smith             | Senior Project Officer, Victorian Perioperative Consultative Council, Safer Care Victoria |
| Adina Hamilton         | Director, Survey, Safety and Quality Insight, Victorian Agency for Health Information     |

## 14.2 ANZASM Staff

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

## 14.3 VASM Staff

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| Dr Nathan Procter    | Project Manager        |
| Andrew Chen          | Senior Project Officer |
| Jessele Vinluan      | Senior Project Officer |
| Ushan Vithanage      | Research Assistant     |
| Kathy Tran           | RMIT Placement Student |

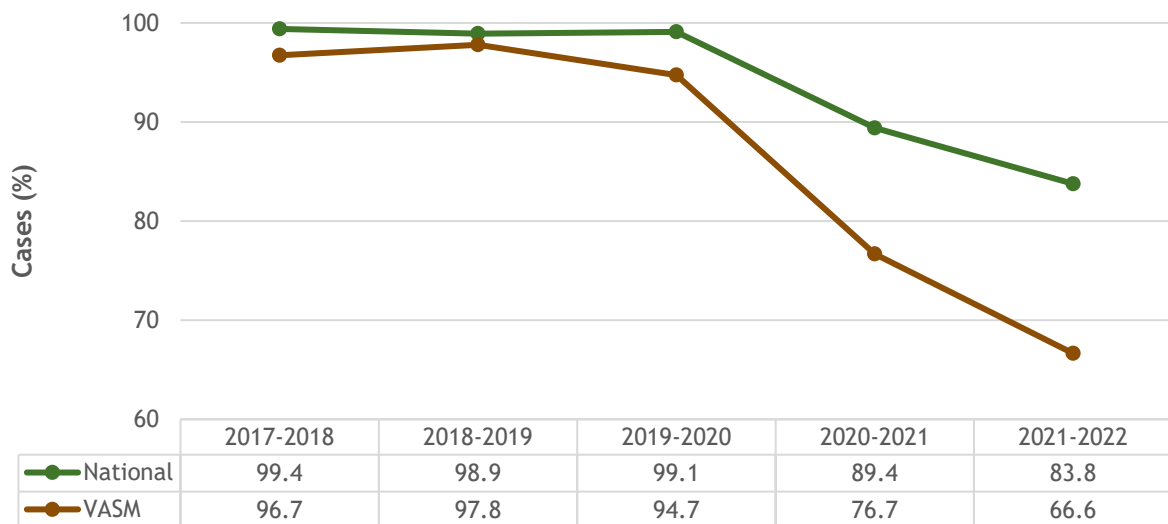
# 15 Appendix

**Table A.1: Mortalities identified by VASM and Victorian Admitted Episodes Dataset, 2017–2022**

| Audit period | Total interventional episodes | VAED-reported interventional mortalities | VAED-reported mortality per 1,000 interventional episodes | VASM-reported surgical mortalities | VASM-reported mortality per 1,000 interventional episodes |
|--------------|-------------------------------|--|---|------------------------------------|---|
| 2017–2018    | 413,523                       | 2,041                                    | 4.94  | 1,774                              | 4.29  |
| 2018–2019    | 404,064                       | 1,984                                    | 4.91  | 1,769                              | 4.38  |
| 2019–2020    | 372,642                       | 1,907                                    | 5.12  | 1,770                              | 4.75  |
| 2020–2021    | 383,488                       | 1,966                                    | 5.13  | 1,754                              | 4.57  |
| 2021–2022    | 381,550                       | 2,141                                    | 5.61  | 1,665                              | 4.36  |
| <b>Total</b> | <b>1,955,267</b>              | <b>9,931</b>                             | <b>5.08</b>   | <b>8,732</b>                       | <b>4.45</b>   |

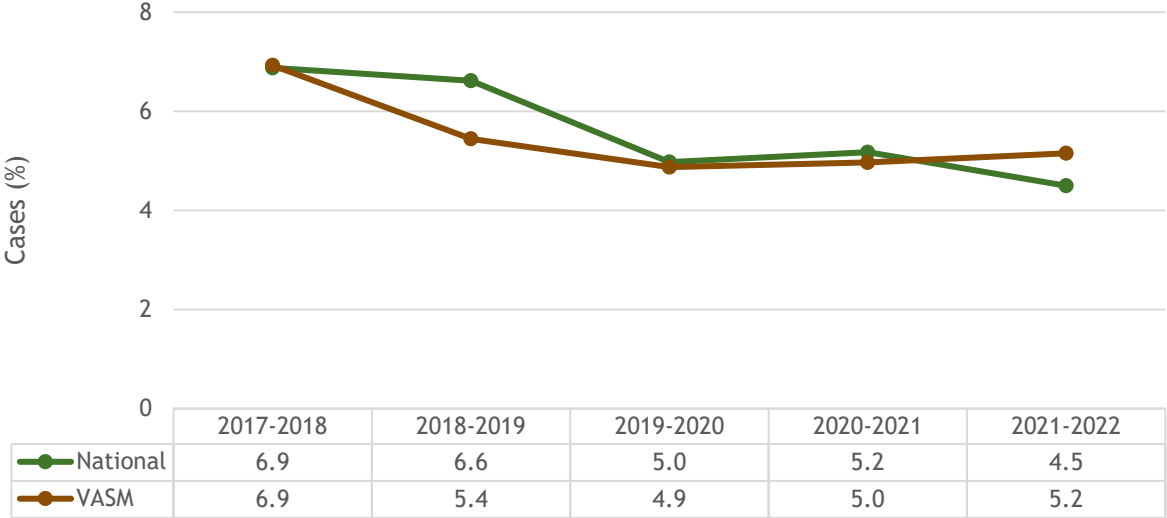
Notes: VAED = Victorian Admitted Episodes Dataset.

**Figure A.1: Return rate of surgical case forms, 2017–2022**



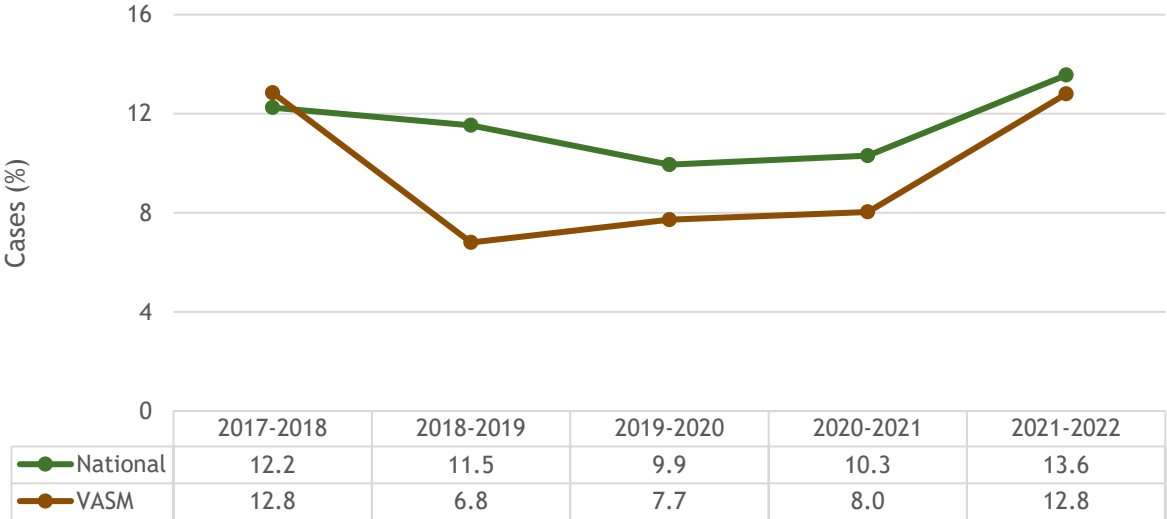
Notes: n=7,623 surgical case forms (SCFs) returned out of 8,801 reported cases in Victoria (1 July 2017–30 June 2022). n=12,718 SCFs returned out of 13,504 reported cases reported from national jurisdictions (1 July 2017–30 June 2022). National defined as other participating jurisdictions, excluding Victorian and New South Wales data. The percentage drop in returned SCFs for the current audit period (2021–2022) is partially due to the data extraction date. In the next report, the 2021–2022 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, 2017–2022**



**Notes:** 5.5% (319/5,771) of VASM cases had delays in surgical diagnosis (1 July 2017–30 June 2022). Data not available: n=17. 5.7% (608/10,622) of national cases had delays in surgical diagnosis (1 July 2017–30 June 2022). Data not available: n=14. National defined as other participating jurisdictions, exclusive of Victoria and New South Wales data. The 2021–2022 data will be more complete in the next report as more cases become available for analysis.

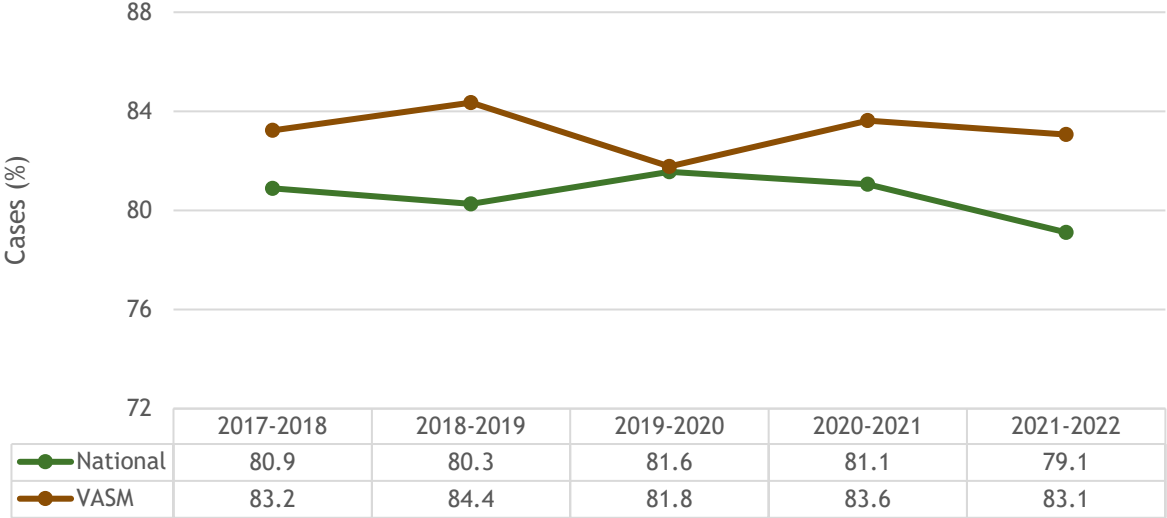
**Figure A.3: Deaths with delay in hospital transfer, 2017–2022**



**Notes:** 8.9% (111/1,254) of VASM cases with preoperative transfer reported delays in transfer (1 July 2017–30 June 2022). Data not available: n=64. 11.0% (308/2,802) of national cases with preoperative transfer reported delays in transfer (1 July 2017–30 June 2022). Data not available: n=106. National defined as other participating jurisdictions, exclusive of Victoria and New South Wales data. The 2021–2022 data will be more complete in the next report as more cases become available for analysis.

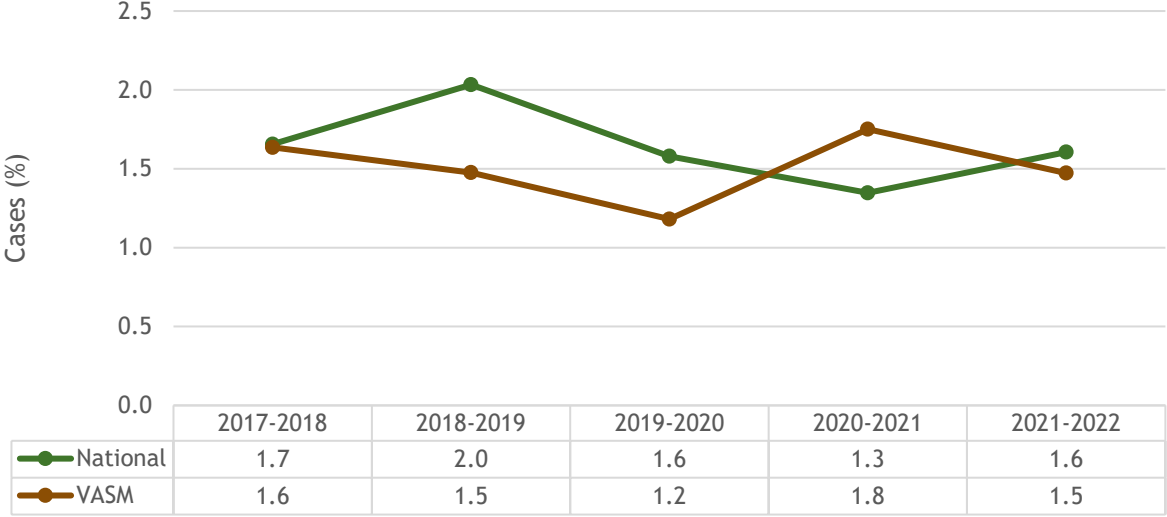


**Figure A.4: Deaths with use of DVT prophylaxis, 2017–2022**



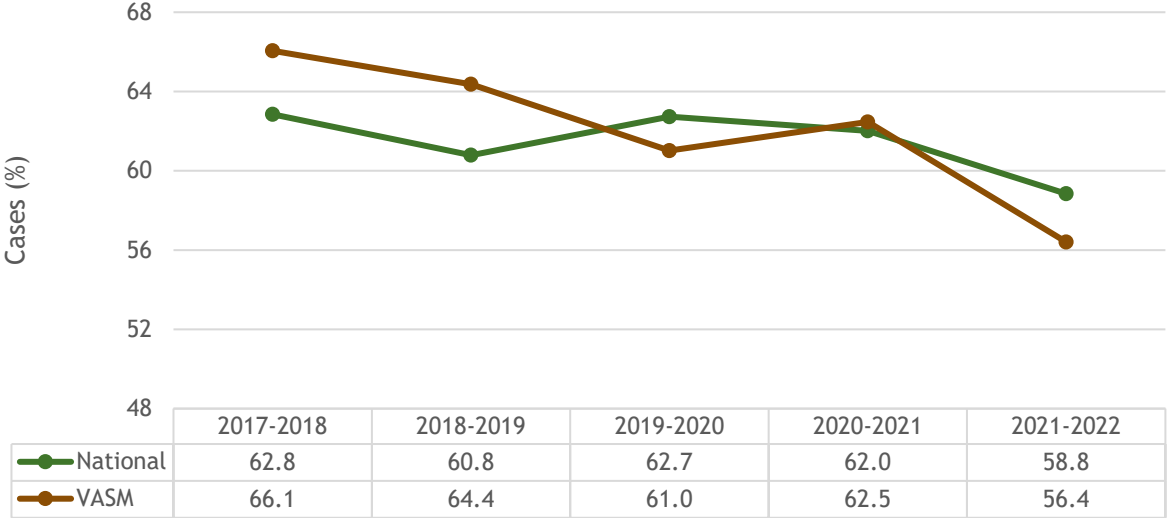
**Notes:** 82.4% (4,753/5,771) of VASM cases had DVT prophylaxis (1 July 2017–30 June 2022). Data not available: n=60. 80.0% (8,493/10,622) of national cases had DVT prophylaxis (1 July 2017–30 June 2022). Data not available: n=91. National defined as other participating jurisdictions, exclusive of Victoria and New South Wales data. The 2021–2022 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, 2017–2022**



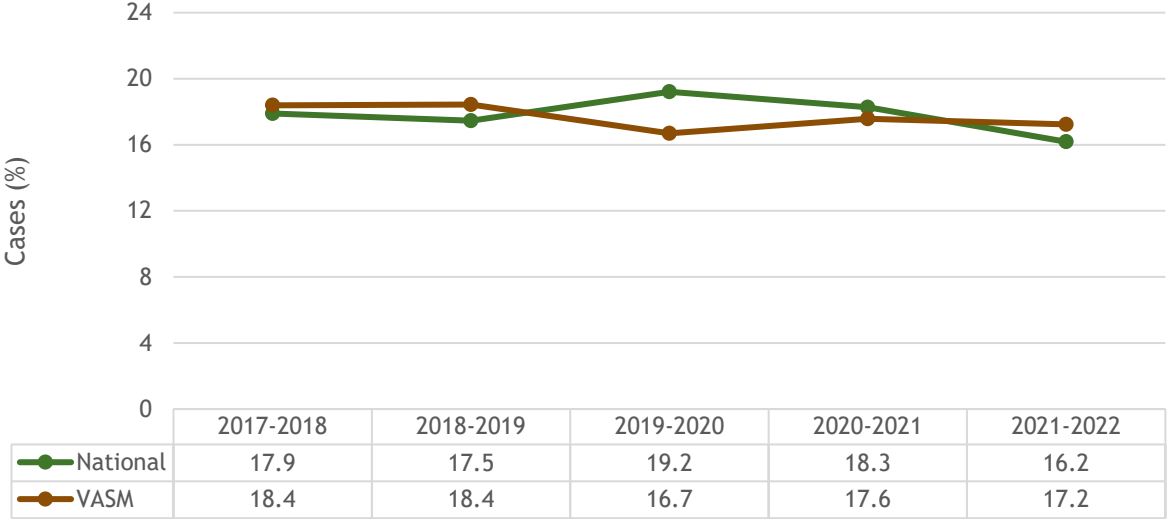
**Notes:** 1.5% (86/5,769) of VASM cases were considered to have an inappropriate choice of prophylaxis (1 July 2017–30 June 2022). Data not available: n=35. 1.6% (168/10,606) of national cases were considered to have an inappropriate choice of prophylaxis (1 July 2017–30 June 2022). Data not available: n=437. National defined as other participating jurisdictions, exclusive of Victoria and New South Wales data. The 2021–2022 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, 2017–2022**



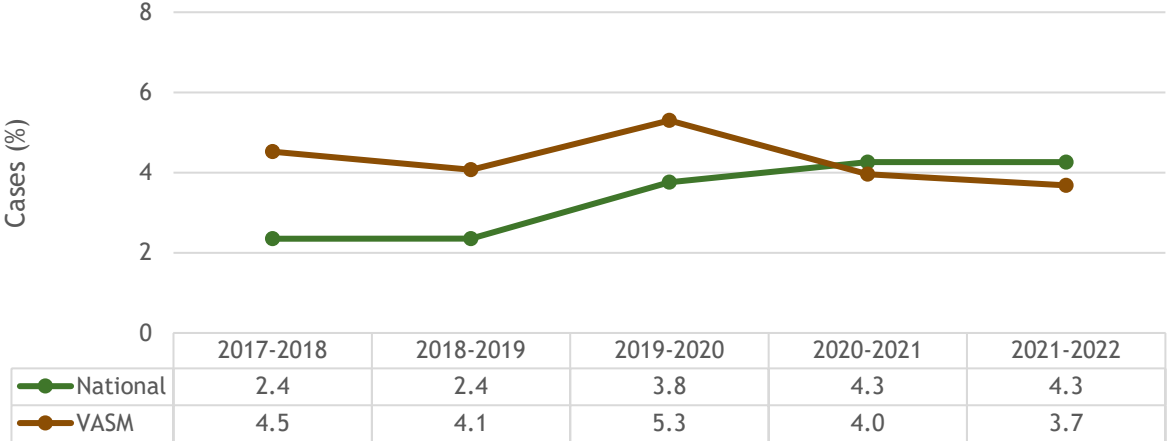
**Notes:** 62.6% (3,615/5,771) of VASM cases received critical care support (1 July 2017–30 June 2022). Data not available: n=8. 61.5% (6,535/10,622) of national cases received critical care support (1 July 2017–30 June 2022). Data not available: n=12. National defined as other participating jurisdictions, exclusive of Victoria and New South Wales data. The 2021–2022 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, 2017–2022**



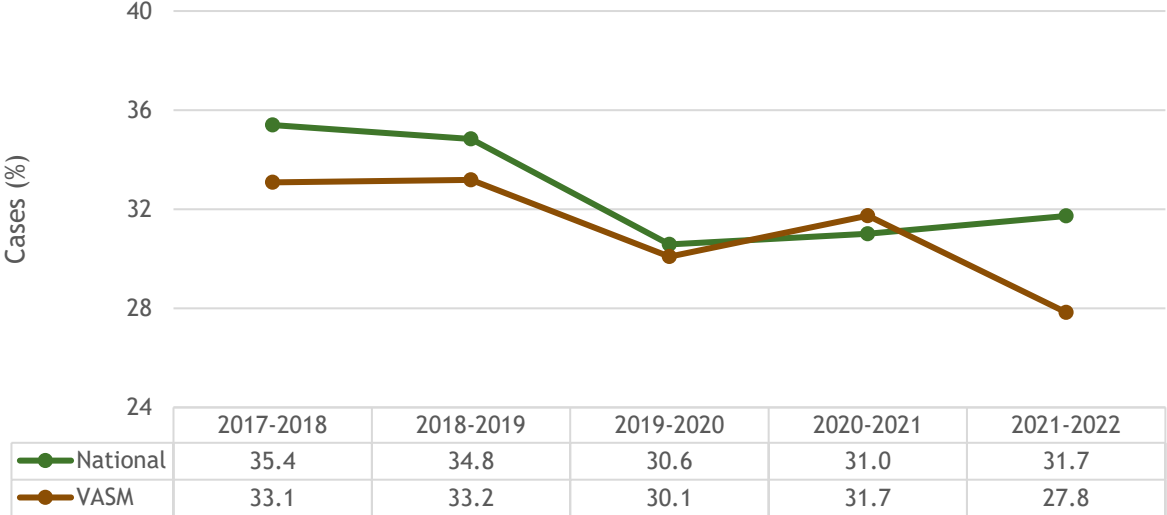
**Notes:** 17.7% (1,019/5,771) of VASM cases deaths had an unplanned CCU admission (1 July 2017–30 June 2022). Data not available: n=25. 17.8% (1,887/10,622) of national cases had an unplanned CCU admission (1 July 2017–30 June 2022). Data not available: n=65. National defined as other participating jurisdictions, exclusive of Victoria and New South Wales data. The 2021–2022 data will be more complete in the next report as more cases become available for analysis.

**Figure A.8: Deaths with unplanned readmission, 2017–2022**



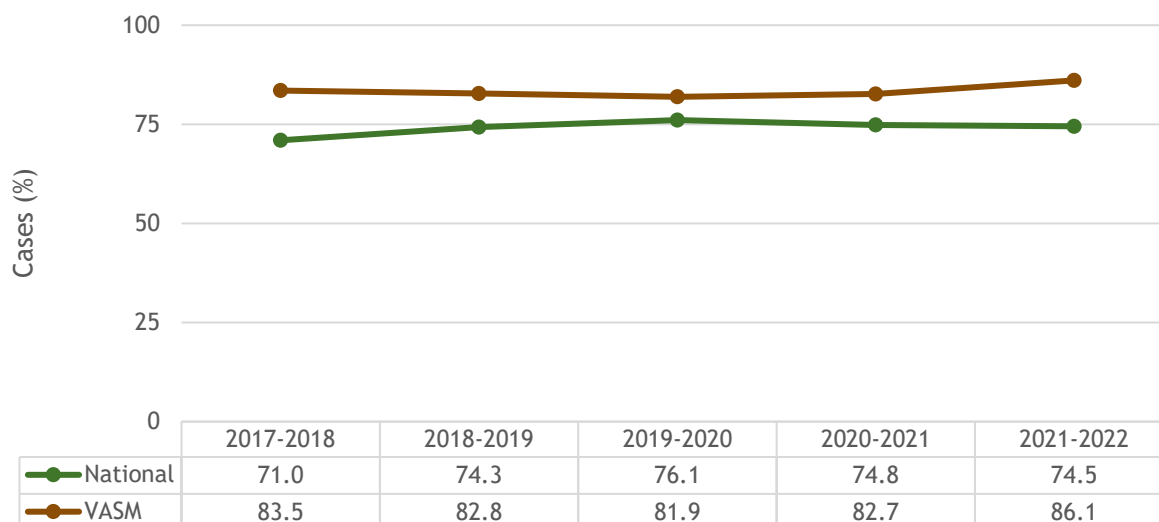
**Notes:** 4.3% (251/5,771) of VASM cases had an unplanned readmission (1 July 2017–30 June 2022). Data not available: n=42. 3.3% (350/10,622) of national cases had an unplanned readmission (1 July 2017–30 June 2022). Data not available: n=66. National defined as other participating jurisdictions, exclusive of Victoria and New South Wales data. The 2021–2022 data will be more complete in the next report as more cases become available for analysis.

**Figure A.9: Deaths with clinically significant infection, 2017–2022**



**Notes:** 31.3% (1,807/5,771) of VASM cases had a clinically significant infection (1 July 2017–30 June 2022). Data not available: n=46. 32.7% (3,478/10,622) of national cases had a clinically significant infection (1 July 2017–30 June 2022). Data not available: n=37. National defined as other participating jurisdictions, exclusive of Victoria and New South Wales data. The 2021–2022 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, 2017–2022**



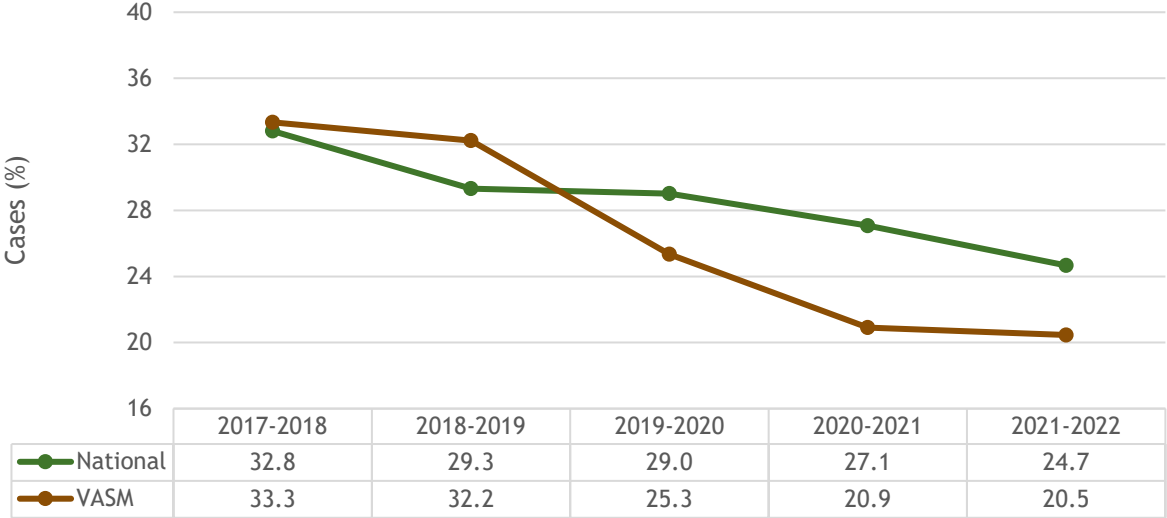
**Notes:** 83.1% (6,028/7,252) operative episodes for 5,324 VASM cases had a consultant present in theatre (1 July 2017–30 June 2022). 74.8% (8,367/11,193) operative episodes for 8,127 national cases had a consultant present in theatre (1 July 2017–30 June 2022). National defined as other participating jurisdictions, exclusive of Victoria and New South Wales data. The 2021–2022 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, 2017–2022**

| Audit period, % <sup>1</sup> (n) | Private                   |                           | Public                    |                           |
|----------------------------------|---------------------------|---------------------------|---------------------------|---------------------------|
|                                  | VASM                      | National                  | VASM                      | National                  |
| 2017-2018                        | 94.4 (418/443)            | 90.8 (432/476)            | 80.3 (1,131/1,409)        | 66.5 (1,418/2,131)        |
| 2018-2019                        | 91.6 (381/416)            | 93.0 (387/416)            | 80.0 (1,065/1,331)        | 70.5 (1,457/2,066)        |
| 2019-2020                        | 91.4 (287/314)            | 97.3 (429/441)            | 79.6 (997/1,253)          | 71.0 (1,297/1,828)        |
| 2020-2021                        | 95.4 (272/285)            | 94.8 (366/386)            | 79.1 (803/1,018)          | 70.8 (1,362/1,923)        |
| 2021-2022                        | 97.9 (139/142)            | 94.4 (255/270)            | 83.4 (529/634)            | 70.5 (963/1,365)          |
| <b>Total</b>                     | <b>93.6 (1,497/1,600)</b> | <b>94.0 (1,869/1,989)</b> | <b>80.2 (4,527/5,645)</b> | <b>69.8 (6,453/9,313)</b> |

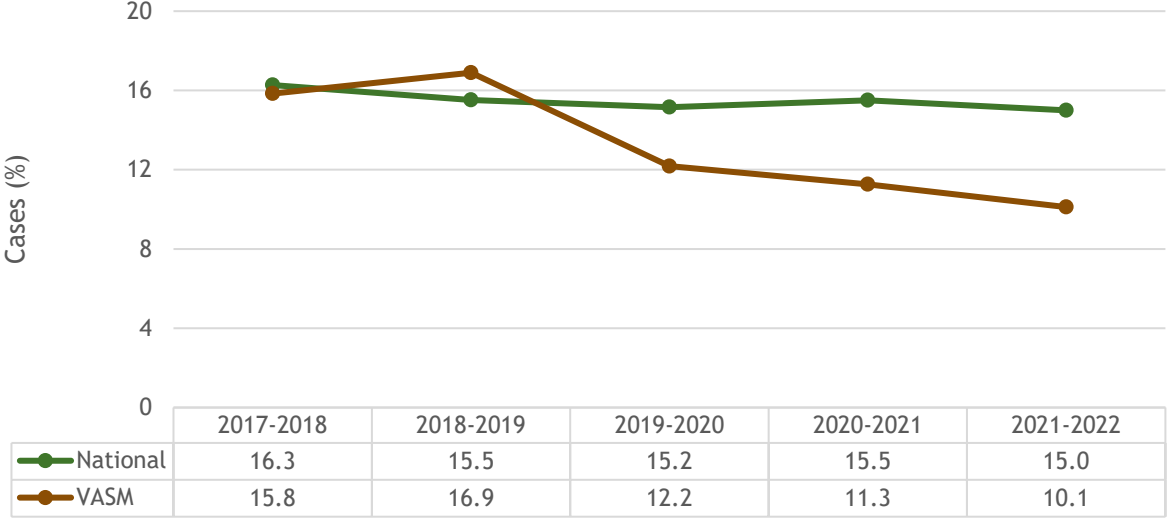
**Notes:** 1 = Proportion of cases where at least one operation took place. National defined as other participating jurisdictions, exclusive of Victoria and New South Wales data.

**Figure A.11: Deaths with postoperative complications, 2017–2022**



**Notes:** 27.2% (1,446/5,324) of VASM cases had postoperative complications (1 July 2017–30 June 2022). Data not available: n=62. 28.8% (2,340/8,133) of national cases had postoperative complications (1 July 2017–30 June 2022). Data not available: n=36. National defined as other participating jurisdictions, exclusive of Victoria and New South Wales data. The 2021–2022 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, 2017–2022**



**Notes:** 13.7% (731/5,324) of VASM cases had an unplanned return to theatre (1 July 2017–30 June 2022). Data not available: n=7. 15.5% (1,261/8,133) of national cases had an unplanned return to theatre (1 July 2017–30 June 2022). Data not available: n=17. National defined as other participating jurisdictions, exclusive of Victoria and New South Wales data. The 2021–2022 data will be more complete in the next report as more cases become available for analysis.

**Table A.3: Areas of VASM CMIs, 2017–2022**

| Year, % (n)  | 2017–2018           | 2018–2019           | 2019–2020           | 2020–2021           | 2021–2022         |
|--|---------------------|---------------------|---------------------|---------------------|-------------------|
| No issues identified   | 68.4<br>(930/1,359) | 69.8<br>(949/1,359) | 72.8<br>(925/1,271) | 77.4<br>(841/1,086) | 79.6<br>(540/678) |
| Area of consideration  | 15.2<br>(206/1,359) | 12.9<br>(175/1,359) | 13.2<br>(168/1,271) | 11.4<br>(124/1,086) | 10.3<br>(70/678)  |
| Area of concern  | 8.5<br>(115/1,359)  | 6.4<br>(87/1,359)   | 5.8<br>(74/1,271)   | 4.3<br>(47/1,086)   | 3.1<br>(21/678)   |
| Adverse event  | 7.9<br>(107/1,359)  | 10.7<br>(146/1,359) | 8.2<br>(104/1,271)  | 6.6<br>(72/1,086)   | 6.8<br>(46/678)   |
| Preventable issues   | 18.8<br>(256/1,359) | 17.4<br>(237/1,359) | 14.9<br>(190/1,271) | 12.3<br>(134/1,086) | 12.8<br>(87/678)  |
| Preventable adverse event or area of concern                           | 12.7<br>(172/1,359) | 12.1<br>(165/1,359) | 9.7<br>(123/1,271)  | 7.9<br>(86/1,086)   | 8.4<br>(57/678)   |
| Preventable adverse event or area of concern that contributed to death | 3.0<br>(41/1,359)   | 3.6<br>(49/1,359)   | 2.6<br>(33/1,271)   | 2.4<br>(26/1,086)   | 2.9<br>(20/678)   |

**Table A.4: Assessor-identified preventable CMIs that contributed to VASM deaths, 2021–2022**

| Admission phase      | Incident category                               |
|----------------------|---|
| <b>Preoperative</b>  |   |
|                      | Cardiac pre-operative assessment inadequate     |
|                      | Injury caused by fall in hospital (4 instances) |
|                      | Delay in transfer to surgical unit              |
| <b>Perioperative</b> |   |
|                      | Injury to heart during open surgery             |
|                      | Injury to liver during open surgery             |
|                      | Arterial complication of open surgery           |
|                      | Perioperative cerebral ischaemia or infarction  |
| <b>Postoperative</b> |   |
|                      | Aspiration pneumonia                            |
|                      | Endoscopic surgery, organ related technical     |
|                      | Diagnosis missed by surgeons                    |
|                      | Open surgery, organ related technical           |
|                      | Anastomotic leak after open surgery             |
|                      | Haemorrhage after needle biopsy                 |

**Table A.5: Areas of clinical management, 2021–2022**

| Variable   | VASM (%) | National (%) | p value            |
|--|----------|--------------|--------------------|
| Audited deaths with delay in surgical diagnosis                                  | 5.2      | 4.5          | 0.497              |
| Audited deaths with delay in transfer  | 12.8     | 13.6         | 0.827              |
| Audited deaths without use of intensive care (ICU) or high dependency unit (HDU) | 56.4     | 58.8         | 0.280              |
| Audited deaths with unplanned admission to intensive care (ICU)                  | 17.2     | 16.2         | 0.537              |
| Audited deaths with unplanned readmission  | 3.7      | 4.3          | 0.522              |
| Audited deaths with a clinically significant infection                           | 27.8     | 31.7         | 0.065              |
| Operation with the consultant surgeon present in theatre                         | 86.1     | 74.5         | <b>&lt;0.0001*</b> |
| Audited operative deaths with unplanned return to theatre                        | 10.1     | 15.0         | <b>0.004*</b>      |
| Inappropriate DVT prophylaxis treatment as viewed by the assessor                | 1.5      | 1.6          | <b>0.021*</b>      |
| Audited deaths with fluid balance issues as viewed by the assessor               | 5.7      | 5.3          | 0.685              |

**Notes:** Denominator varies due to different criteria for each row. \* = indicates statistically significant differences between VASM and national data ( $p < 0.05$  using  $\chi^2$  tests). The 'p' value indicates the chance of a result occurring randomly. National defined as other participating jurisdictions, exclusive of Victoria and New South Wales data.

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