

Victorian Audit of Surgical Mortality (VASM)

Report

01/07/2016 - 30/06/2017



ROYAL AUSTRALASIAN
COLLEGE OF SURGEONS



The Victorian
Surgical Consultative Council



The Royal Australian
and New Zealand
College of Obstetricians
and Gynaecologists
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Abbreviations

ANZASM	Australian and New Zealand Audit of Surgical Mortality
ANZCA	Australian and New Zealand College of Anaesthetists
AOA	Australian Orthopaedic Association
ASA	American Society of Anesthesiologists
CCU	critical care unit
CHASM	Collaborating Hospitals' Audit of Surgical Mortality
CPD	continuing professional development
DHHS	Department of Health and Human Services
DRG	diagnosis-related group
DVT	deep vein thrombosis
FLA	first-line assessment
NSQHS	National Safety and Quality Health Service
RACS	Royal Australasian College of Surgeons
RANZCOG	Royal Australian and New Zealand College of Obstetricians and Gynaecologists
SCF	surgical case form
SCV	Safer Care Victoria
SLA	second-line assessment
VAED	Victorian Admitted Episodes Dataset
VASM	Victorian Audit of Surgical Mortality
VCCAMM	Victorian Consultative Council on Anaesthetic Mortality and Morbidity
VSCC	Victorian Surgical Consultative Council

Clinical Director's report

Learning from mortality outcomes

This is the 10th report since data collection began for the Victorian Audit of Surgical Mortality (VASM), which commenced on 1 July 2007. In this report we present the outcomes of the review of 5,348 deaths from 1 July 2012 to 30 June 2017 that completed the audit process, once 100% audit participation was achieved by both public and private hospitals in Victoria. This start date also coincided with the Royal Australasian College of Surgeons (RACS) mandating the audit for surgical Fellows. In addition, the Royal Australian and New Zealand College of Obstetricians and Gynaecologists (RANZCOG) joined the audit program in 2012. Thus, this audit period allows comparison of uniform data collected over successive years. The VASM commenced collaboration with the Victorian Consultative Council on Anaesthetic Mortality and Morbidity (VCCAMM) in July 2016 to facilitate the reporting of surgical deaths with a possible anaesthetic component.

Since 2007, nine Case Note Review Booklets have been disseminated which, together with the reports, seminars and workshops have proven to be a good and informative tool with the surgical readership.

The RACS continues to place increased emphasis on participation in the VASM as part of continuing professional development (CPD).⁽¹⁾ Since January 2017, our orthopaedic colleagues use the VASM as the only pathway for mandatory mortality audit in their CPD program, as determined by the Australian Orthopaedic Association (AOA). This date also coincides with electronic submission of data as the only method of data submission by all surgeons to the VASM, which is anticipated to greatly improve the quality and completeness of our data.

Despite the existence of this audit, it has been observed that some clinical management issues occur repeatedly. This has led VASM to refocus on its educational role, disseminating lessons learned to clinicians and using the hospital governance reports to drive further improvements.

The Targeting zero report, which assessed the department's systems for all in-hospital care in both the public and private sectors, was released on 14 October 2016.⁽²⁾ Implementation of recommendations had started to produce improvements in identified areas and the VASM continues to play an important role in the revised structure.

The support of the Victorian State Government, the Victorian Department of Health and Human Services (DHHS), Safer Care Victoria (SCV), the Victorian Surgical Consultative Council (VSCC), VCCAMM, The Australian and New Zealand College of Anaesthetists (ANZCA), the Australian Commission on Safety and Quality in Health Care, the Victorian Managed Insurance Authority, the AOA, RANZCOG and RACS has facilitated our task.

This is my last Report, as I will stand down at the end of 2017, and I am happy to introduce Mr Philip McCahy who has taken up the challenge of facilitating the VASM journey. I wish to thank all who have helped us to get where we are. The success of the VASM is dependent upon participating surgeons and hospitals, and highly efficient, motivated and hard-working staff members at the RACS. I remain confident about the future impact of the VASM under new directorship.

Yours sincerely,



Mr Barry Beiles MB.BCh, FRACS (Vasc)
Clinical Director, VASM

VASM Executive Summary

Audited deaths (1 July 2012 to 31 June 2017) (n= 5,348)

Demographics



Age

Age 1 day to 104 years
Mean age 73 years
Median (IQR) 78 (66-86) years



Gender

Male 55.6% (n=2,973)
Female 44.4% (n=2,375)

Risk



Admission status

Elective 17.8% (n=942)
Emergency 82.2% (n=4,361)



Transfers

Patient transfer 20.6% (n=1,104)
Transfer delays 9.4% (n=104)



Preoperative death risk

Minimal 2.6% (n=138)	Moderate 23.1% (n=1,235)	Expected 11.7% (n=625)
Small 9.6% (n=512)	Considerable 43.6% (n=2,330)	Unknown 9.4% (n=508)



Comorbidities

Yes 90.7% (n=4,849)
No 9.0% (n=482)
Unknown 0.3% (n=17)

Total comorbid factors identified 14,703

Cardiovascular 22.2% (n=3,271)	Advanced malignancy 6.3% (n=931)
Respiratory 11.5% (n=1,692)	Diabetes 6.6% (n=974)
Renal 9.7% (n=1,427)	Obesity 3.5% (n=521)
Hepatic 2.5% (n=367)	Age 19.2% (n=2,820)
Neurological/psychiatric 6.5% (n=961)	Other 11.8% (n=1,739)

Operative Profile



Top 10 surgical diagnoses

Fracture of neck of femur	27.2% (n=769)	Aortic aneurysm	6.2% (n=176)
Malignancy	23.2% (n=655)	Sepsis	5.0% (n=141)
Cardiac disease	11.9% (n=337)	Neurotrauma	4.2% (n=118)
Cerebrovascular accident	9.4% (n=267)	Cerebrovascular	1.2% (n=34)
Intestinal obstruction	9.4% (n=265)	Pancreatitis	0.7% (n=21)



Operations

None	8.7% (n=466)	Two	13.9% (n=746)
One	68.8% (n=3,679)	Three or more	8.5% (n=457)



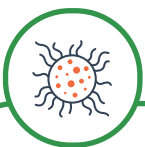
Top 10 surgical procedures

Laparotomy(-oscopy) approach	17.9% (n=1,287)	Colorectal	7.8% (n=561)
Orthopaedic	12.1% (n=867)	Other abdominal and hernia	7.5% (n=539)
Wound care	10.5% (n=756)	Thoracic and tracheostomy	6.7% (n=479)
Cardiac	9.6% (n=689)	Neurosurgical non-trauma	4.9% (n=354)
Neurosurgical trauma	8.3% (n=594)	Gastro-intestinal endoscopy	4.4% (n=317)



Postoperative complications

No complications	65.5% (n=3,200)	2 or more complications	4.7% (n=230)
1 operative complication	28.5% (n=1,390)	Unknown	1.3% (n=62)



Infections

Occurred in 966 cases.

Acquired postoperatively	71.6% (n=692)	Surgical-site infection	7.0% (n=68)
Acquired preoperatively	16.3% (n=157)	Other invasive-site infection	5.1% (n=49)



Trauma

Occurred in 1,224 cases.

Fall at home	39.5 % (n=483)	Other falls	8.9% (n=109)
Fall in a care facility	32.2% (n=394)	Road accident	11.0% (n=135)
Fall in hospital	5.8% (n=71)	Violence	2.6% (n=32)



Unplanned return to the operating theatre

Unplanned return 15.2% (740/4,882)

Audit Outcomes



Degree of criticism of patient management

Occurred in 5,348 patient surgical care cases.

No issues identified	70.6% (n=3,735)	Area of concern	8.0% (n=425)
Area of consideration	17.1% (n=907)	Adverse event	4.2% (n=222)



Most common preventable issues identified

Occurred in 817 cases.

Operative management issues	26.7% (n=218)
Delay issues	19.3% (n=158)
Postoperative care issues	16.4% (n=134)
Preoperative care issues	12.1% (n=99)
Protocol issues	8.6% (n=70)

I. 2016–2017 Current audit period indicators

The current audit period indicators presented in this section include a comparison between VASM and national data from the Australian and New Zealand Audit of Surgical Mortality (ANZASM) for the current financial year (1 July 2016–30 June 2017). The Collaborating Hospitals' Audit of Surgical Mortality (CHASM) in New South Wales runs a comparable audit methodology to ANZASM and collects similar data. CHASM data was not accessible to VASM as it is independently managed by the Clinical Excellence Commission of New South Wales, and has a different data lock and different time frame requirements for analysis. As a result, the ANZASM national data aggregate comparisons exclude audit outcomes for New South Wales.

Table 1 shows the characteristics of the current audit period.

Table 1: Characteristics of the current audit period

Characteristic	VASM 2016–2017	ANZASM 2016–2017	P value <i>p</i> <0.05 statistically significant*
Cases	n=805	n=2,387	
Age >85	28.6% (230/805)	26.9% (643/2,387)	0.385
Gender ratio (male : female)	56.1% : 43.9%	55.8% : 44.2%	0.902
Admission status (emergency : elective)	82.6% : 17.4%	86.9% : 13.1%	0.003*
Operative status (operative : nonoperative)	92.2% : 7.8%	79.4% : 20.6%	<0.001*
Comorbidities ≥3	57.2% (419/732)	59.0% (1,255/2,128)	0.434
ASA* >4	61.5% (452/735)	61.4% (1,315/2,141)	0.895
Diagnosis delay	6.4% (51/800)	5.3% (126/2,374)	0.248
DVT prophylaxis used	81.6% (596/730)	82.3% (1,534/1,865)	0.733
Transfer delay	9.3% (15/162)	10.5% (60/574)	0.769
Fluid balance unsatisfactory	8.5% (68/801)	7.7% (177/2,300)	0.494
CCU used	66.7% (494/741)	66.8% (1,264/1,893)	0.963
CCU should have been provided	5.8% (13/226)	6.6% (38/576)	0.75
Unplanned return to theatre	15.2% (113/742)	14.7% (279/1,892)	0.761
Unplanned admission to CCU	20.4% (151/740)	20.9% (394/1,888)	0.831
Postoperative complication	32.8% (241/735)	30.3% (569/1,877)	0.222
Infection	34.0% (249/732)	34.4% (645/1,876)	0.891
Surgical-site infection	6.6% (10/152)	8.8% (32/362)	0.482
No issues identified	75.1% (599/798)	80.8% (1,918/2,373)	0.007*
Area of consideration	12.7% (101/798)	10.6% (251/2,373)	0.118
Area of concern	6.6% (53/798)	5.4% (129/2,373)	0.440
Adverse event	4.9% (39/798)	2.9% (69/2,373)	0.009*
Preventable issues	10.7% (85/798)	9.6% (228/2,373)	0.410
Adverse event that was preventable	3.6% (29/798)	2.2% (52/2,373)	0.038*
Adverse event that was preventable and caused the outcome*	1.9% (15/798)	1.0% (23/2,373)	0.058

**p*<0.05 fisher exact test was considered statistically significant.

Note: VASM n=805, ANZASM n=2,387. In some sections data was omitted or not applicable for analysis of the study cohort, resulting in fluctuations in the denominator number). Audit period 1 July 2016 to 30 June 2017.

ANZASM: Australian and New Zealand Audit of Surgical Mortality; ASA: American Society of Anesthesiologists - the ASA physical status classification system is an international measure of patient risk used by anaesthetists.⁽³⁾ CCU: critical care unit; DVT: deep vein thrombosis; VASM: Victorian Audit of Surgical Mortality.

*Note: Assessors flagged futile surgeries as adverse events that were preventable and caused the outcome. This has been driven by improved assessor understanding on the topic of futile surgeries.⁽⁴⁾ These patients are overwhelmingly elderly people many of whom would have passed away over the short to medium term without the surgery having been performed. Because of the risks inherent in surgery and anaesthetics, futile surgery on elderly patients can cause harm (the outcome) where no error occurred during the surgery.

Comments:

The implementation of risk management strategies for a generally elderly and infirm group of patients is especially important. The audit looks at parameters such as American Society of Anaesthesiologists (ASA) grade, admission status, the use of deep vein thrombosis (DVT) prophylaxis to reduce the likelihood of pulmonary embolus, use of critical care facilities and fluid balance management. The proportion of patients aged over 85 was higher in Victoria (28.6%; 230/805) compared with patients nationally (26.9%; 643/2,387) although the difference was not statistically significant ($p=0.4$). The majority of surgical deaths have occurred in elderly patients with underlying health problems who were admitted as emergency patients with acute life-threatening conditions that often required surgery. The actual cause of death was often linked to their pre-existing health status, in that the cause of death frequently mirrored the pre-existing illness.

It has been observed during the audited period that 7.8% of the 805 of Victorian patients do not have an operation during their episode of care. This was usually the result of an active decision not to proceed and often occurred in patients admitted as an emergency for an irretrievable clinical problem. The most frequent operative procedures described were for trauma or acute abdominal pathology. This reflects the high percentage of patients admitted as emergencies in the audited period.

Assessors involved in the audit process review the appropriateness of the clinical care provided in each case. A case can have multiple issues associated with the patient care; for this analysis the more comprehensive assessment, the second-line assessment (SLA), was considered when one was available. An adverse event and an area of concern are at the higher end of the spectrum of criticism applied by the peer-review process. In over 75.1% (599/798) of audited deaths in Victoria there were no perceived issues of patient care. Nationally, this figure is 80.8% (1,918/2,373). When assessing areas of concern, it was observed that Victoria had a higher rate than the national figures (6.6%; 53/798 compared with 5.4%; 129/2,373, $p<0.4$). The Victorian rate of preventable adverse events was slightly higher than that nationally (10.7%; 85/798 compared with 9.6%; 228/2,373) but did not reach statistical significance ($p=0.34$).

It is important to remember that criticisms of clinical care are not always attributable to the surgical team. A third of the issues identified were attributed to other specialty areas or the institution in which the patient was receiving care.

1. Recommendations for clinical stakeholders

These emerging issues and recommendations are points to consider and execute by hospitals and health professionals. The recommendations outlined below are lessons learned from the audited surgical mortality cases. The treating surgeons involved in these cases receive detailed reports and recommendations on issues of patient management identified by the peer-review assessors.

1.1. Improved leadership in patient care

- In complex cases there must be clear, demonstrable leadership in patient management.
- The treatment plan for each patient should be understood by all involved in their care.
- The lead clinician must be accountable, responsive, prepared for challenges and must focus on optimal patient care.
- During lengthy operations there should be a low threshold for seeking assistance from colleagues to avoid fatigue.
- Senior surgical opinion is essential when dealing with surgical complications and should not be delayed by team hierarchy structure.

1.2. Improved perioperative management

- Appropriate preoperative, intraoperative and postoperative preparation and management aims to decrease operative complications and promote successful recovery. Delay in, or unnecessary preoperative investigations can have fatal consequences.
- Preparation and management should include:
 - evaluation of both physical and psychological preparation
 - complete medical history and physical examination procedures
 - consent for the surgery and discussion of potential outcomes
 - appropriate documentation and communication of results with clinical and surgical teams
 - the avoidance of futile surgery through informed discussion with the patient and family.
- The patient should be discharged to the ward with comprehensive orders.
- Preventative measures should be implemented for reducing complications.
- Instructions must be given about further management when the patient is discharged from a clinical or surgical team.
- The potential outcomes from the probable clinical diagnosis must be considered when developing a treatment plan.
- The patient should be transferred to a medical unit if they are elderly, high risk and medical issues have been identified as the most prominent clinical factor during the admission episode. This is, however, on the basis that the surgical postoperative care can be performed appropriately in that setting.

1.3. Improved protocol compliance

- All hospitals should have a formal protocol for early identification of clinical management issues and immediate management plans. This protocol needs to be updated according to national guidelines and policies.
- Hospitals should follow protocols. Failure to follow hospital protocols or national clinical guidelines during all stages of patient care can contribute to errors.

1.4. Action on evidence of clinical deterioration

- Clinical deterioration should be monitored as it is an issue that is recognised throughout Australia and internationally.
- When clinical deterioration occurs and there is no clear cause, consideration should be given to causes outside the treating surgeon's specialty or expertise.
- Clinical findings must be considered alongside the results of investigations.
- Clinical deterioration must be acted on as well as recorded.

1.5. Futile surgery and end of life care

- A number of surgeons and assessors considered that some of the surgical procedures were futile.
- Decisions about whether to continue with active treatment and surgery can be very complex in frail patients, particularly when the treatment has a high risk of death or when the end of life is near.
- RACS has explored the topic of futile surgery and end of life matters, and prepared a policy statement on this topic.⁽⁴⁾

1.6. Improved awareness of surgical emergencies, transfers and sharing of care

- The audit revealed that patients admitted as surgical emergencies are at greater risk when their care is shared. All health professionals should increase their awareness of this risk to improve the quality and safety of patient care.
- Due to their limited physiological reserves, time delays should be minimised for elderly, frail patients who need to be transferred between hospitals. Time delays can significantly affect surgical outcomes.

1.7. Infection control

- The audit revealed that patients admitted as surgical are at an increased risk of developing infection.⁽⁵⁾ The risk is high, especially in such a comorbid group of patients, and stringent infection control care should be considered in this patient pool. The Australian Guidelines for the Prevention and Control of Infection in Healthcare are designed to prevent and manage healthcare associated infection and these should be utilised at hospitals. The VASM endorses the use of current hospital protocols and guidelines to reduce the incidence of infection.⁽⁶⁾
- Key actions to be taken for control and management are:
 - timely recognition
 - appropriate investigation
 - rapid administration of treatment
 - timely involvement of expert teams.

1.8. In-hospital fall prevention

- The audit revealed that surgical patients had more combined falls while in hospital or in a health care facility than at home. All health professionals should increase their awareness of this risk of fall to improve the safety and quality of patient care.
- The Best Practice Guidelines for Australian Hospitals, Residential Aged Care Facilities and Community Care⁽⁷⁾ are designed to facilitate practices that reduce falls and associated harm. The VASM endorses the use of current hospital protocols and guidelines to reduce the incidence of in-hospital falls.^(8, 9)

1.9. Improved communication

- All health professionals and institutions should actively collaborate and communicate to support an appropriate interchange of information and coordination of patient care.

- Effective and efficient communication is required at all times during the admission episode.
- RACS is committed to building respect in surgery in Australia and New Zealand, and handling complaints of bullying, discrimination, harassment and sexual harassment, as outlined in The RACS Action Plan: Building Respect, Improving Patient Safety.⁽¹⁰⁾

2. Introduction

2.1. About the VASM

The VASM is part of the ANZASM, a national network of regionally-based audits of surgical mortality that aim to ensure the highest standard of safe and comprehensive surgical care. The VASM is collaboration between the Victorian Government's DHHS, SCV, VSCC, RACS, RANZCOG, AOA and the VCCAMM. The VASM project is funded by SCV to review all deaths associated with surgical care and to ascertain the adverse outcomes that could have been prevented. Safer Care Victoria replaced the Office for Safety and Quality Improvement and is Victoria's leading agency for healthcare safety, quality and innovation. Safer Care Victoria works with patients and health services to take a patient-centred approach to quality and safety improvement. See Figure 1 in the 2016–2017 VASM Technical Report for more information relating to the governance of the VASM.⁽¹¹⁾

2.2. Objectives

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

2.3. Audit process

Regional audits of surgical mortality are notified of in-hospital deaths associated with surgical care. The mortality notifications in Victoria are submitted by hospitals, coroner e-depositions or directly from the treating surgeon. All cases in which a surgeon was responsible for, or had significant involvement in, the care of a patient are within the scope of the audit, whether or not the patient underwent a surgical procedure. The audit includes deaths that occur in a Victorian hospital when:

- an operation was performed by a surgeon or gynaecologist, regardless of who admitted the patient, or
- the patient was under the care of a surgeon or gynaecologist and no operation was performed.

If a case does not fulfil either of the above-listed criteria it is excluded from the audit by the notifying hospital or by audit staff. Deaths identified by the reporting surgeon as terminal care cases are recorded, but these are excluded from further assessment in the audit. Terminal care is nominated by the surgeon on the surgical case form (SCF) and cannot be identified from the notification of death information received by the audit of surgical mortality office.

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

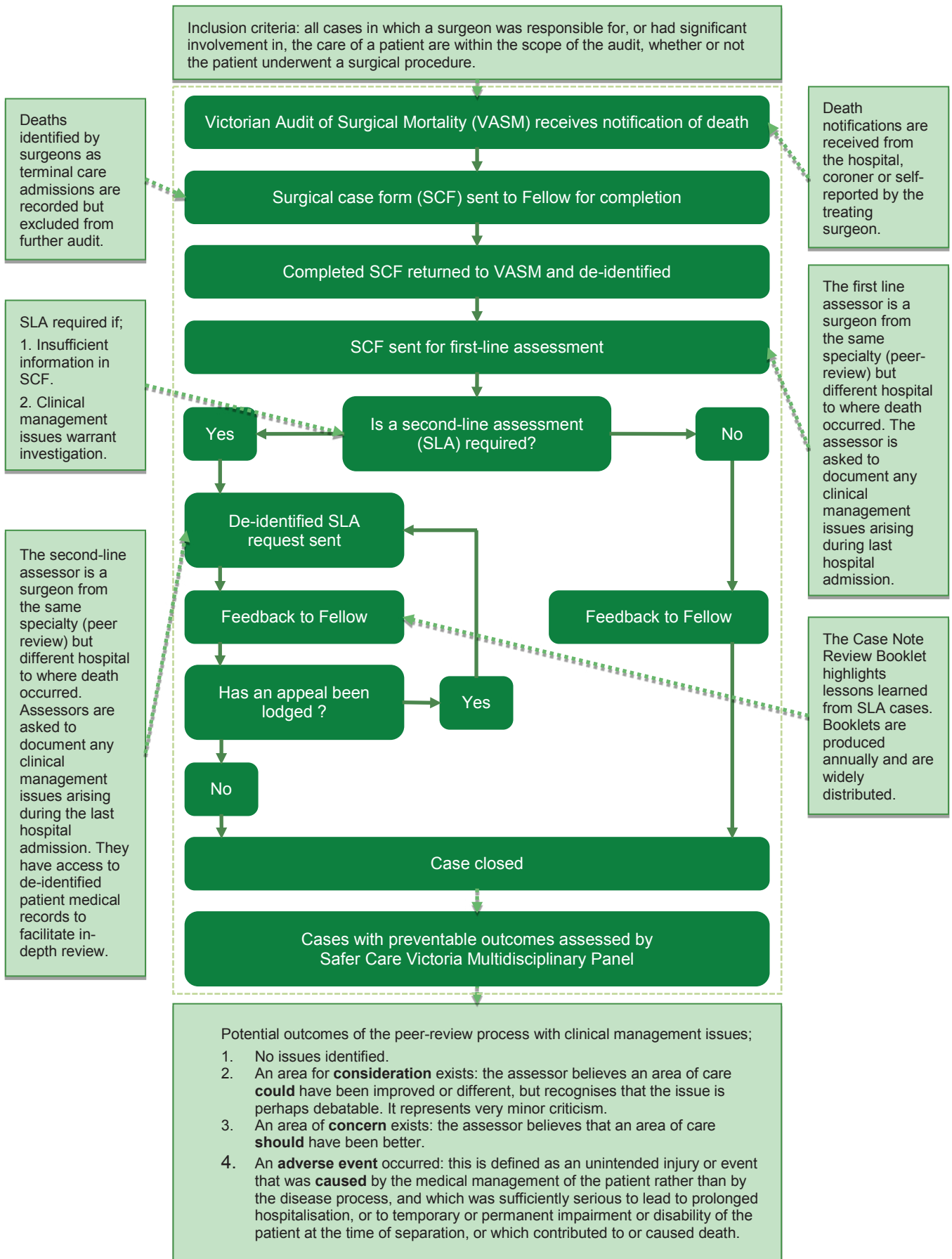
There are two possible outcomes of the FLA.

- The information provided by the treating surgeon is adequate to reach a conclusion about the case and to identify issues of clinical management, if present.
- A further in-depth Second-line assessment (SLA case note review) is necessary:
 - for clarification of issues of patient management identified or suspected by the first-line assessor, or
 - because the information provided by the treating Fellow was inadequate to reach a conclusion.

In response to the Targeting zero report recommendations,⁽²⁾ an additional process commenced in 2017 in collaboration with the VSCC and SCV for a multidisciplinary panel to review selected de-identified SLAs involving cases where the outcome was potentially preventable. The outcome of the multidisciplinary panel review will be presented in future VASM reports.

Where SLA is deemed necessary, assessors are selected using the same criteria as for first-line assessors. The reports provided by the assessors are returned to the treating Fellow, together with a feedback form so that the treating surgeon can “assess the assessors”. The feedback form contains a free-text field in which the treating surgeon can expand on points raised in the assessment. This allows the treating Fellow to provide accurate clinical details of the treated patient. Any updates received from the treating surgeon are added to the file held by the VASM. (See Figure 1 for audit process)

Figure 1: The VASM audit process



2.4. Anaesthetic mortality review collaboration

The VASM commenced collaboration with the VCCAMM in July 2016. The state-wide monitoring and reporting of potential anaesthesia-related mortality and morbidity by the VCCAMM is based on the voluntary submission of direct reports from treating anaesthetists, or indirect reports from VASM and other medical practitioners or hospital anaesthetic departments. The VASM also identifies patients who may have a potential anaesthetic component to their death based on the information provided in the SCF (Question 17) by the treating surgeon (see Figure 2). The VASM refers these cases to VCCAMM for a further anaesthetic assessment, in an attempt to achieve more complete capture of anaesthetic-related deaths. VCCAMM currently is investigating the methodology how feedback can be provided to VASM under VCCAMM's current legislative obligations.⁽¹²⁾

Figure 2 shows the methodology used by VASM to report potential anaesthetic cases to VCCAMM.

Figure 2: Flowchart of VASM reporting methodology for potential anaesthetic cases to VCCAMM



II. 2012–2017 Audit trend indicators

3. Audit compliance and audit processes

3.1. Audit numbers

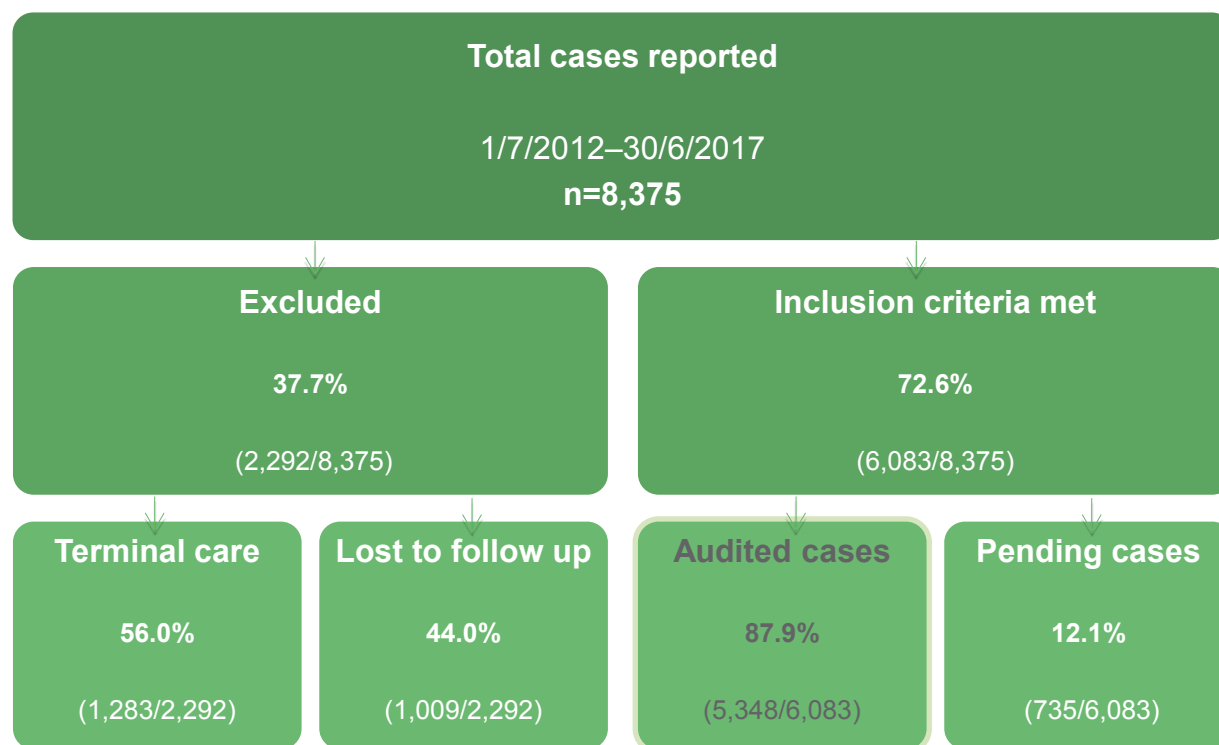
The present audit reports on the period 1 July 2012 to 30 June 2017. During this period the VASM received 8,375 notifications of deaths that were associated with surgical care. Data from 1 July 2007–30 June 2012 has been cumulatively reported in previous VASM publications.⁽¹¹⁾

It is beneficial to put these deaths into perspective by reviewing the total number of surgical procedures performed in Victoria over this period. VASM examined the Victorian Admitted Episodes Dataset (VAED), and found that since 1 July 2012, a total of 3,283,726 patients underwent an interventional procedure in Victoria.

It should be noted that there also are reported deaths that emanate from the private sector. The private sector accounted for 30.7% (1,644/5,348) of total cases audited from 1 July 2012 to 30 June 2017. Differences in risk profiles between the two sectors are associated with the fact that critically ill, higher risk emergency patients are generally seen in the public hospital system, which provides the majority of critical care services.

Figure 3 shows the VASM audit numbers.

Figure 3: Audit numbers



Note: n=8,375 cases reported.

Comments:

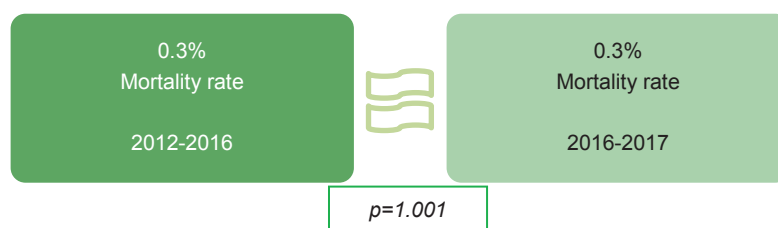
- Audit data from 2012 has been included for this report analysis because at this time:
 - 100% audit participation was reached at sites with surgical services across public and private hospitals in Victoria.
 - RACS mandated the audit for surgical Fellows.
 - RANZCOG joined the audit programme.
 - The SCF had been revised for several risk management sections to capture improved quality data.
- The VASM reports on clinical outcomes for closed cases that have completed the full peer review and data cleaning process.
- The findings on 27.4% (2,292/8,375) of the reported mortalities were excluded from further analysis. Exclusion was due to terminal care admissions in 1,283 of the 2,292 cases and the case being lost to follow up in 1,009 of the 2,292 cases (reporting errors, cases wrongly attributed to surgical units, the surgeon moving interstate, abroad or retiring, unattainability of medical records, Fellows relocating health service sites or Fellows being noncompliant).
- Clinical information and completed assessment reviews were available for 87.9% (5,348/6,083) of cases reported after 1 July 2012 that met the audit inclusion criteria.
- The backlog of 12.1% (735/6,083) of cases for the 2016–2017 audit period will be included in the analysis of future reports. The time frame given for each step of the audit process (SCF, FLA and SLA return) is 21 working days. Obtaining medical records and de-identifying the documentation can take up to 4 months for complex cases.
- The VASM's goal is to review all mortality cases within 3 months of notification. The specialties with the highest casemix were General Surgery, Orthopaedic Surgery, Neurosurgery, Vascular Surgery and Cardiothoracic Surgery. Work is being undertaken to streamline the review process.

3.2. Verification of audit numbers

The audit process is dependent upon receiving notifications of death from participating hospitals. This requires each hospital to prepare and submit a list of deaths that have occurred while the patient was under the care of a surgeon. In these circumstances the discharging unit would usually be recorded as surgical; however, in some instances a patient who has received surgical care may not be under the care of a surgeon at the time of death.

In parallel with the VASM audit process, hospitals must also submit data to the VAED, which is maintained by the DHHS. This is a robust database providing the casemix information required for hospital activity based funding.⁽¹³⁾ The information identifies individual patient care episodes to diagnosis-related groups (DRGs). These DRGs are specialty-specific and provide an alternative source of mortality data. The DHHS has provided the VASM with a list of procedural deaths that occurred in patients with surgical DRGs over the period 1 July 2012 to 30 June 2017. A comparison of the VAED data with the VASM reported mortality data was performed to ascertain potential gaps in reporting of hospital mortality to the audit office. These gaps are verified by VASM by requesting sites to review unreported deaths. The gap in reporting process identified 246 interventional procedures that do not fulfil the VASM inclusion criteria (e.g. cardiology, radiology, gastroenterology procedures), brings the VASM reporting compliance by health services to 100%. This is shown in Table 2 and Figure 4.

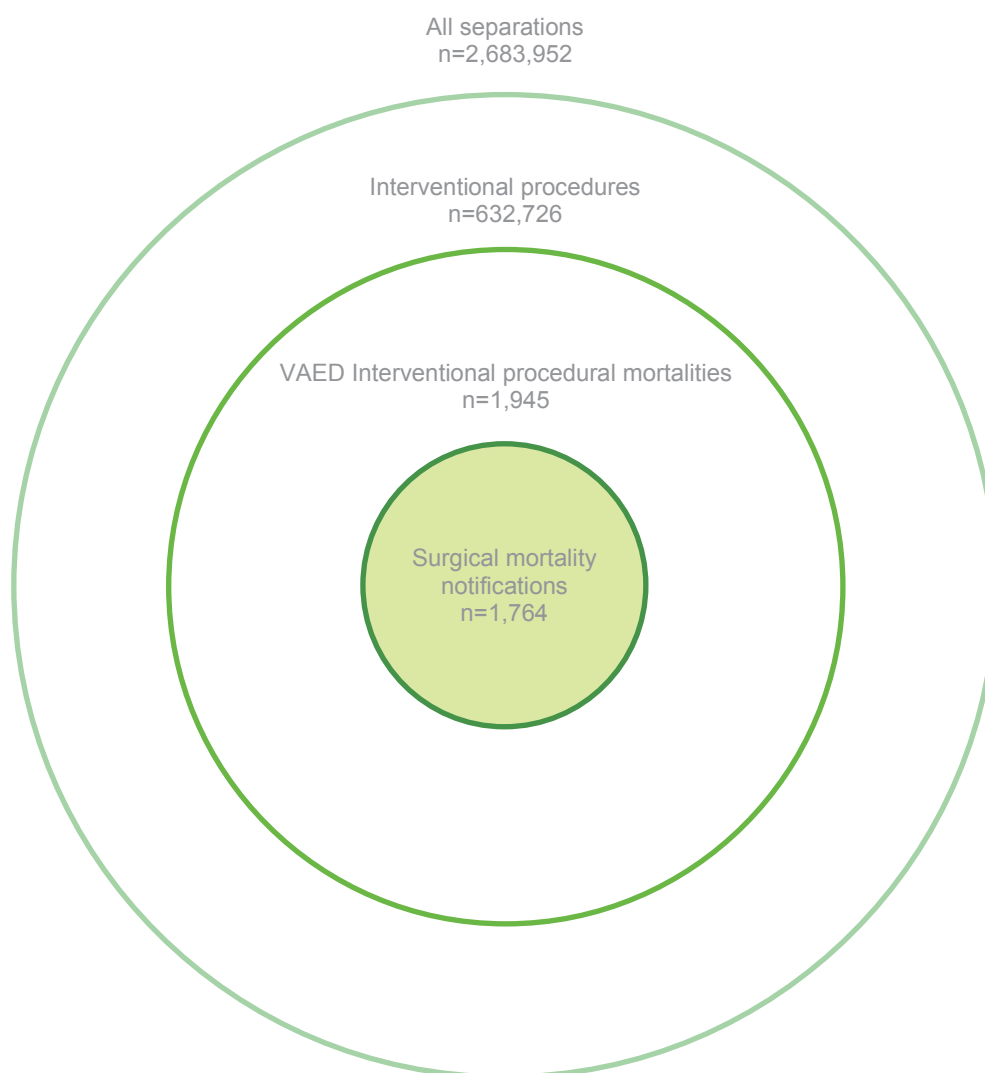
Table 2: Mortalities identified by Victorian Admitted Episodes Dataset and Victorian Audit of Surgical Mortality



Audit period	Total interventional procedures	VAED reported interventional procedural mortalities	VASM reported surgical mortalities
2012–2013	634,609	1,997	1,558
2013–2014	663,768	1,924	1,613
2014–2015	672,957	1,966	1,700
2015–2016	679,676	2,009	1,720
2016–2017	632,716	1,945	1,764
Total	3,283,726	9,841	8,355

Audit period 1 July 2012 to 30 June 2017.
VAED: Victorian Admitted Episodes Dataset.
p= probability value.

Figure 4: Mortalities identified in 2016-2017 by the Victorian Admitted Episodes Dataset versus the Victorian Audit of Surgical Mortality



Comments:

- The VAED indicated that from 1/7/2012 to 30/6/2017, 3,283,726 patients received procedural or surgical care in Victorian public and private hospitals. Of these, 0.3% (8,355) resulted in auditable mortalities reported to the VASM.⁽¹⁴⁾
- For the 2016–2017 period, VAED identified 1,945 interventional procedures including surgical mortalities while VASM identified 1,764. When the data sets were investigated, 246 cases were identified in the VAED results that were not included in the VASM results. The number of cases by surgical specialty were: Cardiology (n=110), Nephrology (n=2), Obstetrics (n=3), Neonatology (n=35), Haematology (n=15), Endocrinology (n=16), Gastroenterology (n=1) and other undefined procedures (n=64). Subsequent investigation demonstrated that all 246 cases did not meet the VASM audit criteria, therefore resulting in a 100% VAED and VASM notification match.
- It should be noted that the VASM and the VAED data are collected for different purposes and should be considered complementary. The VAED is a database established for funding purposes. It contains more patients than the VASM because procedures performed by non-surgeons are included in the VAED. Also,

the VASM dataset includes all patients under the care of a surgeon, whereas the VAED dataset used for this comparison includes only patients undergoing a procedure (see Figure 4).

- Based on VAED data there has been a stable mortality rate over the last 5 years of 0.3% (8,355/3,283,726).⁽¹⁴⁾
- The Australian Commission on Safety and Quality in Health Care engaged Monash University and Health Outcomes Australia to evaluate the economic impact of five clinical quality registries. The report stated that “*The Australian Audit of Surgical Mortality ... is understood to be highly effective.*” The study showed clinical quality registries have delivered significant value for money when correctly implemented and sufficiently mature, producing a substantial benefit to cost ratio ranging from 2:1 to 7:1.⁽¹⁵⁾

3.3. Hospital Clinical Governance and Hospital Performance Reports

- The VASM released the first series of the national individualised Hospital Clinical Governance Reports in 2014, and the current series was disseminated in 2017. The VASM and the ANZASM identify clinical management issues via independent peer-review assessments to actively manage and improve patient safety. The audit developed strategies to address these issues via educational tools such as workshops, seminars and publications. The Hospital Clinical Governance Reports use a comprehensive data set that can assist accreditation of hospitals for certain National Safety and Quality Health Service (NSQHS) Standards. These include: Standard 1 - Governance for Safety and Quality in Health, Standard 3 - Healthcare Associated Infections, Standard 6 - Clinical Handover, Standard 9 - Recognising and Responding to Clinical Deterioration in Acute Health Care and Standard 10 - Preventing Falls and Harm from fall.⁽¹⁶⁾
- These reports enable benchmarking and monitoring of clinical management trends within a hospital as well as comparisons with other participating peer-grouped hospitals, both within the region and nationally. Hospital Clinical Governance Reports can be presented and discussed at hospital clinical governance committee meetings and audit of surgical mortality management committee meetings. They can also be discussed with the local health network (or similar) representative, as well as with hospital quality managers and representatives from the SCV, Victorian Agency for Health Information and DHHS. Hospitals routinely ask for evidence of CPD and mortality audit compliance and the RACS will provide the confirmatory documentation of this request to Fellows.
- The first series of the Hospital Performance Summary Report released in 2017 enables a comparison of hospitals in terms of potentially preventable mortalities and preventable clinical management issues that contributed to death.
- Both reports will assist the audit team, the SCV, the Victorian DHHS and hospitals to develop strategies to address preventable errors and clinical management issues. These reports are to be used in combination with other comprehensive clinical performance data sets and supplementary performance reports to monitor and improve patient safety in Victoria.
- The RACS Research, Audit and Academic Surgery Division conducted a review on the topic: what makes a good morbidity & mortality meeting. The aim of the review was to produce a booklet with educational guidelines and a checklist. This was followed by a formal RACS position paper on the topic, released in 2017.⁽⁴⁾

3.4. Participation and compliance

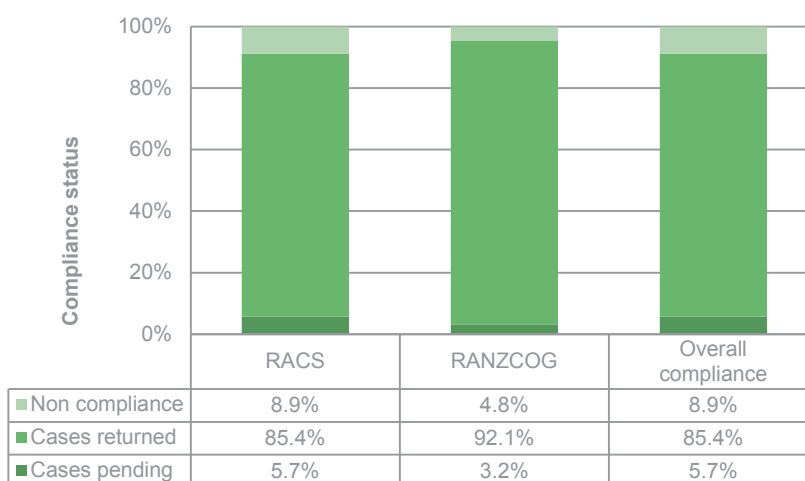
All hospitals that provide surgical services participate and comply with the audit requirements. To comply with the audit process, Fellows of RACS must not only agree to participate, but to also return completed SCFs and assessment forms in a timely, accurate and complete manner. Thus, there is a difference between surgeon participation and compliance. Participation is the receipt of confirmation that the surgeon will participate, and this has been largely irrelevant since 2012 when RACS mandated this activity for all Fellows. Compliance is the return rate of SCFs by the nominated surgeon for deaths notified to VASM by the hospitals. Hospitals provide notifications of death on a regular basis, as this is the main trigger for the audit process to begin.

The RACS Council has delivered strong support to the ANZASM, with participation and compliance by surgeons in their state mortality audit a compulsory component of the CPD program since January 2010.

The RANZCOG, AOA and ANZCA boards have approved formal collaboration with the ANZASM in the audit process.

The VASM audit collects data on all deaths occurring after a gynaecological surgical procedure. The Consultative Council on Obstetric and Paediatric Mortality and Morbidity and VCCAMM continue to separately review obstetric, neonatal and anaesthetic deaths in Victoria. Figure 5 outlines the compliance rates of Victorian Fellows.

Figure 5: Current compliance status



Audit period: 1 July 2012 to 30 June 2017.

RACS: Royal Australasian College of Surgeon

RANZCOG: Royal Australian and New Zealand College of Obstetricians and Gynaecologists

Compliance is measured by the number of notifications of death received by VASM versus cases returned by the treating Fellow to the audit office.

Comments:

- RACS Fellows had a compliance rate of 85.4% (7,096/8,312) while gynaecological Fellows had a compliance rate of 92.1% (58/63). The process review backlog (pending cases) should decrease by the next CPD verification period, as the time frame given for each step of the audit process (SCF, FLA and SLA return) is 21 working days. Obtaining medical records and documentation de-identification processes can take up to 4 months for complex cases. When verified compliance calendar period allowing a longer processing time frame from January 2016 to December 2016, 94.2% (3,262/3,462) compliance was reached by RACS Fellows and 93.1% (21/23) compliance was reached by RANZCOG Fellows.
- Almost half of RANZCOG and RACS Fellows perform assessments as first- or second-line assessors.

- For Fellows who appear non-compliant, a monthly reminder letter is sent by the VASM for one year. Fellows who are not compliant with their annual CPD requirements after the due date of 28 February receive an escalating series of reminders from the Chair, Professional Standards; Chair, Professional Development and Standards Board; the President and the Executive Director for Surgical Affairs. Failure to comply with CPD is considered a breach of the RACS Code of Conduct and may be referred to the Professional Conduct Committee.
- The first volume of the ANZASM National Case Note Review Booklet produced in collaboration with the RANZCOG is now available and provides important lessons to all gynaecologists that can lead to better outcomes for patients.⁽¹⁷⁾

3.5. Demographics and characteristics of audited deaths

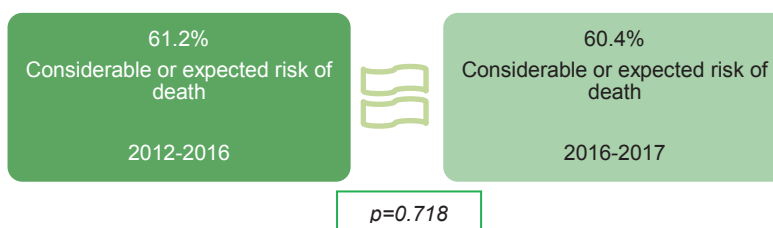


Table 3: Characteristics of audited deaths over the audit period

Audit Period	2012–2016		2016–2017	
Number of audited deaths	n=4,543		n=805	
Mean age (range)	73 years	1 day - 104 years	74 years	7 days - 104 years
Median age in years (IQR)	78 years	(67 – 86 years)	78 years	(66 – 86 years)
Gender (Male : Female)	44.5%	: 55.5%	43.9%	: 56.1%
Admission status (Emergency : Elective)	17.8%	: 82.2%	17.4%	: 82.6%
ASA grades	ASA 1–2	7.0%	ASA 1–2	6.1%
	ASA 3	28.0%	ASA 3	32.4%
	ASA 4	50.1%	ASA 4	48.3%
	ASA 5–6	14.9%	ASA 5–6	13.2%
Risk of death prior to surgery	Expected	12.8%	Expected	13.6%
	Considerable	48.4%	Considerable	46.8%
	Moderate	25.4%	Moderate	26.0%
	Small	10.5%	Small	11.0%
	Minimal	2.9%	Minimal	2.6%
Most common comorbid factors	Cardiovascular	23.3%	Cardiovascular	21.8%
	Age	19.7%	Age	20.9%
	Respiratory	12.1%	Respiratory	10.6%
	Renal	10.2%	Renal	9.4%
	Other	8.6%	Other	9.5%
	Diabetes	6.8%	Diabetes	7.2%
	Neurological	6.8%	Neurological	6.8%
	Advanced malignancy	6.4%	Advanced malignancy	7.6%
	Obesity	3.7%	Obesity	3.6%
	Hepatic	2.6%	Hepatic	2.6%
Most common surgical diagnoses	Fracture of neck of femur	27.4%	Fracture of neck of femur	26.0%
	Malignancy	22.0%	Malignancy	26.7%
	Cardiac disease	12.3%	Cardiac disease	9.8%
	Cerebrovascular accident	9.7%	Cerebrovascular accident	7.7%
	Intestinal obstruction	8.9%	Intestinal obstruction	11.9%
	Aortic aneurysm	6.2%	Aortic aneurysm	6.3%
	Neurotrauma	4.1%	Neurotrauma	4.7%
Number of operative procedures performed	≥3	8.7%	≥3	7.2%
	2	14.2%	2	12.5%
	1	68.2%	1	72.5%
	0	8.9%	0	7.81%

Note: total n=5,348. Data not available: gender n=1 (<0.1%); admission status: n=44 (0.8%); ASA grade: n=383 (7.2%); risk of death: n=42 (0.8%). Unavailable data was excluded from analysis. IQR: Interquartile range.

Audit period: 1 July 2016 to 30 June 2017.

ASA: American Society of Anesthesiologists. The ASA physical status classification system is an international measure of patient risk used by anaesthetists.⁽³⁾

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

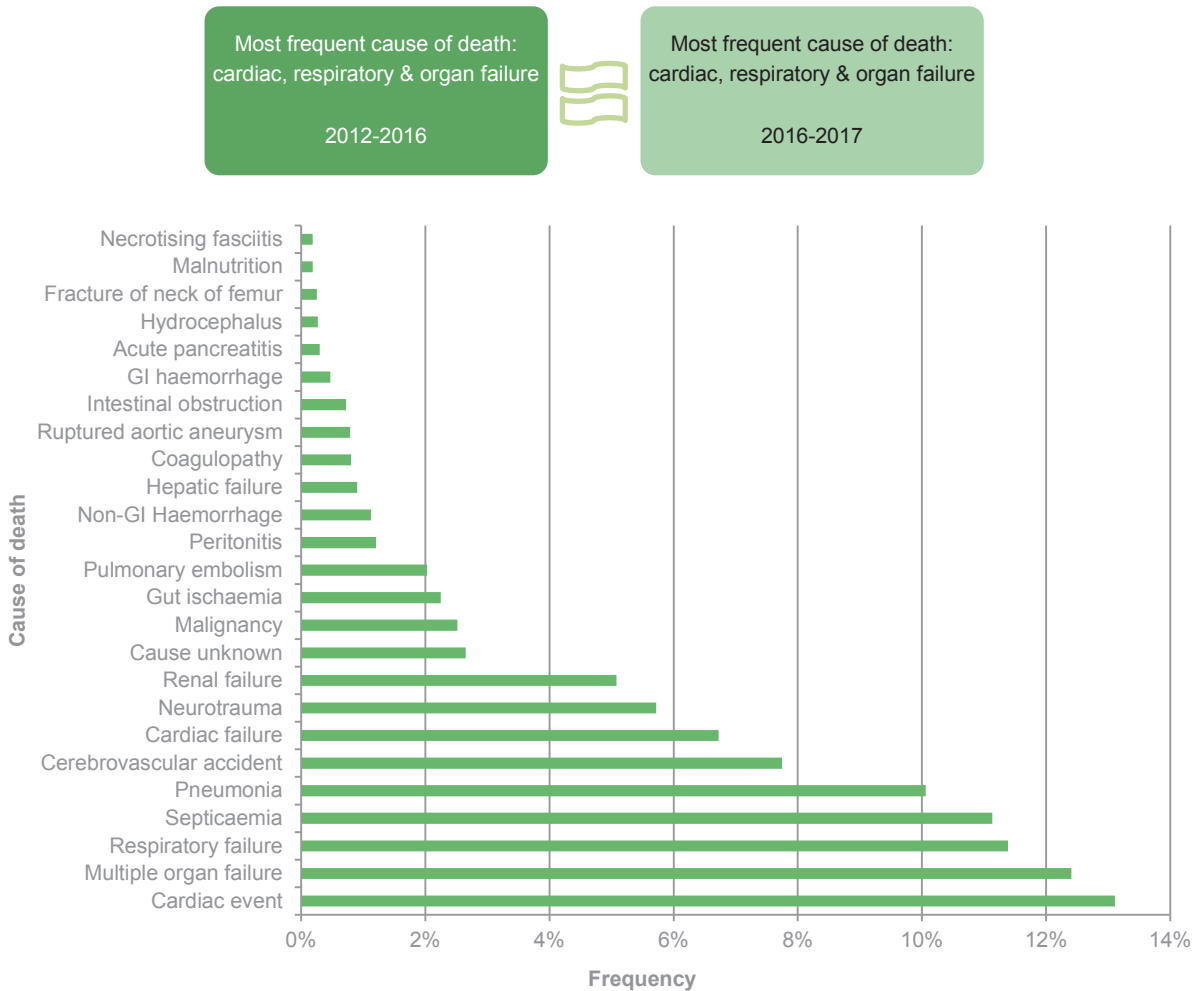
Comments:

- The risk of death remains high in this pool of patients and the demographic data remained stable during the audit period of 1 July 2012 to 30 June 2017.
- Nonoperative surgical admissions have decreased since 2012 from 12.7% (127/997) to 7.8% (63/805) ($p < 0.001$).
- There was an increase in malignancy and intestinal obstruction and decrease in cardiac disease as surgical diagnoses.

3.6. Establishing the cause of death

The cause of death recorded by the treating surgeon, as presented in Figure 6, is based on the clinical course of the patient and any relevant supporting evidence from investigations. Where doubt exists around the circumstances leading to death, the case will be referred to the coroner.

Figure 6: Frequency of reported causes of death



Note: n=6,068 conditions were perceived to be responsible for death in 5,348 cases. Exclusion: palliative care (n=60), hypotension (n=17) and hypoxaemia (n=13) as contributory factors rather than cause of death. Audit period 1 July 2012 to 30 June 2017.

The cause of death is directly coded from the treating surgeon’s statement. Once a code has a count of ≥10 across the audit period it is included in this figure by being grouped into larger overarching categories. This figure represents all 26 overarching cause of death categories. The codes were re-categorised and detailed in the 2016–2017 VASM Technical Report.⁽¹¹⁾ GI: gastrointestinal.

Comments:

- There were 6,068 conditions perceived to have caused death (more than one cause can be attributed to one case). The most frequently cited were cardiac events, 12.9% (n=782); multiple organ failure, 12.2% (n=740); septicaemia, 10.9% (n=664); respiratory failure 11.2% (n=679) and pneumonia, 9.9% (n=600). In many cases this reflects the terminal event and not the underlying pathology, and this has been identified as an issue in terms of the accurate completion of death certificates.⁽¹⁸⁻²¹⁾
- At times the cause of death is related to existing comorbidities. An Australian study concluded that “potentially modifiable comorbidities are associated with poorer post-operative outcomes”.⁽²²⁾
- In 19.3% (1,033/5,348) of cases a coronial postmortem was performed. This rate remained constant during the full audit period and the reasons for the low rate of postmortem referrals remain unknown. A recent Australian study examined clinicians’ understanding about reportable deaths to the Victorian coroners and highlighted that these provide educational information and valuable insights, for areas of concern.⁽²³⁾
- Postmortems were performed in 30.3% (282/931) of elective cases and 17.4% (746/4,297) of emergency cases. Postmortems are known to provide educational information and valuable insights, and these referral rates are of concern.⁽¹⁸⁻²¹⁾
- The cause of death identified by the coroner’s office and by the VASM had 82% agreement when the coronial finding was used as the gold standard.⁽²⁴⁾

3.7. Peer-review process

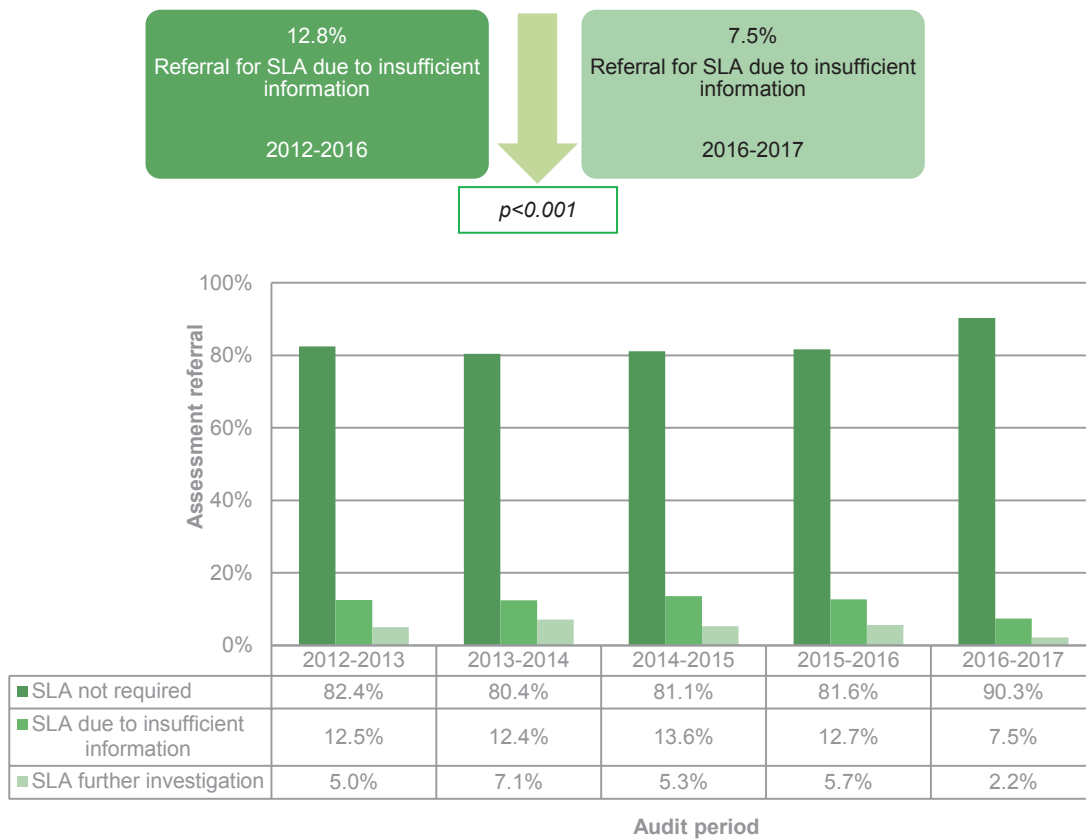
The VASM peer-review process is a retrospective examination of the clinical management of patients who died while under the care of a surgeon. All assessors (first- and second-line) must decide if the death was a direct result of the disease process alone, or if aspects of the management of the patient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

FLAs were completed in 5,348 cases and 17.3% (924) of those cases required an in-depth SLA. The SLA referral rate for the current period (2016–2017) was 9.7% (78/805). Each first-line assessor had to decide if the treating surgeon had provided adequate information to allow a conclusion to be reached. If the information was deemed inadequate then an SLA was requested. Other triggers for requesting an SLA are:

- the need for a more detailed review of the case is required, which could better clarify events leading up to death, and
- the death is unexpected, for example in a young, fit patient with benign disease or a day surgery case.

The rate of referral for SLA due to a lack of information in the SCF has decreased since the beginning of the audit but still requires improvement. SLAs required for other triggers may represent suspected issues of clinical management. The reasons given for referral for SLA are provided in Figure 7.

Figure 7: Reason for referral for second-line assessment (SLA)



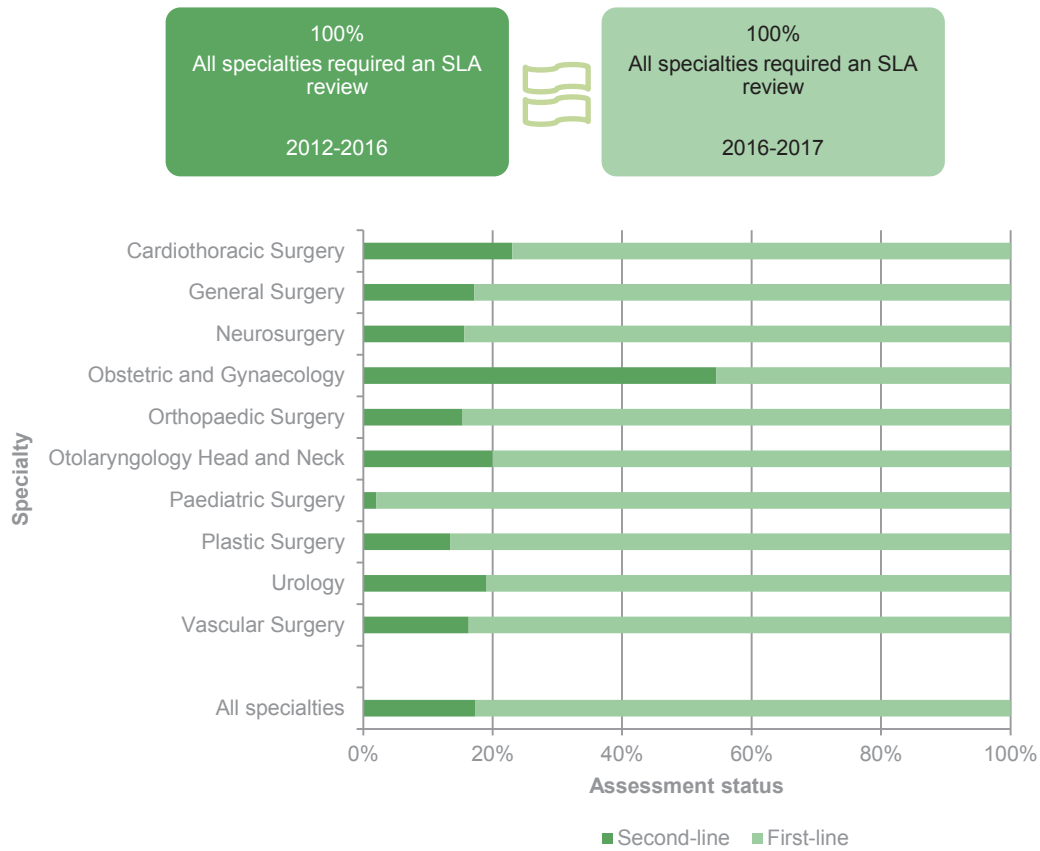
Note: total n=5,348.
 Data not available: n=3 (<1%). Unavailable data was excluded from analysis.
 Audit period 1 July 2012 to 30 June 2017.
 p=probability value.

Comments:

- 82.7% (4,424/5,348) of cases did not undergo SLA (the case was closed following the FLA).
- An SLA can be requested for insufficient information and/or further investigation. The need for SLA has decreased over time, in part because the quality of the information provided by the treating surgeon in the SCF has improved. Increasing use of the Fellows Interface, which does not allow the return of incomplete forms, has also improved the quality of the information provided. The percentage of cases referred for SLA due to insufficient information has dropped from 12.5% (125/997) in 2012–2013, to 7.5% (60/805) in 2016–2017. Cases with an ASA score greater than or equal to 4 were significantly more likely to be referred for SLA ($p < 0.001$; data not shown).
- 30.4% (281/924) of SLA requests were made based on the need for a more detailed review of perceived issues of management.
- There have been improvements in the quality of the data provided to VASM; however, ongoing issues remain with the quality of the data provided by some treating surgeons. Greater attention to detail in completing the SCF would help reduce the workload of colleagues who have agreed to act as first- and second-line assessors. The established compulsory move to the electronic interface in 2017 facilitates improvements of the data quality submitted.
- In 22.0% (203/924) of SLAs at least one aspect of the patient medical record submitted to the assessor was deemed unsatisfactory and required further investigation. Criticisms included poor medical admission notes, missing imaging, missing reports, missing transfer notes and follow-up records, and unsatisfactory description of the surgical procedure. Comprehensive and legible hospital case notes are an important record of what occurred during a patient’s treatment.

Figure 8 describes the need for referral for SLA by specialty.

Figure 8: Frequency of need for second-line assessment (SLA) by specialty



Note: n=5,348.
Audit period 1 July 2012 to 30 June 2017.

Comments:

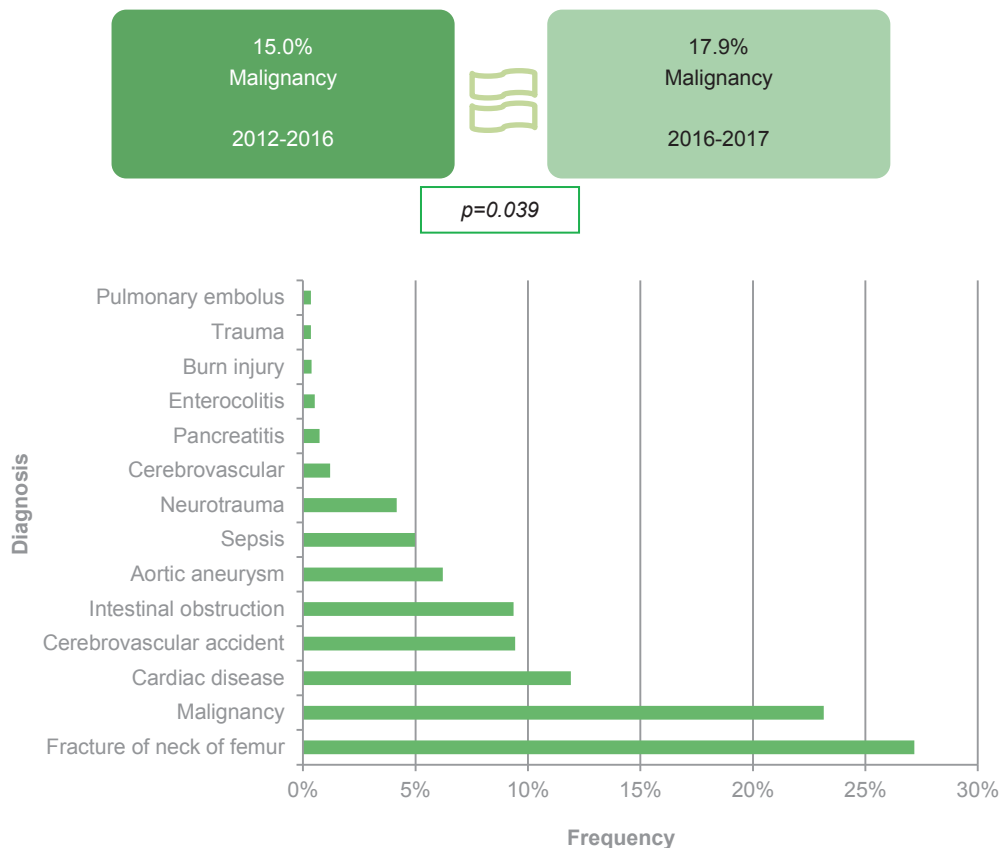
- The need for SLA referral varied between specialties. Gynaecology had the highest percentage of cases referred for SLA; however, no inferences can be made as the number of mortalities in this specialty was low for the audited period.
- The need for referral for SLA was similar in metropolitan and rural regions (data not shown).
- SLAs were required for all specialties with reported mortalities, emphasising the educational value of the external peer-review assessments and the educational value of the audit.

4. Clinical risk management

4.1. Establishing the surgical diagnosis

The most frequent diagnoses identified during the audit process are outlined below in Figure 9.

Figure 9: Most frequent diagnoses



Note: n=4,160 diagnoses (identified in 5,348 patients).

p=probability value.

Audit period 1 July 2012 to 30 June 2017. Only diagnoses with a frequency >10 interventions have been recorded.

Information on diagnosis codes are detailed in the 2016–2017 VASM Technical Report.⁽¹¹⁾

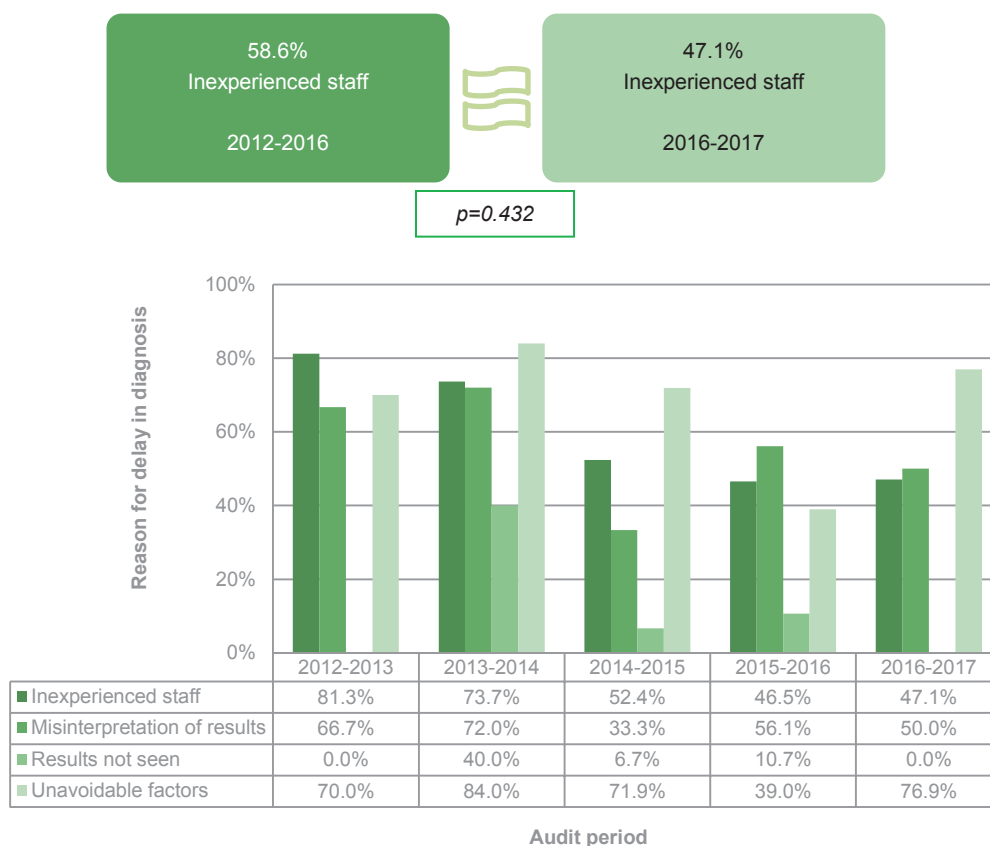
Comments:

- It is important to note that only the most frequent diagnoses are presented in the above figure.
- There has been an increase in the frequency of malignancy as a diagnosis, increasing to 17.9% (114/638) in 2016–2017 from 15.0% (528/3,522) in 2012-2016.

4.2. Delay in diagnosis

Early diagnosis is critical in preventing surgical complications or deterioration, particularly in a frail population. Treating surgeons were asked to record any perceived delays in establishing a diagnosis and proceeding to definitive treatment (see Figure 10).

Figure 10: Perceived delays in establishing a diagnosis



Note: n=364 issues (identified in 5,348 patients). Data not available: n=28 (<1%). Unavailable data was excluded from analysis.
 Audit period 1 July 2012 to 30 June 2017.
 p=probability value.
 A case can have multiple delay issue associations.

Comments:

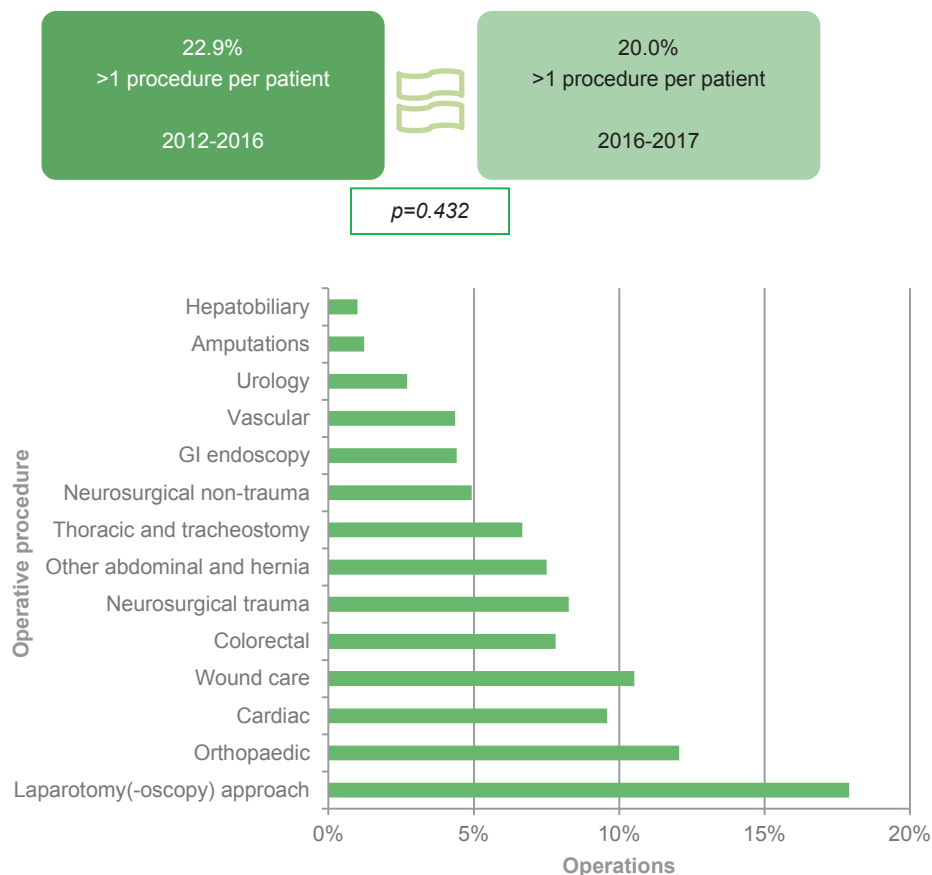
- Diagnostic delays were identified by the treating surgeon in 6.8% (364/5,348) of all cases, and in 7.2% (348/4,861) of cases in which the patient underwent an operation.
- Assessors identified delays in patient care in 21.2% (129/609) of cases, higher than the incidence identified by treating surgeons.
- Delay in establishing a diagnosis remained constant at around 7% (364/5,348) during the audited period.⁽¹¹⁾
- It is important to note that such delays are not always attributable to the surgical team. As published in a review in the United Kingdom on care received by elderly patients undergoing surgery, delay between admission and operation was related to risk assessment which “should include input from senior surgeons [or] anaesthetists”.⁽²⁵⁾

4.3. Profile of operative procedures

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

The role of the treating surgeon is to take responsibility for the overall success of the operation. The treating surgeon needs to ensure that the operation proceeds smoothly and with the lowest possible risk of complications or an unplanned return to theatre, especially in a training environment.

Figure 11: Frequency of individual surgical procedures



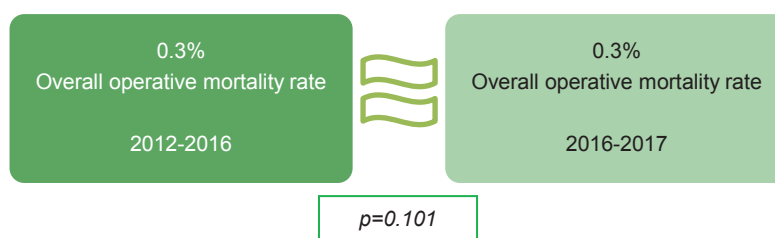
Note: n=4,882 patients having operative treatment (with 7,186 episodes). Only procedures with a frequency >10 interventions have been recorded. The operative procedures were categorised in this report to group the operations for simpler classification. A breakdown of operative procedures is provided in the 2016–2017 VASM Technical Report⁽¹⁰⁾ Audit period 1 July 2012 to 30 June 2017. GI: gastrointestinal. p=probability value.

Comments:

- There were 4,882 patients who underwent operative treatment (2012–2017). As a patient can undergo multiple procedures during the same admission, and at the same surgical session, a total of 7,186 separate procedures were performed.
- During the last year of the audit period since 2012 there was a 4.9% decrease in the number of patients who had multiple surgical episodes.⁽¹¹⁾
- Laparotomy and laparoscopic approaches are recorded separately by VASM staff in addition to the definitive intra-abdominal procedure, which accounts for this data point being the most frequently recorded.

Table 4 shows the operative mortality frequency by specialty

Table 4: Operative mortality frequency by specialty



Specialty	Frequency (%)
General Surgery	1,655 (33.9)
Orthopaedic Surgery	983 (20.1)
Cardiothoracic Surgery	664 (13.6)
Neurosurgery	631 (12.9)
Vascular Surgery	445 (9.1)
Urology	195 (4.0)
Plastic Surgery	174 (3.6)
Otolaryngology Head and Neck	52 (1.1)
Paediatric Surgery	51 (1.0)
Obstetrics and Gynaecology	21 (0.4)
Other*	11 (0.2)
Total	4,882 (100%)

Note: n=4,882 patients who had operative treatment (7,186 operative episodes).

Data not available: n=0 (0%). Unavailable data was excluded from analysis.

Audit period 1 July 2012 to 30 June 2017.

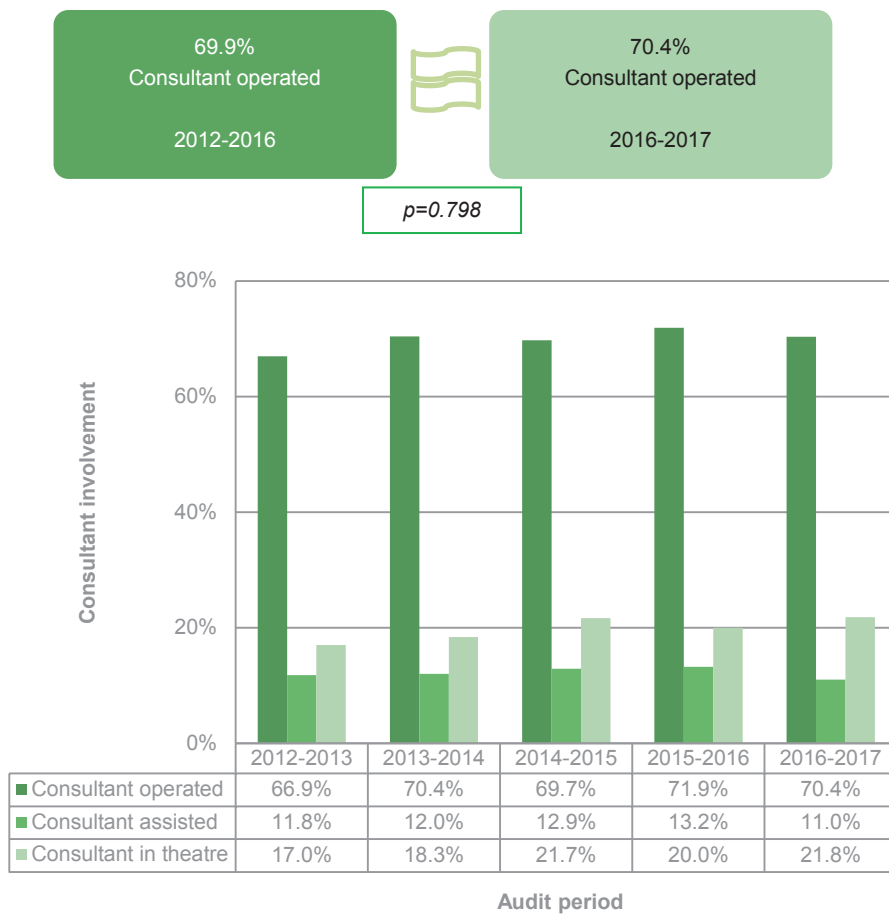
*Other surgeries include smaller specialties with low case numbers such as Oral/maxillofacial, Ophthalmology, Oncology and Trauma.

p=probability value.

- There was great variation by specialty in the rate of operative mortality over the audit period, attributable to the casemix and risk profile of patients in each specialty. Only 21 gynaecology patients were included in this report. One patient can have multiple surgical episodes.
- A higher rate of operative intervention was seen in elective patients (98.5%; 928/942) compared with patients admitted as emergencies (89.7%; 3,913/4,362; $p<0.001$). This was expected, as most elective admissions to a surgical unit were for an operative procedure.
- Sometimes it is deemed inappropriate to continue with the procedure, as occurred in 6.7% (327/4,882) of patients who underwent operative procedures.

Figure 12 shows the seniority of surgeon performing surgery

Figure 12: Seniority of surgeon performing surgery



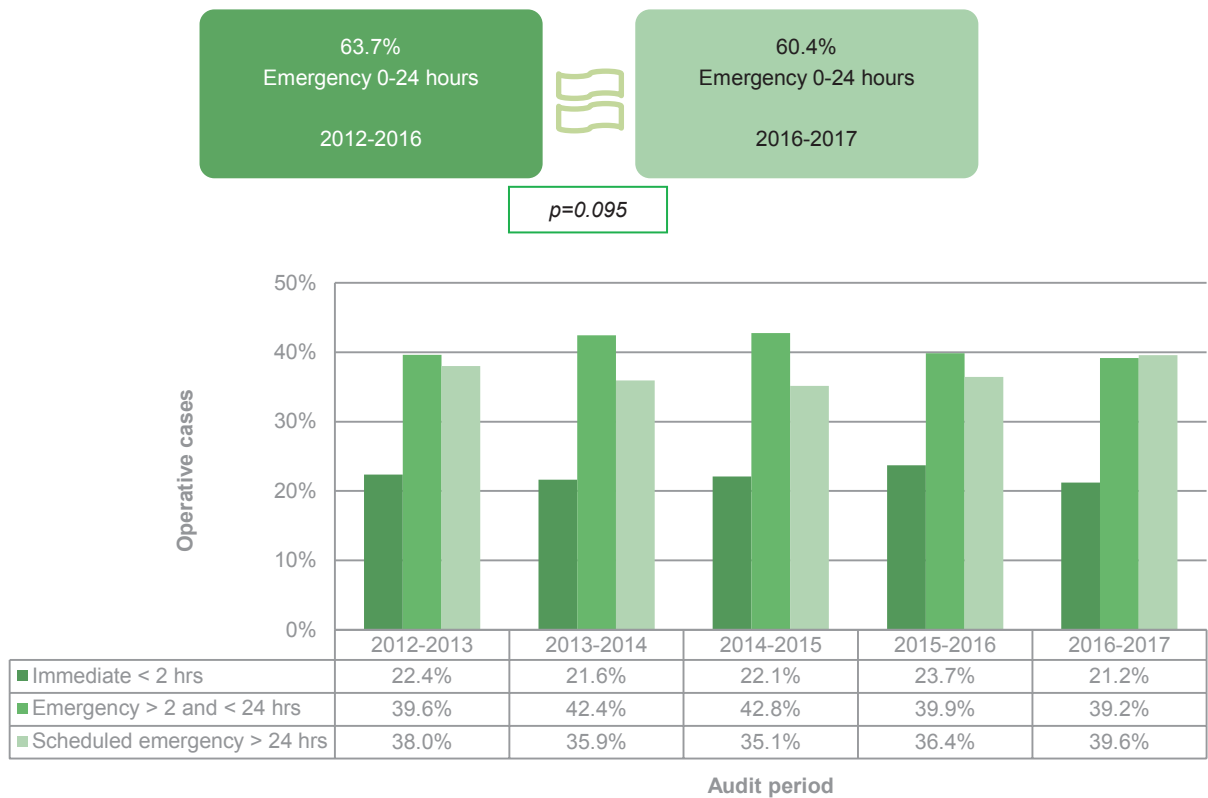
Note: n=7,186 episodes in 4,882 patients having operative treatment.
 Audit period 1 July 2012 to 30 June 2017.
 p=probability value.

Comments:

- A consultant surgeon performed the surgery in 70.0% (4,804/6,867) of operative episodes (2012–2017). There was stable active participation in the operative sessions by consultants in 70.4% (710/1,009) cases for the audited period. The role of the consultant is to take responsibility for the overall success of the operation, so their presence in theatre is crucial.
- In 6.4% (65/1,009) of cases the surgeon did not indicate if an anaesthetist was present and in 4.4% (44/1,009) of cases the anaesthetist was not present because local anaesthetic was used. An anaesthetist was present in 100% (900/900) of cases in which there was an operative procedure that was not performed under local anaesthetic. Of these cases, 8.1% (77/944) were identified as possibly having an anaesthetic component to the death (data not shown).
- VASM reported 85 cases with an anaesthetic component in the death to VCCAMM since collaboration started between the two organisations. The outcome of these cases will be incorporated in future VCCAMM, ANZCA and VASM publications.

Figure 13 shows the timing of operative procedures in hospital emergency admissions

Figure 13: Timing of operative procedures in emergency admissions



Note: n=4,743 operative episodes in emergency patients. Data not available: n=215 (4.0%). Unavailable data was excluded from analysis.
 Audit period 1 July 2012 to 30 June 2017.
 Hrs: hours.
 p=probability value.

Comments:

- Of the emergency admissions that underwent surgery, 22.3% (1,059/4,743) had surgery within 2 hours of admission, 40.9% (1,939/4,743) had surgery within 24 hours, and 36.8% (1,745/4,743) had surgery more than 24 hours after admission.
- 63.2% (2,998/4,743) of emergency admissions to a surgical unit required surgery within 24 hours of admission. Strategies to address the associated scheduling operative session problems are being implemented by government, surgeons and hospitals. ⁽²⁶⁻²⁸⁾

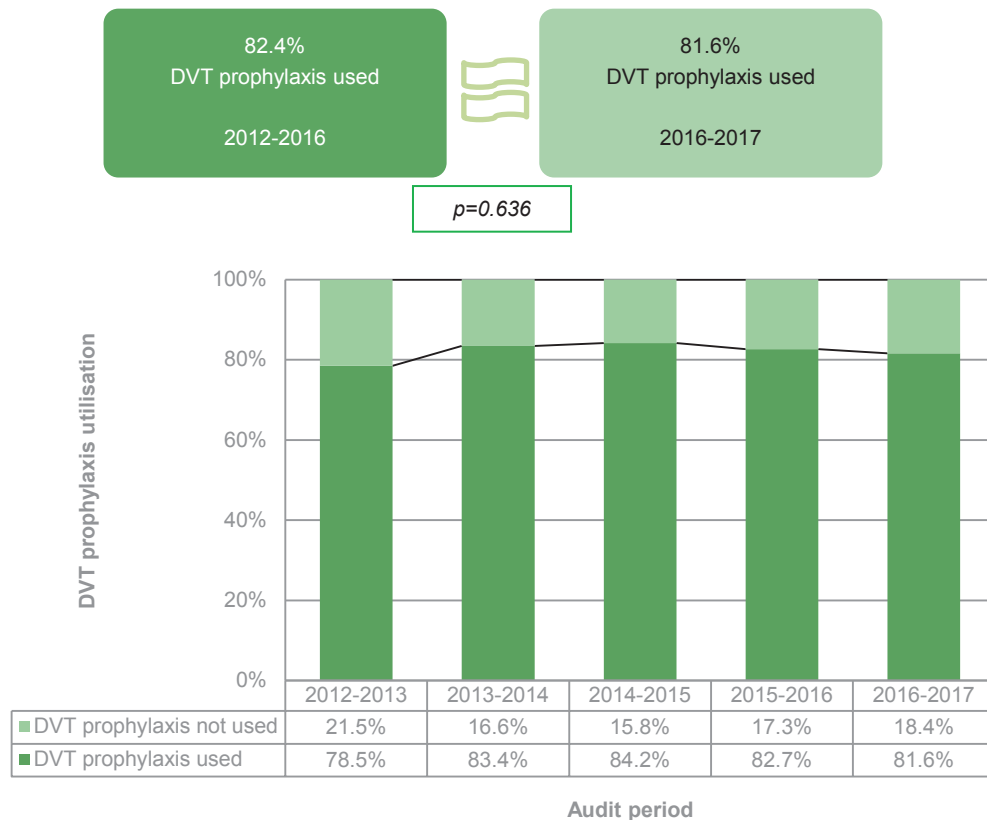
4.4. DVT prophylaxis

The goal of this section is to identify whether strategies were put in place to prevent the formation of DVT and subsequent pulmonary embolism in patients at risk. There are effective pharmacological and mechanical prophylaxis options available; however, pulmonary embolism remains a major cause of mortality in hospital patients across Australia. The Clinical Practice Guidelines for the Prevention of Venous Thromboembolism in Patients Admitted to Australian Hospitals^(8, 29) are reviewed and updated periodically to facilitate the best care available to patients.

The recommendations in the guidelines and the VASM report are intended to encapsulate the available evidence on the prevention of DVT. However, the guidelines should only be followed subject to the judgement of clinicians caring for individual patients and the patients' own preferences.

The treating surgeon has to record if DVT prophylaxis was given and the type of prophylaxis used. Reasons for not providing DVT prophylaxes are also included in this section (see Figures 14, 15 and 16).

Figure 14: DVT prophylaxis use during the audit period

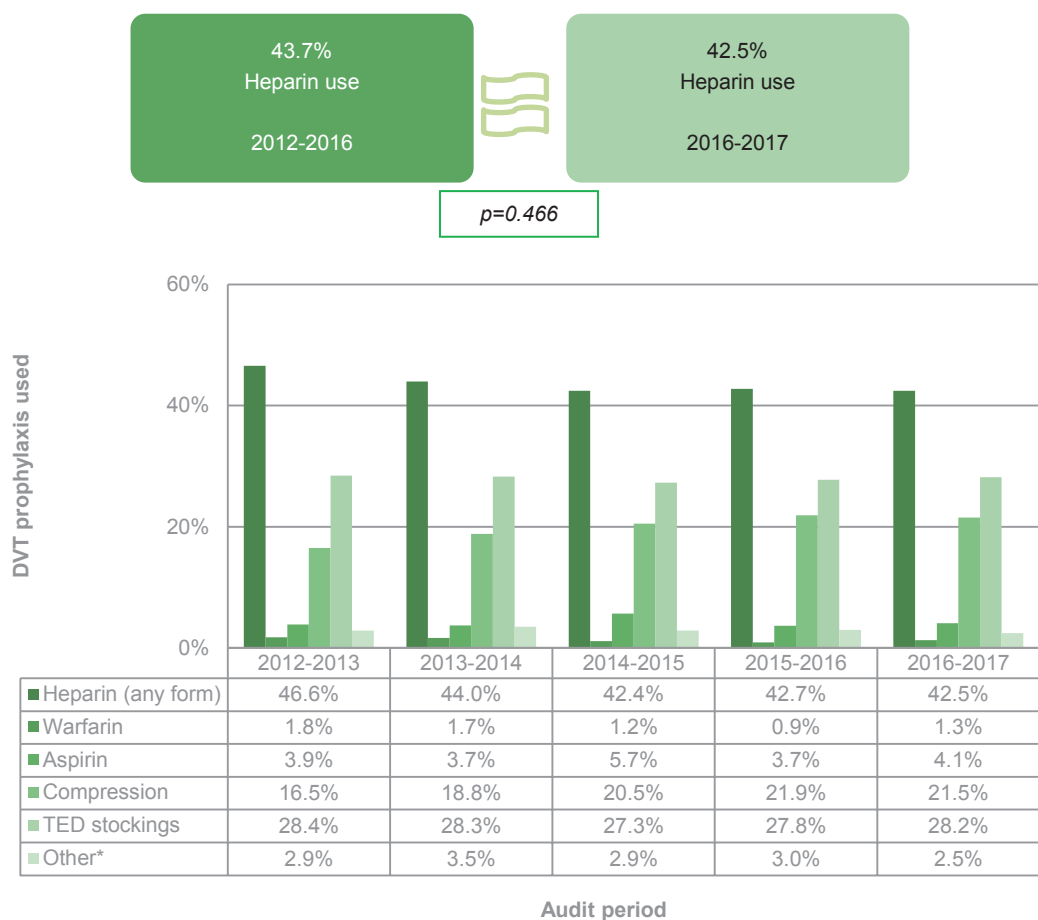


Note: total n=4,882 operative cases. Data not available: n=66 (1.4%). Unavailable data was excluded from analysis.
 Audit period 1 July 2012 to 30 June 2017.
 DVT: deep vein thrombosis.
 p=probability value.

Comments:

- The use of DVT prophylaxis has remained high: 82.4% (3,367/4,086) in 2012–2016 and 81.6% (596/730) in 2016–2017.
- The VASM data shows that use of DVT prophylaxis is similar in both elective and emergency cases (data not shown).

Figure 15: Type of DVT prophylaxis used



Note: n=7,215 agents used in 5,348 cases (one patient can receive multiple prophylactic agents during surgical care). Data not available: n=66 (0.9%); DVT prophylaxis used but type unspecified: n=178 (2.5%). Unavailable data was excluded from analysis. Audit period 1 July 2012 to 30 June 2017.

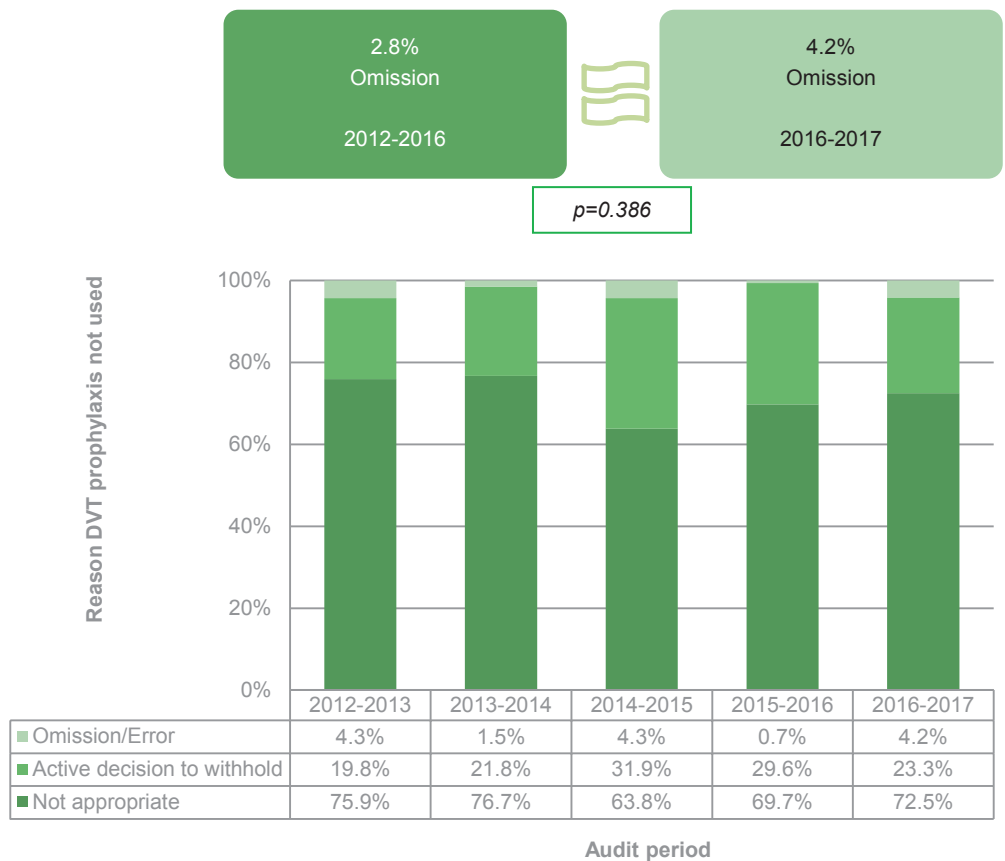
*Other includes: calf stimulators, Clexane, Fragmin, clopidogrel, enoxaparin, epidural, full anticoagulation for non-ST segment elevation myocardial infarction, and inferior vena cava filter and infusion.

DVT: deep vein thrombosis; TED: thromboembolic deterrent.
p=probability value.

Comments:

- There was a decrease in the use of Heparin: from 43.7% (2,568/5,878) in 2012–2016 to 42.5% (464/1,093) in 2016–2017.
- Aspirin has now been shown to be a valid therapeutic agent in thromboprophylaxis.⁽³⁰⁾
- The spectrum of DVT prophylaxis used varied slightly over time; no major variance was noted.
- The type of prophylaxis used is subject to the judgement of clinicians caring for individual patients.

Figure 16: Reasons given treating surgeon for not providing DVT prophylaxis



Note: n=853 patients not receiving prophylaxis in 4,882 operative cases. Data not available: n=123 (14.4%). Unavailable data was excluded from analysis.

Audit period 1 July 2012 to 30 June 2017.

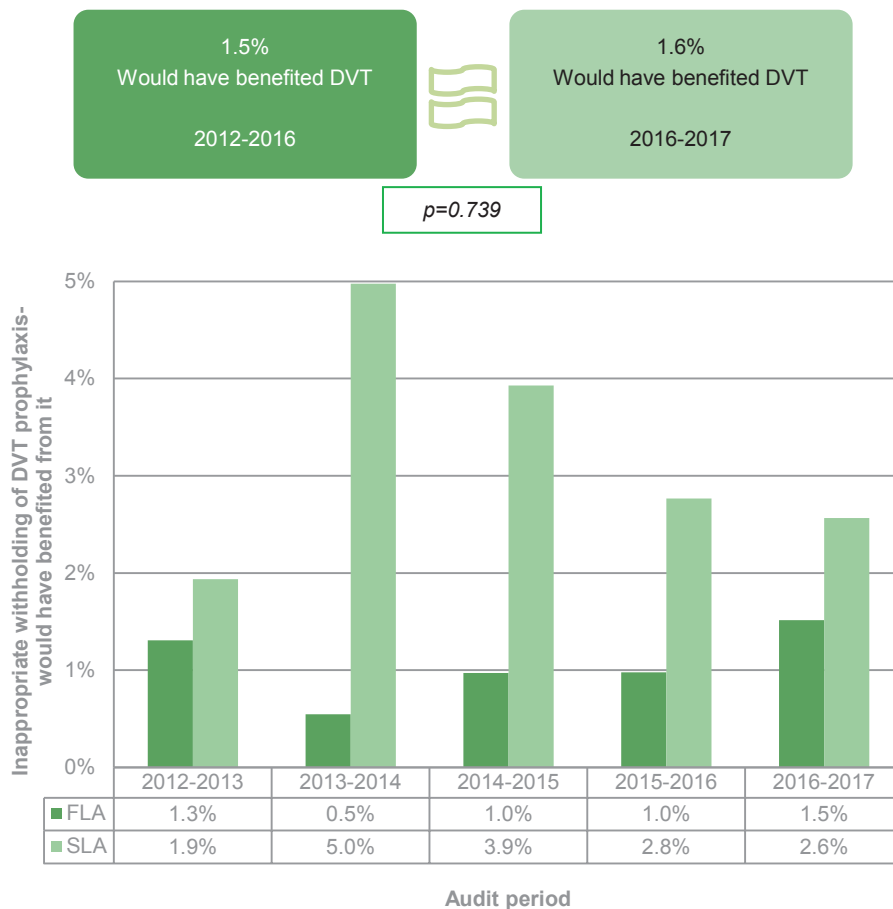
DVT: deep vein thrombosis.

p=probability value.

Comments:

- 17.5% (853/4,882) of patients who had an operative procedure did not receive DVT prophylaxis. In the majority of these cases this was a conscious decision by the treating team.
- The omission/error rate has increased from 2.8% (17/610) in 2012–2016 to 4.2% (5/120) in 2016–2017. The VASM will monitor trends in the upcoming analysis period.

Figure 17: Assessor perception of the appropriateness of decision to withhold DVT prophylaxis



Note: n=853 patients not receiving prophylaxis in 4,882 operative cases. Data not available: n=79 (1.6%). Unavailable data was excluded from analysis.
 Audit period 1 July 2012 to 30 June 2017.
 DVT: deep vein thrombosis; FLA: first-line assessment; SLA: second-line assessment.
 p=probability value.

Comments:

- Assessors were asked to comment on the appropriateness of withholding prophylaxis, as outlined in Figure 17. Of the patients who did not receive DVT prophylaxis, the first-line assessors reported that 1.5% (10/660) would have benefited from it, while the second-line assessors identified that 2.6% (2/78) of patients would have benefited from it.
- Assessors could not accurately assess the appropriateness of the decision to withhold DVT in 79 cases due to insufficient evidence in the audit documentation. The tendency of second-line assessors to be more critical than first-line assessors of clinical management events was foreseeable, as second-line assessors have the opportunity to review and investigate patient medical records.

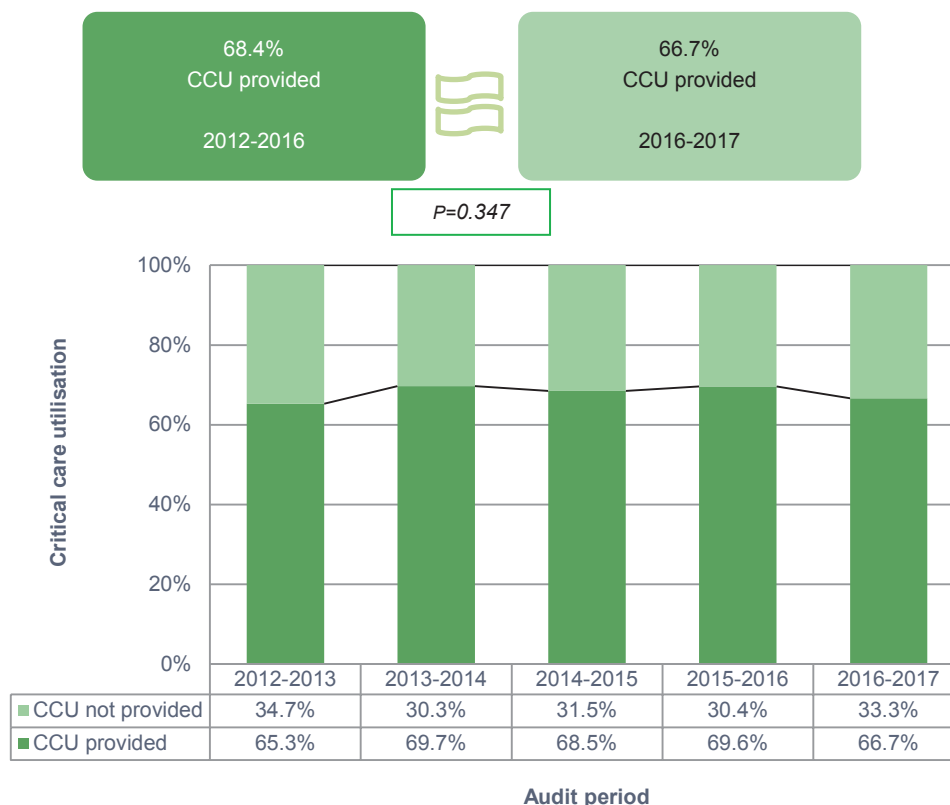
4.5. Adequacy of provision of critical care support to patients

Critical care is essential to support acute surgical admissions as they are the most seriously ill group of patients.

Ideally, critical care facilities should be co-located with emergency and surgical departments, especially in larger acute hospitals. A close working relationship between the surgical team and the critical care unit (CCU) is essential, although not all surgical patients require critical care support.

The treating surgeon was asked to record if their patient received critical care support before or after surgery. The first- and second-line assessors also reviewed the appropriateness of the use of critical care facilities for patients (see Figures 18 and 19).

Figure 18: Provision of critical care support

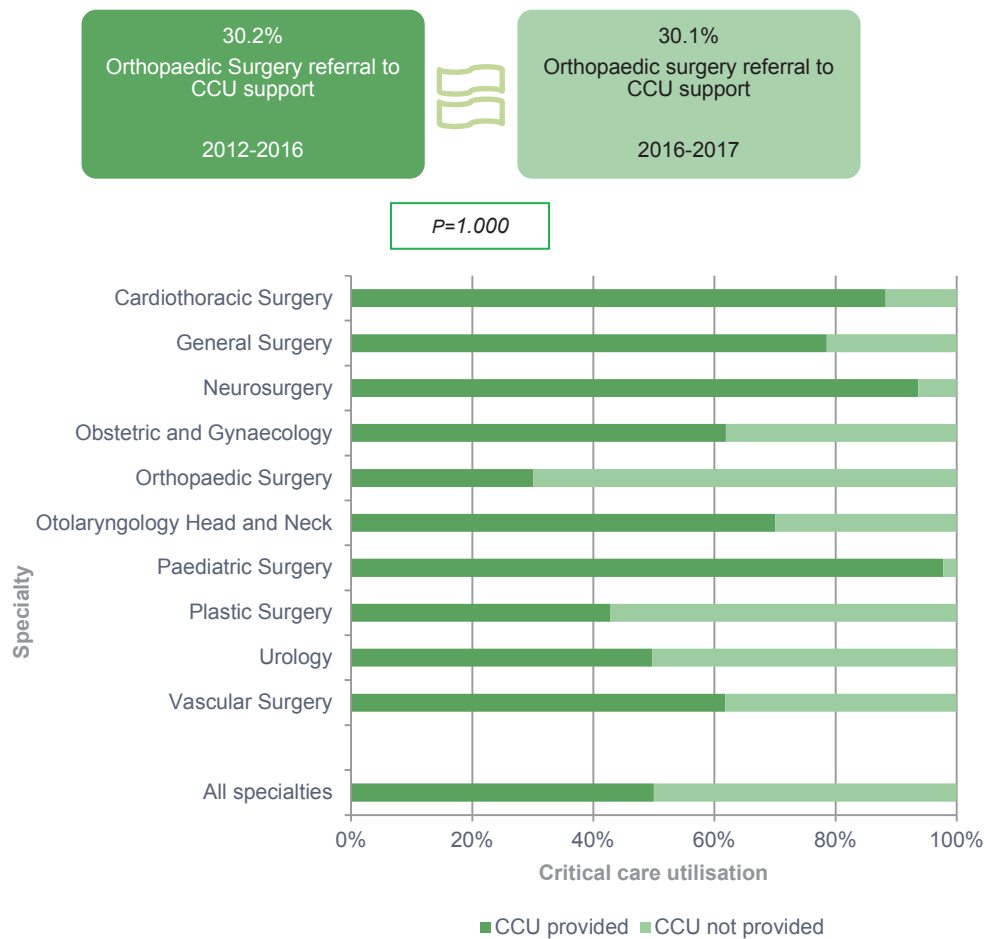


Note: n=4,882 operative cases.
 Data not available: n=12 (<1%). Unavailable data was excluded from analysis.
 Audit period 1 July 2012 to 30 June 2017.
 CCU: critical care unit.
 p=probability value.

Comments:

- 68.2% (3,319/4,870) of patients received critical care support (2012–2017).
- In 2016–2017, critical care support was used in 66.7% (494/741) of operative cases.
- The use of and need for critical care is higher in emergency cases (data not shown).
- It should be acknowledged that not all hospitals have critical care services and should therefore triage patients accordingly. There was no difference in CCU usage between rural and metropolitan hospitals for patients (data not shown).

Figure 19: Provision of critical care support to patients by specialty



Note: n=4,882 operative cases.
 Data not available: n=12 (<1%). Unavailable data was excluded from analysis.
 Audit period 1 July 2012 to 30 June 2017.
 CCU: critical care unit.

Comments:

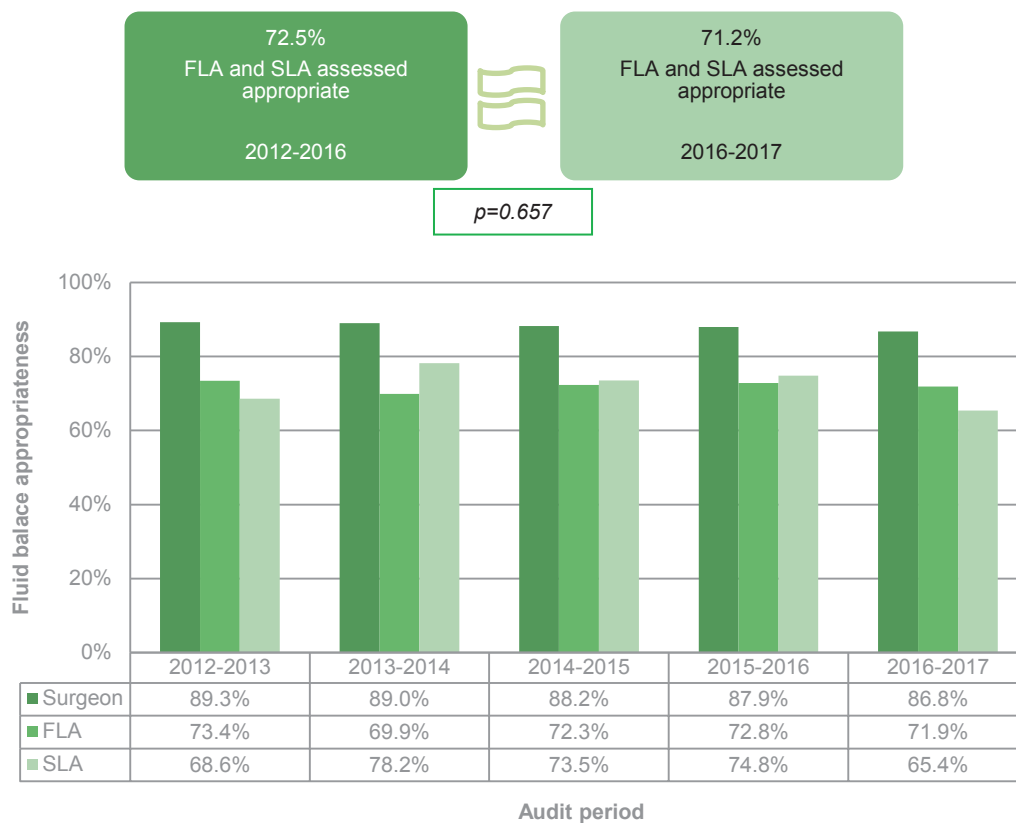
- Similar to previous years, orthopaedic patients have low referral rates for critical care support. This is thought to be due to the high number of elderly patients with a fractured neck of femur admitted from nursing homes.
- The treating surgeon perceived that a lack of critical care support was potentially an issue in 2.3% (36/1,551) of cases (data not shown).
- Assessors (both first- and second-line) reported that 9.0% (140/1,551) of patients who did not receive critical care support were likely to have benefited from it, which, although small, is more than double that identified by the treating surgeon.

4.6. Issues with fluid balance

Deciding on the optimal amount of intravenous fluids to administer, and the best rate at which to give them can be complex. The treatment decisions must be based on careful assessment of the patient’s individual needs. The overall goal is to provide enough fluid and electrolytes to meet losses, maintain the normal status of body fluid compartments and enable renal excretion of waste products. Surgical consultants and clinical teams should be competent in fluid management strategies.

The treating surgeon and all assessors were asked to comment on the appropriateness of fluid balance during the episode of care (see Figure 20).

Figure 20: Perception of fluid balance appropriateness



Note: surgeon (surgical case form): n=4,882; FLA: n=3,984; SLA: n=898. Data not available: surgeon (surgical case form): n=56 (1.1%); FLA: n=46 (1.2%); SLA: n=11 (1.2%). Unavailable data was excluded from analysis.

Audit period 1 July 2012 to 30 June 2017.

FLA: first-line assessment; SLA: second-line assessment.

p=probability value.

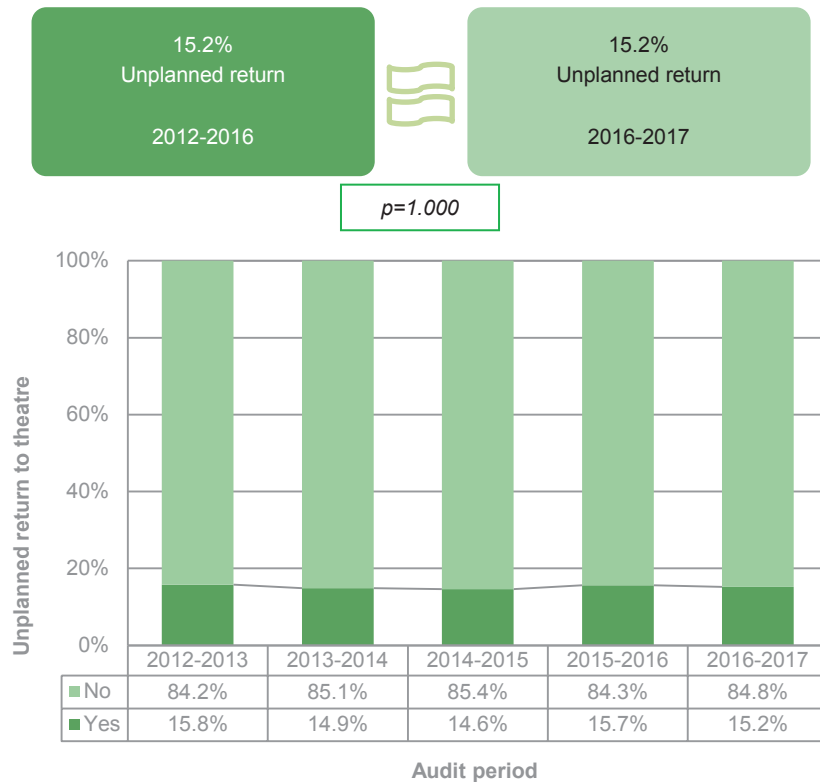
Comments:

- The treating surgeon felt that fluid balance had been managed appropriately by their clinical team in 88.3% (4,260/4,826) of cases.
- Assessors (first- and second-line) identified inappropriate fluid balance in 8.2% (394/4,825) of cases.
- A study on the interaction between fluid balance and disease severity of the critically ill patient found that “early adequate fluid resuscitation together with conservative late fluid management may provide better patient outcomes”.⁽⁹⁾

4.7. Unplanned return to the operating room

An unplanned return to the operating room is usually necessitated by the development of a complication requiring further operative intervention. (See Figure 21). Some complications following complex surgery are to be expected due to the pre-existing comorbidity profile, surgical risk status and the nature of the disease being treated. However, a high rate of return to the operating room can indicate that the care being provided could be improved, and it is an overall VASM, VSCC and DHHS goal to see the trend decrease over future audit periods

Figure 21: Unplanned return to the operating room



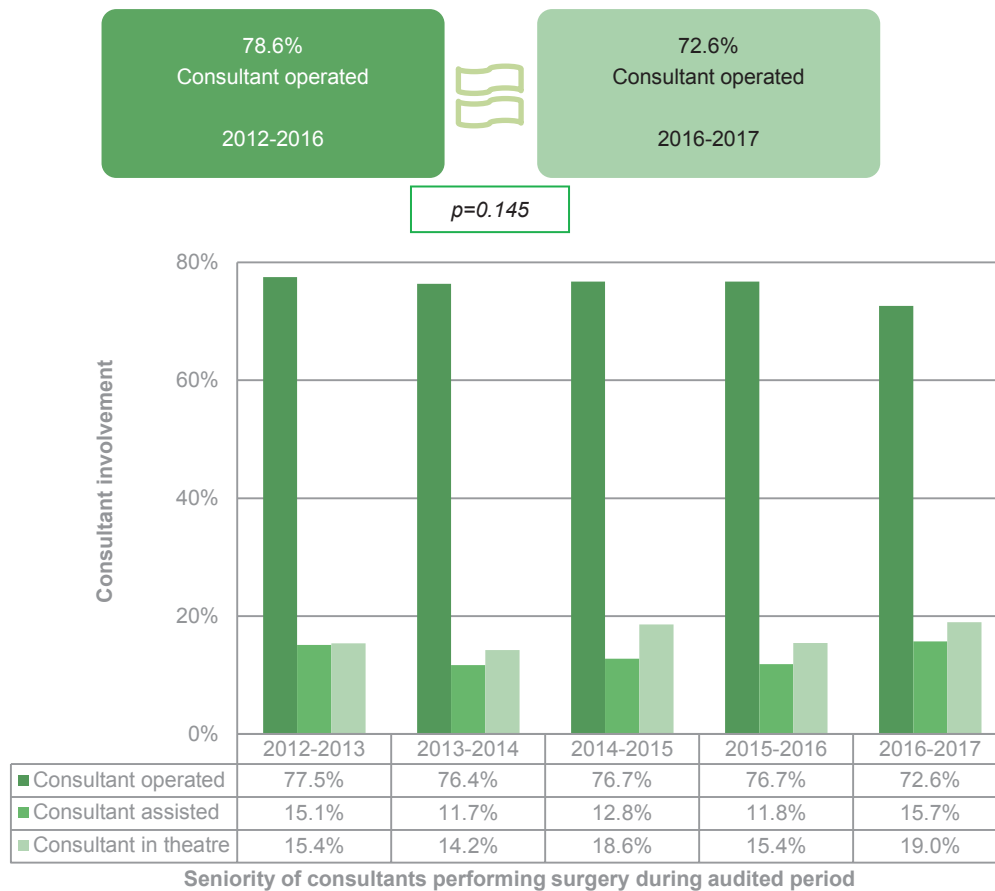
Note: n=4,882 patients who underwent operative treatment; n=740 patients who had an unplanned return to theatre. Data not available: n=16 (0.3%). Unavailable data was excluded from analysis.
 Audit period 1 July 2012 to 30 June 2017.
 p=probability value.

Comments:

- An unplanned return to theatre was reported in 15.2% (740/4,882) of cases in which a surgical procedure was performed. These figures are similar to the national mortality audit findings.⁽³¹⁾
- The frequency of unplanned returns remains stable: 15.8% (137/866) in 2012–2013 compared with the slightly lower 15.2% (113/742) in 2016–2017, which is not statistically significant.
- An overall decrease in the frequency of unplanned returns to theatre over the audit period would be desirable and appropriate.

Figure 22 shows the seniority of consultants performing surgery during unplanned returns to the operating room.

Figure 22: Seniority of consultants performing surgery during unplanned returns to the operating room



Note: n=4,882 patients who underwent operative treatment; n=740 patients who had an unplanned return to theatre.
 Audit period 1 July 2012 to 30 June 2017.
 p=probability value.

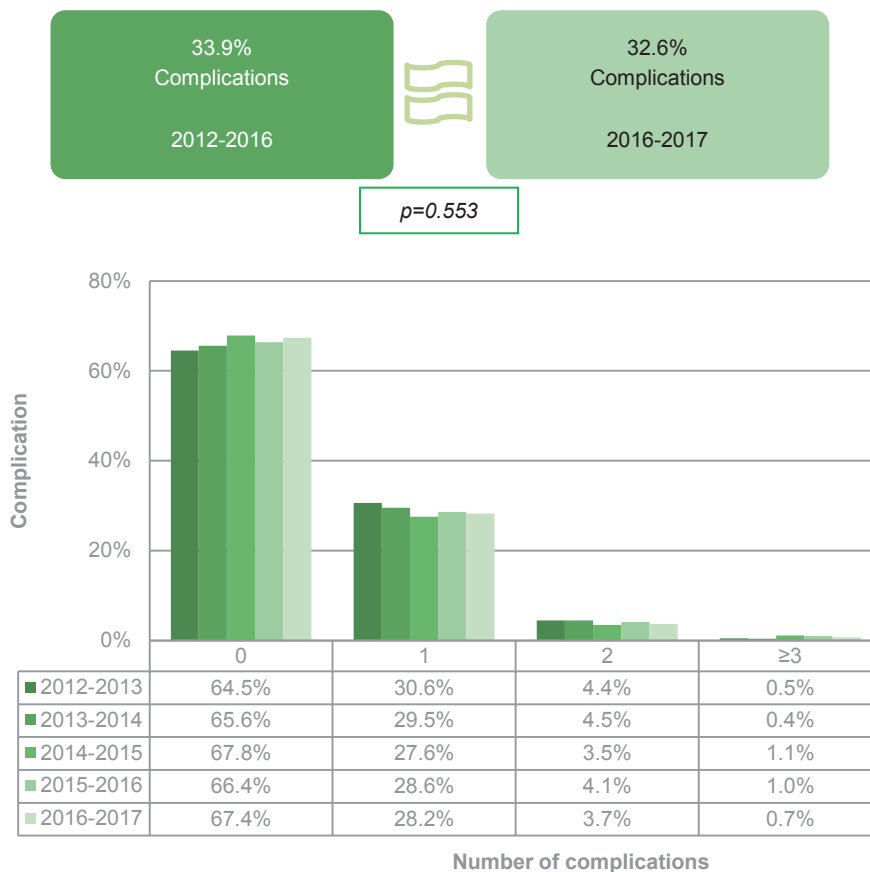
Comments:

- Active consultant participation in cases requiring an unplanned return to the operating room is appropriate as such cases are more challenging and the risks are greater.
- There is a decrease in consultant involvement in 2016–2017 compared with previous years. VASM investigations into the national dataset suggest that supervised trainees safely perform emergency operations provided that cases are judiciously selected.⁽³²⁾ The VASM will monitor trends in the upcoming analysis period.
- The frequency of unplanned returns to the operating room for each surgical specialty reflects the risk profile inherent in their casemix and surgical inferences (data not shown). Some surgical specialties are associated with higher complication risks than others.
- There were no major differences in unplanned returns to the operating room between metropolitan and rural regions. The seniority of surgeons operating in rural and metropolitan regions was also similar (data not shown).

4.8. Postoperative complications

Figure 23 shows the postoperative complications recorded by treating surgeon.

Figure 23: Postoperative complications recorded by treating surgeon



Note: n=4,882 patients who underwent operative treatment.

Data not available: n=40 (0.8%); in further n=22 (0.5%) complications were identified but type was not stated. Unavailable data was excluded from analysis.

Audit period 1 July 2012 to 30 June 2017.

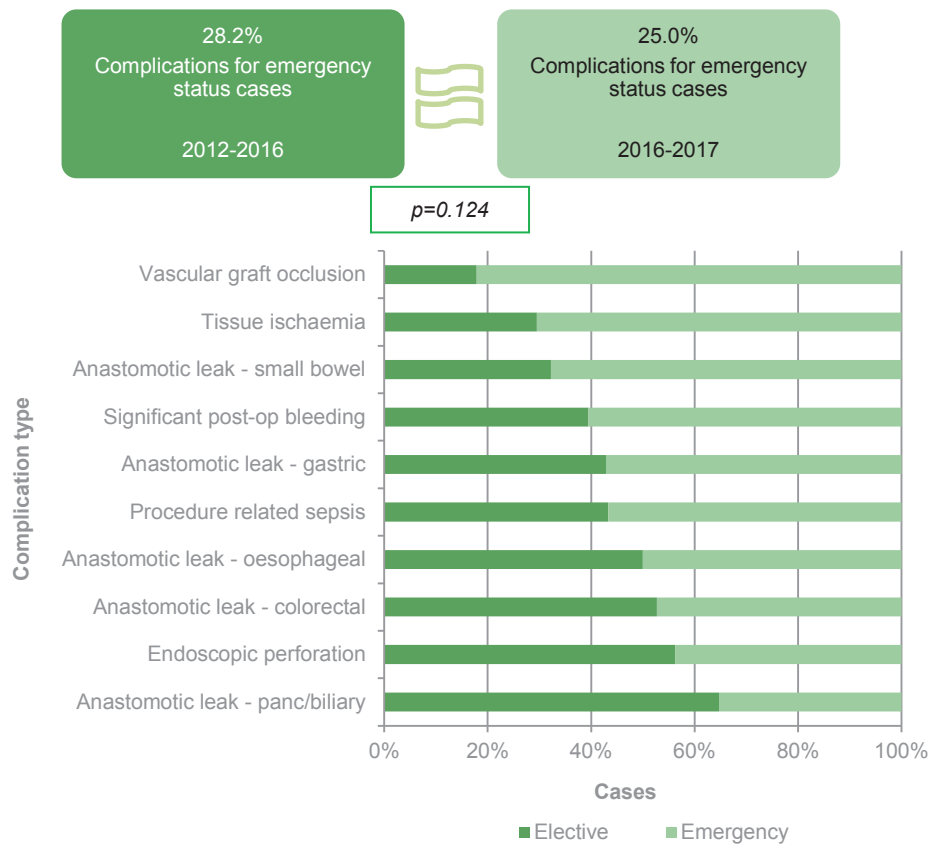
p=probability value.

Comments:

- 65.5% (3,200/4,882) of patients who underwent operative treatment had no complications.
- The rate of postoperative complications reported by treating surgeons has remained constant throughout the audit period.
- A single operative complication was recorded in 28.5% (1,390/4,882) of cases. Only a small number of patients had more than one complication.

Figure 24 shows the frequency of specific postoperative complications by urgency *status*.

Figure 24: Frequency of specific postoperative complications by urgency status



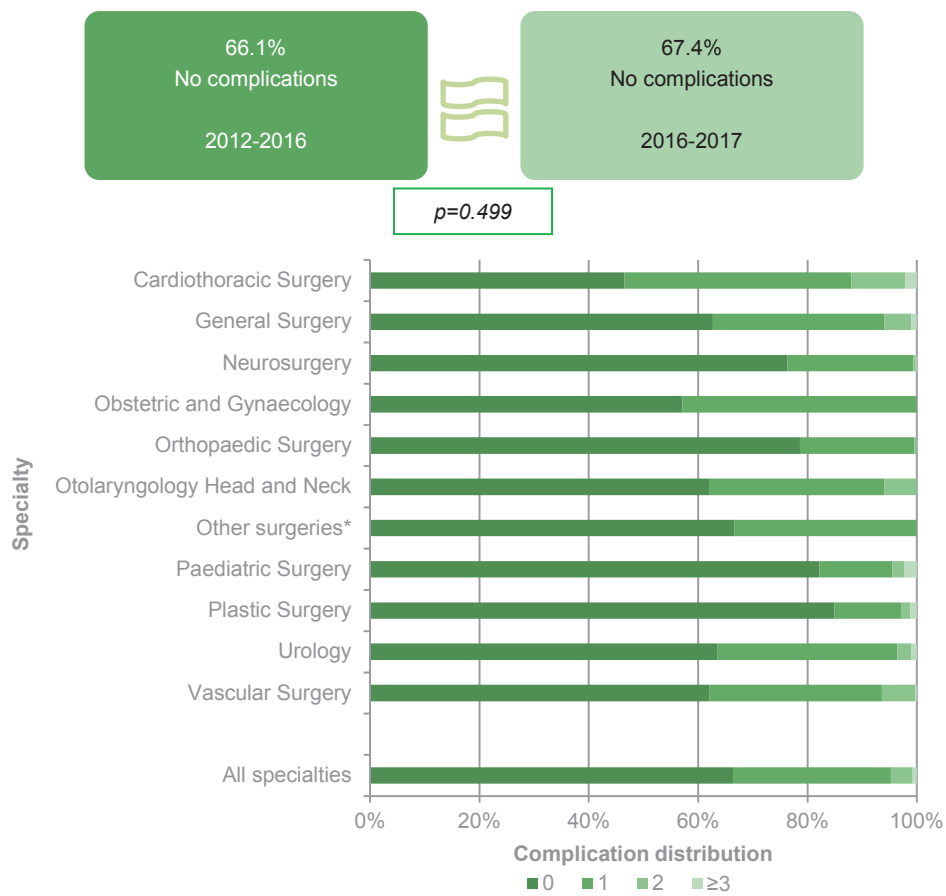
Note: n=1,895 complications in 6,867 episodes for 4,882 patients who underwent operative treatment.
 Data not available: n=18 (0.9%). Unavailable data was excluded from analysis.
 Audit period 1 July 2012 to 30 June 2017.
 Panc: pancreatic; post-op: post-operative.
 p=probability value.

Comments:

- Emergency cases were more likely to have postoperative complications.
- 73.2% (3,913/5,348) of cases were patients admitted as emergencies and of those, 31.0% (1,214/3,913) had a complication. Emergency cases are at a greater complication risk during surgical procedures.
- A total of 1,163 ‘other’ complications were identified and excluded from the graph. These included: cardiac failure, intrapulmonary haemorrhage, intracerebral bleed, postoperative hypoxia, acute or chronic renal failure, paraplegia, liver failure, pneumonia, perforated viscus, pulmonary embolism, pyelonephritis, respiratory failure, seizures, sepsis, stroke and wound haematoma.
- The SCF section on complications will be revised in 2018 to ensure clearer categorisation of complications for different specialties rather than capturing these under the ‘other’ categories.

Figure 25 shows postoperative complications by specialty.

Figure 25: Postoperative complications



Note: n=4,882 patients having operative treatment. Data not available: n=40 (0.8%); unspecified complication: n=22 (0.5%). Unavailable data was excluded from analysis.

Audit period 1 July 2012 to 30 June 2017.

*Other surgeries include smaller specialties with low case numbers, such as Oral/maxillofacial, Ophthalmology, Oncology and Trauma.

p=probability value.

Comments:

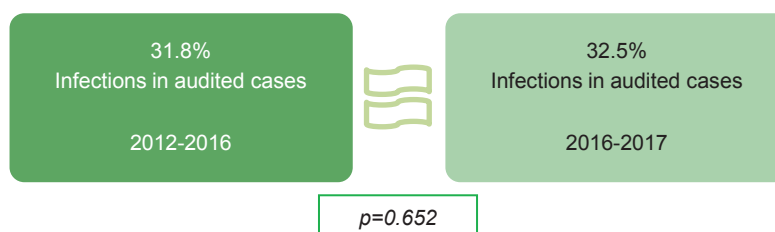
- There were differences in the rate of postoperative complications among the specialties. Cardiothoracic Surgery had the highest number of complications per patient due to the frailty and high risk profile of patients.
- Only 21 gynaecology patients were included in this report.

4.9. Clinically significant infections

The VASM monitors trends, including whether the infection was acquired preoperatively or postoperatively, from the retrospective mortality infection data available at hospitals.

Table 5 and Table 6 outline the type and timing of infection respectively, while Figure 26 shows infection timing by surgical specialty.

Table 5: Clinically significant infections by type



Infection type	2012–2013		2013–2014		2014–2015		2015–2016		2016–2017		Total	
	%	(n)	%	(n)	%	(n)	%	(n)	%	(n)	%	(n)
Pneumonia	47.5	(135)	50.0	(171)	45.8	(189)	43.8	(176)	39.7	(104)	45.5	(775)
Intra-abdominal sepsis	11.6	(33)	13.5	(46)	16.0	(66)	17.4	(70)	22.5	(59)	16.1	(274)
Septicaemia	30.3	(86)	24.9	(85)	23.5	(97)	23.4	(94)	19.5	(51)	24.3	(413)
Other*	10.6	(30)	11.7	(40)	14.8	(61)	15.4	(62)	18.3	(48)	14.2	(241)
Total	100.0	(284)	100.0	(342)	100.0	(413)	100.0	(402)	100.0	(262)	100.0	(1,703)

Note: n=1,703 infections in 5,348 patients.

Data not available: n=23 (1.3%). Unavailable data was excluded from analysis.

Audit period 1 July 2012 to 30 June 2017.

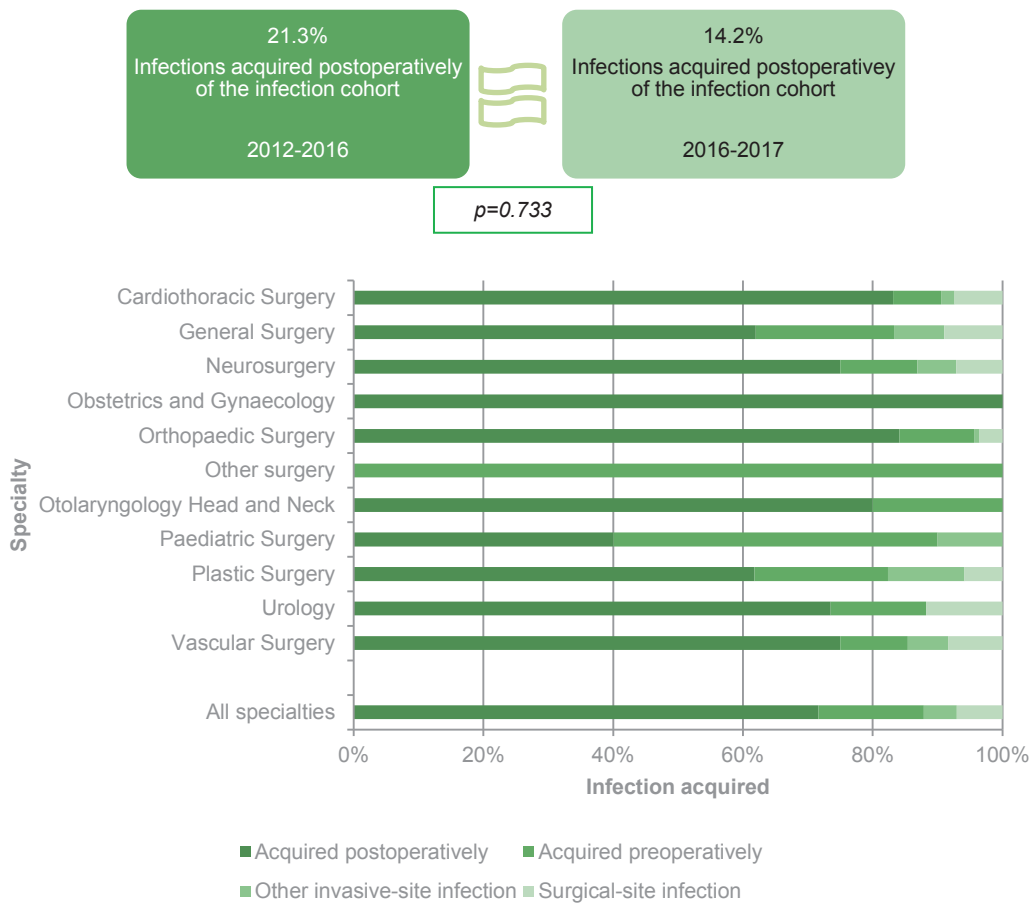
Other* includes other sites of infection with the following causative organisms: *Clostridium difficile*, *Candida albicans*, *Escherichia coli*, *Enterobacter aerogenes*, *Enterococcus*, *Klebsiella*, *Lactobacillus*, Methicillin-resistant *Staphylococcus aureus*, Methicillin-sensitive *Staphylococcus aureus*, *Staphylococcus haemolyticus*, *Staphylococcus pyogenes*, *Staphylococcus aureus*, Varicella, yeast and mixed organisms.

p=probability value.

Comments:

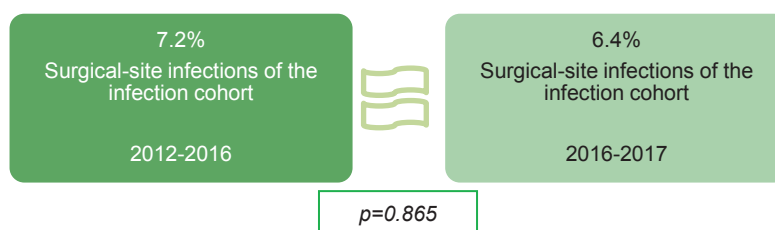
- Infection was reported in 31.8% (1,703/5,348) of cases since data collection commenced for infections.
- Combined, pneumonia and septicaemia accounted for 69.8% (1,188/1,703) of the cases where infection was present.
- The infective organism was identified in 36.9% (628/1,703) of the infection cohort.
- Antibiotic prophylaxis is a good infection control measure in surgery and should be considered.⁽³³⁾
- Strategies for reducing surgical-site infections have been implemented overseas and in Australia.^(34, 35)

Figure 26: Timeframe in which the clinically significant infection was acquired by specialty



Note: n=966 infections in 5,348 patients. Data not available: n=34 (3.4%). Unavailable data was excluded from analysis.
 Audit period 1 July 2012 to 30 June 2017.
 p=probability value.

Table 6: Timeframe in which the clinically significant infection was acquired



Infection timeframe	2012–2013 % (n)	2013–2014 % (n)	2014–2015 % (n)	2015–2016 % (n)	2016–2017 % (n)	Total % (n)
Acquired preoperatively	21.1 (38)	13.2 (25)	12.9 (29)	17.2 (37)	17.8 (28)	16.3 (157)
Surgical-site infection	4.4 (8)	7.9 (15)	6.2 (14)	9.8 (21)	6.4 (10)	7.0 (68)
Acquired postoperatively	69.4 (125)	75.7 (143)	76.9 (173)	66.0 (142)	69.4 (109)	71.6 (692)
Other invasive-site infection	5.0 (9)	3.2 (6)	4.0 (9)	7.0 (15)	6.4 (10)	5.1 (49)
Total	100.0 (180)	100.0 (189)	100.0 (225)	100.0 (215)	100.0 (157)	100.0 (966)

Note: n=966 infections acquired during last admission in 5,348 patients. Data not available: n=34 (3.4%). Unavailable data was excluded from analysis.

Audit period 1 July 2012 to 30 June 2017.

p=probability value.

Comments:

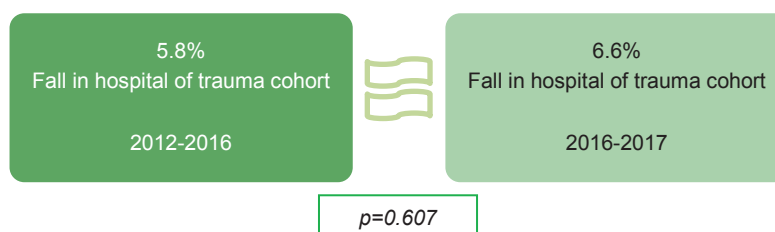
- The timeframe in which the infection was acquired can play a role in the patient's recovery following the surgical procedure.
- The infection timeframe varied across specialties, reflecting the casemix of individual specialties.
- Overall, 71.6% (692/966) of infection cases were acquired postoperatively.
- Surgical-site infections occurred in 7.0% (68/966) of cases involving infection. Surgical-site infections have decreased from 7.2% (58/809) in 2012–2016 to 6.4% (10/157) in 2016–2017. There were similar findings in the national data pool.^(5, 36-38)

4.10. Trauma

The VASM started collecting data on trauma cases in 2012. Trauma cases are those in which a patient received severe bodily injury or shock from a fall, accident or violence (see Table 7).

The VASM monitors trends, especially in falls, to ensure strategies are implemented to prevent and minimise harm from trauma in the future.

Table 7: Causes of trauma



Trauma causes	2012–2013 % (n)	2013–2014 % (n)	2014–2015 % (n)	2015–2016 % (n)	2016–2017 % (n)	Total % (n)
Fall at home	40.2 (92)	42.3 (112)	40.8 (120)	33.9 (86)	40.1 (73)	39.5 (483)
Fall in a care facility	39.7 (91)	30.2 (80)	27.9 (82)	32.3 (82)	32.4 (59)	32.2 (394)
Fall in hospital	3.9 (9)	4.9 (13)	8.2 (24)	5.1 (13)	6.6 (12)	5.8 (71)
Fall type unknown	1.3 (3)	2.6 (7)	2.4 (7)	2.4 (6)	2.2 (4)	2.2 (27)
Fall other*	5.7 (13)	7.2 (19)	7.1 (21)	7.9 (20)	4.9 (9)	6.7 (82)
Road accident	7.4 (17)	9.4 (25)	10.9 (32)	16.1 (41)	11.0 (20)	11.0 (135)
Violence	1.7 (4)	3.4 (9)	2.7 (8)	2.4 (6)	2.7 (5)	2.6 (32)
Total	100.0 (229)	100.0 (265)	100.0 (294)	100.0 (254)	100.0 (182)	100.0 (1,224)

Note: n=1,224 trauma cases in 5,348 patients. Data not available: n=53 (<1%). Unavailable data was excluded from analysis. Audit period 1 July 2012 to 30 June 2017.

*Includes roads and public venues.

p=probability value.

Comments:

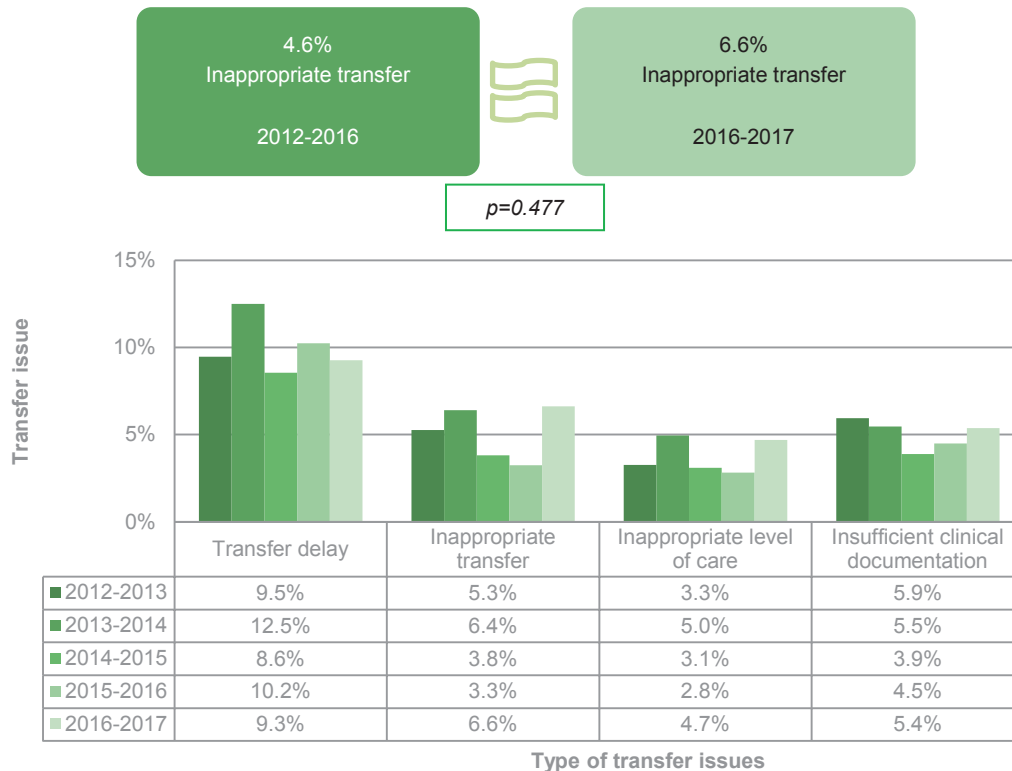
- 22.9% (1,224/5,348) of mortalities reported since July 2012 were attributed to trauma.
- Of the traumatic events, 86.4% (1,057/1,224) were caused by falls, 11.0% (135/1,224) were caused by traffic accidents and 2.6% (32/1,224) were associated with violence.
- 38.0% (465/1,224) of falls occurred in hospitals or care facilities, while 39.5% (483/1,224) of falls occurred at home and only 8.9% (109/1,224) occurred elsewhere.
- The VASM mortality audit surgical population is at an increased risk of falls due to the acuity of the life threatening pre-existing conditions, comorbidities and frailty associated with advanced age. The 38.0% (465/1,224) of falls that occurred in hospitals or care facilities should be addressed, with strategies implemented to reduce the number of falls in those locations.
- A review of patient care received by elderly patients undergoing surgery in the United Kingdom had similar findings.⁽²⁵⁾ Future trending analysis of falls should provide greater insight into strategies for improvement in this aspect of patient care, especially when falls occur in a care facility and in hospital.⁽³⁹⁾
- The VASM would like to see a reduction in fall trends in the years to come and will therefore include this in its educational programs. A study found a reduction in postoperative falls in patients who participated in a preoperative education program.⁽⁴⁰⁾ Reviewing falls in trauma and orthopaedic cases can be a powerful educational tool to unite institutions motivated to assess changing demographics and standards of treatment, and ultimately instil change.⁽⁴¹⁾ Similar educational strategies could be implemented at Victorian health care facilities.⁽⁴²⁾

4.11. Transfer

The treating surgeon was asked to provide information on patients who required inter hospital transfer as part of their care. This included information on the timeliness and appropriateness of the transfer. Treating surgeons were also asked to record any perceived clinical issues associated with individual patient transfers.

Figure 27 shows the spectrum of all transfer issues identified by surgeons.

Figure 27: Inter hospital transfer issues



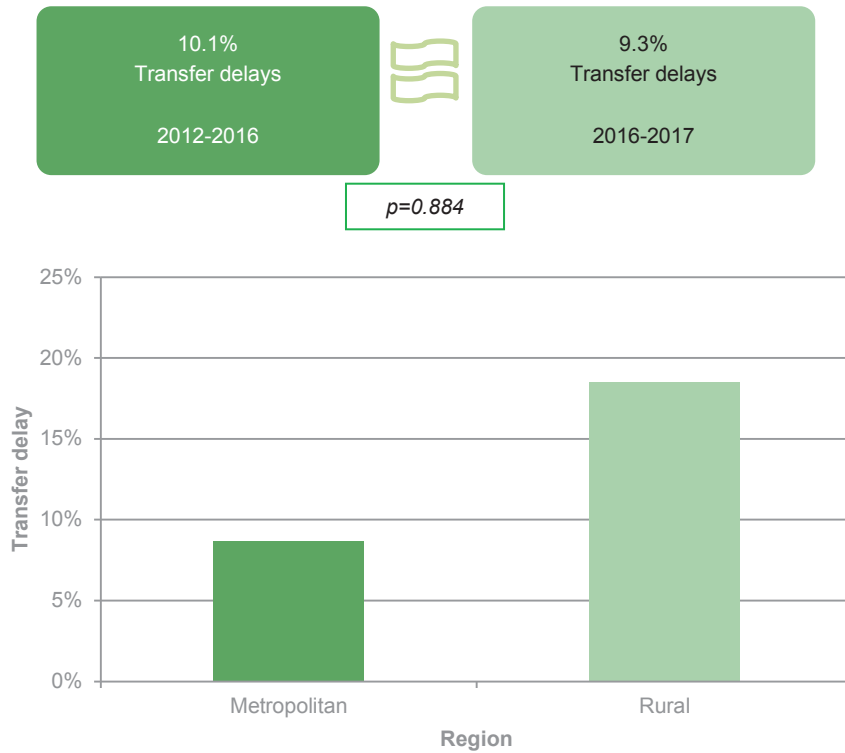
Note: n=1,104 transfers in 4,882 operative cases.
 Audit period 1 July 2012 to 30 June 2017.
 p=probability value.

Comments:

- Patients underwent a transfer to another hospital in 20.6% (1,104/5,348) of cases and this has been constant throughout the audit.
- Transfer delays were recorded in 9.4% (104/1,104) of transfer cases. Various issues of care related to transfers were identified in 22.1% (244/1,104) of transfer cases.
- An inappropriate level of care during transfer was identified for 3.4% (38/1,104) of transfer cases and the rate of inappropriate transfers was 6.6% (10/151). Inadequate clinical information and documentation was provided to the receiving hospital in 9.2% (102/1,104) of transfer cases (data not shown).
- Delays and problems in transfer can cause risks and challenges for shared surgical care. There is a need to improve the safety of patient care in such settings and implement clear communication channels between relevant patient care teams.

Inappropriate delay in transfer to a surgical unit was the major issue associated with transfer of a patient. Figure 28 shows the spectrum of all transfer issues identified by region.

Figure 29: Perceived delays in transfer of patients to another hospital by region



Note: n=1,104 transfers in 4,882 operative cases.
 Audit period 1 July 2012 to 30 June 2017.
 p=probability value.

Comments:

- A major reason for transfer is to provide a higher level of care, such as access to critical care support, and it is expected that rural hospitals will have a greater need to transfer patients. RACS supports the Rural Doctors Association of Victoria’s recommendation that there should be greater support and round the clock availability of well-trained rural doctors to ensure that appropriate care is provided to the patient prior to transfer.⁽⁴³⁾
- Transfer problems were more frequently seen in rural regions (18.5%; 25/135) compared with metropolitan areas (8.7%; 79/907) and this result was statistically significant ($p<0.001$). During 2016 to 2017 versus 2012-2016, the VASM noted a small reduction in transfer delays from 9.1% (75/823) to 7.1% (1/14) (data not shown).

5. Outcomes of the peer review

A primary objective of the VASM peer-review process is ascertaining if death was a direct result of the disease process alone, or if aspects of patient management might have contributed to that outcome. There are two possible outcomes: either death was a direct outcome of the disease process and the clinical management had no impact on the outcome, or there was a perception that aspects of patient management may have contributed to the death of the patient. In cases in which there is a perception that the clinical management may have contributed to death, the VASM has specified a spectrum of criticism from which the assessor can choose, as outlined below and in Table 8.

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

5.1. Areas of clinical incidents

Table 8: Severity of criticism of perceived clinical management issues

	Less severe	←—————→		Most severe
Areas of clinical incidents	None detected	Consideration	Concern	Adverse event
Outcome of incidents	Not applicable	Did not affect clinical outcome	May have contributed to death	Probably contributed to death
Preventable incidents	Not applicable	Probably not	Probably	Definitely
Association of incidents	Not applicable	Hospital	Clinical team	Surgical team

A patient can have more than one clinical management issue associated with the care that led to the final outcome. When assessing deficiencies per patient the analysis uses a weighting system, as outlined in Table 8, and the most severe criticism identified per patient is used in Tables 9, 10, 11 and 12.

Table 9: Overall criticism of patient management over the total audit period

Degree of criticism of patient management	Total occurrences		Patients affected by clinical outcomes	
	(n=7,505 in 5,348 cases)	%	(n=5,348)	%
No issues identified	3,841	52.0%	3,735	70.6%
Area of consideration	2,100	28.4%	907	17.1%
Area of concern	1,040	14.1%	425	8.0%
Adverse event	401	5.4%	222	4.2%
Total	7,382	100.0%	5,289	100.0%

Note: n=1,554 clinical management issues in 5,348 cases.

Data not available: total occurrences: n=123 (1.7%); patients affected: n=59 (1.1%). Unavailable data was excluded from analysis. Audit period 1 July 2012 to 30 June 2017.

Comments:

- Audited cases can have more than one clinical management issue identified for each patient. The percentage of patients affected is the important measure.
- Assessors perceived that clinical management issues occurred in 29.1% (1,554/5,348) of cases.
- Minor issues of patient management (areas of consideration) were perceived to have occurred in 17.1% (907/5,289) of cases while areas of concern were identified in 8.0% (425/5,289) of cases.
- In 4.2% (222/5,289) of cases assessors identified a clinical management issue serious enough to be categorised as an adverse event.
- Assessors perceived more clinical issues than treating surgeons, which highlights the importance and value of an independent peer-review assessment. These results are detailed in the 2016–2017 VASM Technical Report.⁽¹¹⁾
- The prevalence of areas of concern and adverse events identified by assessors was similar among the specialties. (data not shown) Data may be skewed for specialties with few mortalities reported as well as those that recently started participating in the audit process.

Table 10: Perceived impact of clinical management issues on clinical outcomes over the total audit period

Perceived impact on patient outcome	Total occurrences		Patients affected by clinical outcomes	
	(n=7,505 in 5,348 cases)	%	(n=5,348)	%
No issues of management identified	3,841	53.1%	3,735	71.2%
Did not affect clinical outcome	809	11.2%	414	7.9%
May have contributed to death	2,209	30.5%	890	17.0%
Probably contributed to death	372	5.1%	208	4.0%
Total	7,231	100.0%	5,247	100.0%

Data not available: total occurrences: n=274 (3.8%); patients affected: n=101 (1.9%). Unavailable data was excluded from analysis.

Comments:

- Assessors felt that clinical management issues probably contributed to death in 4.0% (208/5,247) of patients. In the remaining cases in which management issues were perceived, the impact of those issues on the outcome was inconsequential.

Table 11: Perceived preventability of clinical management issues over the total audit period

Perceived preventability of clinical issues	Total occurrences		Patients affected by clinical outcomes	
	(n=7,505 in 5,348 cases)	%	(n=5,348)	%
No issues identified	3,841	54.3%	3,735	71.6%
Definitely not preventable	148	2.1%	78	1.5%
Probably not preventable	1,217	17.2%	578	11.1%
Probably preventable	1,396	19.7%	562	10.8%
Definitely preventable	476	6.7%	263	5.0%
Total	7,078	100.0%	5,216	100.0%

Data not available: total occurrences: n=427 (6.0%); patients affected: n=132 (2.5%). Unavailable data was excluded from analysis.

Comments:

- Assessors determined that the clinical management issues were definitely or probably preventable in 15.8% (825/5,216) of patients with clinical issues.

Table 12: Clinical team responsible for clinical management issues over the total audit period

Clinical team responsible for management issue	Total occurrences		Patients affected by clinical outcomes	
	(n=8,066 in 5,348 cases)	%	(n=5,348)	%
No issues identified	3,841	51.4%	3,735	72.8%
Surgical team	2,123	28.4%	1,014	19.8%
Other clinical team	1,068	14.3%	274	5.3%
Hospital issue	248	3.3%	61	1.2%
Other factors*	199	2.7%	45	0.9%
Total	7,479	100.0%	5,129	100.0%

Note: n=7,420 clinical management issues in 5,348 cases. Data not available: total occurrences: n=587 (7.8%); patients affected: n=219 (4.1%). Unavailable data was excluded from analysis.

Audit period 1 July 2012 to 30 June 2017.

More than one clinical team can be responsible for a management issue.

*Other factors can include issues such as staffing levels, patient transfer, patient refusal, ambulance care, anaesthetic care and availability or quality of critical care support.

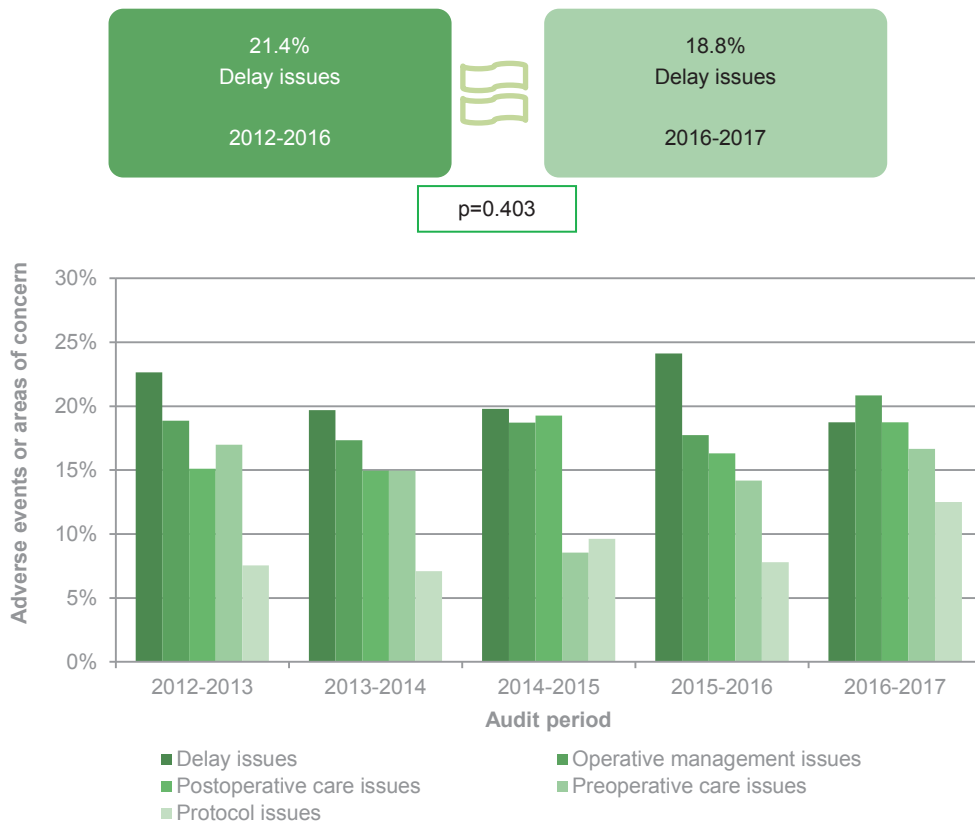
Comments:

- A clinical management issue attributable to the surgical team was identified in 19.8% (1,014/5,129) of cases. Clinical management issues were attributed to other clinical teams (e.g. medical and emergency departments) in 5.3% of cases, to hospital issues in 1.2% of cases, and to other factors in 0.9% of cases. In 4.1% (219/5,348) of cases the assessors did not identify the responsible team.
- These findings are similar to the national mortality audit results.⁽³¹⁾

5.2. Frequency of clinical management issues

The frequency of specific clinical management issues is shown in Figures 29 and 30. Figure 29 outlines the trending of clinical management issues outlined by second-line assessors across the audit period, focussing on issues identified as areas of concern or adverse events. If an assessor flags an area of concern or adverse event it implies significant criticism.

Figure 30: Trends in top five areas of concern and adverse events in second-line assessments (SLAs)



Note: n=1,441 (in 609 SLAs) clinical management issues as an adverse event or area of concern of these the top five clinical management issues identified. More than one clinical management issue can be attributed to a case.
 Audit period 1 July 2012 to 30 June 2017.
 The clinical issues were re-categorised as detailed in the 2016–2017 VASM Technical Report.⁽¹¹⁾
 p= probability value.

Comments:

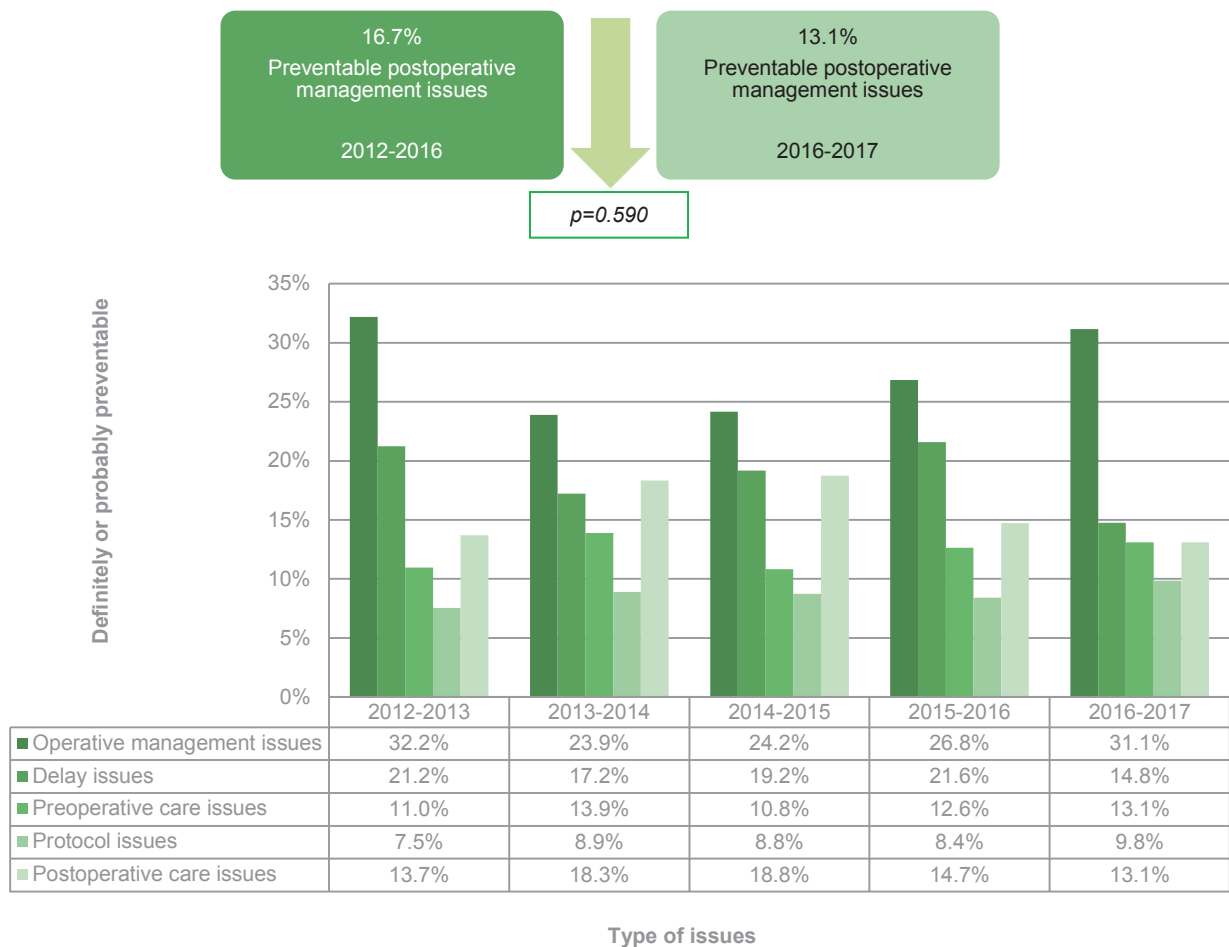
- Trends in, and causes of, clinical management issues are monitored closely by VASM and remain the focus of reports and educational events. The most common clinical management issues were delay issues (21.2%; 129/609), operative management issues (18.4%; 112/609), postoperative care issues (16.9%; 103/609) and preoperative care issues (13.3%; 81/609). Protocol issues remained constant during the audited period.
- There was a decrease in the frequency of delay issues, from 21.4% (120/561) of cases in 2012–2016 to 18.8% (9/48) of cases in 2016–2017 ($p < 0.402$). Despite the existence of this audit and the recommendations made by the VASM, it has been observed that the same types of issues occur repeatedly. This has led the VASM to refocus on its educational role in disseminating lessons learned to clinicians and the provision of hospital governance reports to drive further improvements.
- The delay category includes delays in patient care, diagnosis, fully investigating the patient, patient presenting, recognising complications, transfer to surgical unit, transfer to tertiary hospital and starting

medical treatment. The category also includes delay to operation caused by missed diagnosis and delay to surgery where earlier operation was desirable.

- Operative management issues include decision to operate, timing of operation, preferably different operation or procedure, a more limited surgery, organ injury, competence of surgical team, failure to stop haemorrhage, wrong approach used and incorrect or inappropriate therapy.
- A number of studies on hip fracture patients found that delay to surgery was attributable to patient factors such as age,⁽⁴⁴⁾ comorbidities,⁽⁴⁵⁾ ASA status, gender, day of surgical admission,⁽⁴⁶⁾ waiting times and reduction of theatre changeover time.⁽⁴⁷⁾
- There was also criticism of the choice of operative procedure, decision to consider another operative approach and performing less extensive procedures on frail patients with multiple comorbidities. The use of open compared with laparoscopic procedures carries a higher incidence of anastomotic leaks and the choice of the operative procedure can be critical in reducing postoperative complications.⁽⁴⁸⁾

Figure 30 focuses specifically on clinical management issues identified by the assessor as being preventable. The more frequent the clinical management issue, the greater the need for strategies to improve surgical care in that clinical area.

Figure 31: Trends in top five preventable clinical management issues in second-line assessments



Note: n=1,441 clinical management issues identified as an adverse event or area of concern by assessors; 817 were recorded as probably or definitely preventable.

Audit period 1 July 2012 to 30 June 2017.

More than one clinical management issue can be attributed to one case.

The clinical issues were re-categorised and detailed in the 2016–2017 VASM Technical Report.⁽¹¹⁾

p=probability value.

Comments:

- The most common preventable clinical management issues during the audit period 2012-2017 were operative management issues (26.7%; 218/817) and delay issues (19.3%; 158/817).
- Preventable delay issues saw the largest drop, falling from 19.7% (149/756) in 2012–2016 to 14.8% (9/61) in 2016–2017. Preventable postoperative care issues had the second largest drop, falling from 16.7% (126/756) in 2012–2016 to 13.1% (8/61) in 2016–2017.
- Preventable operative management issues saw the largest rise, increasing from 26.3% (199/756) in 2012–2016 to 31.1% (19/61) in 2016–2017. Ongoing review and monitoring of patient management is needed in order to identify issues and reduce the number of cases with preventable mortality.⁽⁴⁹⁾

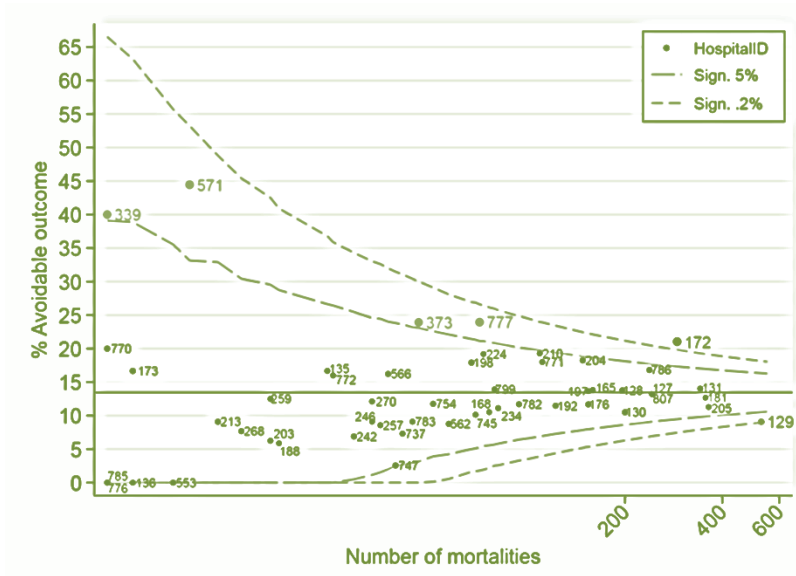
The increase in operative management issues are likely due to the college's recommendations to reduce active treatment and futile surgery in frail patients, particularly when the treatment has a high risk of death or when the end of life is near.

- Audited cases in which no operative procedure occurred had a lower rate of areas of concern and adverse events (28.9%; 1,409/4,882) compared with cases in which an operative procedure occurred (5.0%; 32/635) (data not shown). Overall, 8.7% (466/5,348) of patients did not undergo an operation.

5.3. Peer-review process outcomes by hospital

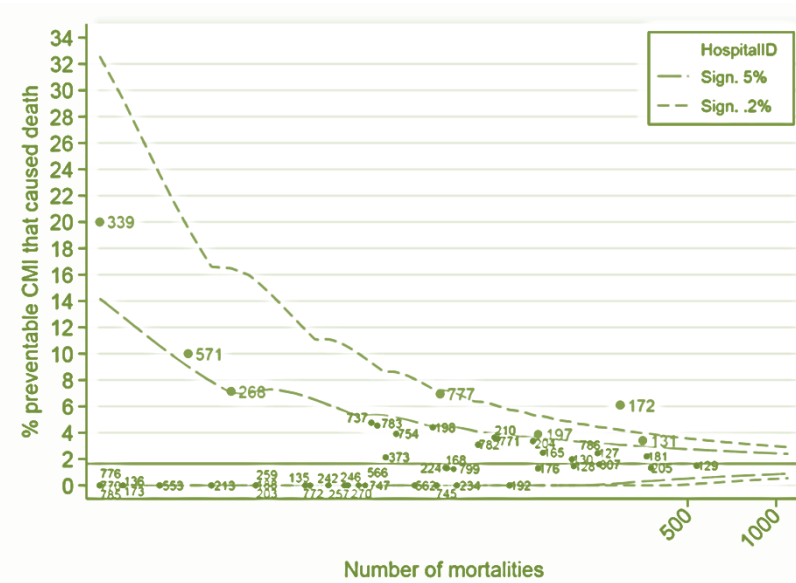
Where cases have undergone both FLA and SLA, only the SLA (the highest level of assessment) was included in the analyses provided in Figures 31 and 32. If an assessor flags an area of concern or adverse event and the preventability of the final outcome, this implies significant criticism. In the funnel plots detailed below, VASM combined these to look at the prevalence of the highest degree of criticism among hospitals. The hospital performance results have been forwarded to SCV and all collaborating hospitals for a comprehensive clinical performance review. Hospitals that flagged above the 0.2% significant contour had been notified and are expected to perform further internal investigation.

Figure 32: Cases where the final outcome was considered preventable flag 0.2% and 5% significant contours above Victorian mean 13.4%)



Note: sign: significant contour overlay. Greater than 0.2% sig=204, 172 (above contour). Less than -0.2% sig=129 (below contour).

Figure 33: Cases with a potentially preventable clinical management issue (flag 0.2% and 5% significant contours above national mean 1.6%)



Note: sign: significant contour overlay. Greater than 0.2% sig=172 (above contour). Less than -0.2% sig=nil (below contour).

6. VASM evaluation

6.1. Treating surgeon's appraisal of the VASM peer-review process

The VASM has uniquely implemented an extra step in the audit process, with a feedback form provided to the treating surgeon alongside the assessors' reports. This additional audit step allows the surgeon to record their opinion of the assessments provided. The treating surgeon can provide feedback to record their perspective to close the audit loop, because the treating surgeon is the only person in possession of the clinical history of the patient's course to death.

The peer-review process feedback form was returned by the treating surgeon in 6.8% (366/5,348) of the audited cases.

Of those forms, 284 related to FLAs (77.6%) and 82 were associated with SLAs (22.4%).

Overall, 82.8% (303/366) of treating surgeons agreed that the peer-review feedback was fair, while 8.2% (30/366) remained neutral and 9.0% (33/366) disagreed with the assessors' opinions. Additional comments on the case were provided by the surgeon on 31.4% (115/366) of the returned evaluation forms.

The treating surgeon agreed that the peer-review feedback was a good source of information to improve surgical care at their institution in 68.6% (251/366) of the returned evaluation forms. This evaluation survey pilot demonstrates that there is value in this additional audit step.

For a detailed analysis of these qualitative surveys, please see the 2016–2017 VASM Technical Report.⁽¹¹⁾

6.2. Concordant validity considerations

Completion of all fields in the SCF by the treating surgeon requires some self-reflection. An example is where the treating surgeon is asked to nominate any areas of consideration, concern or adverse events emanating from their care of the patient. Such responses by the treating surgeon were compared to assessors' responses to the same question, and the degree of concordance was estimated.

Analysis of concordance is a method of studying inter-rater reliability in reporting all clinical management issues. Performing a full case note review on all reported deaths is not feasible for logistical reasons.

Gwet's AC1 provides a more stable inter-rater reliability coefficient than Cohen's Kappa and appears less affected by prevalence and marginal probability. It is represented in this report for better interpretation of inter-rater reliability analysis.⁽⁵⁰⁾

The outcomes of concordance analysis shown below are reassuring, as they mirror the predicted outcomes.

- Disagreement between first- and second-line assessors was most marked in HDU care, the areas of timing and choice of the operation; decision to operate; technical management and the clinical management section. Second-line assessors perceived more issues than first-line assessors.⁽⁵¹⁾
- The tendency of second-line assessors to be more critical of clinical management events was foreseeable, as they have access to an independent description of the episode of care.

6.3. The perceived quality of VASM information

The VASM completed two series of this qualitative project in response to the recommendations made by external auditors, Aspex Consulting.

The VASM was externally audited in 2015 by Aspex Consulting. The external audit suggested the update of a new KPI relating to: “The perceived value of information provided by VASM in order to promote ongoing improvements to surgical safety, quality and confidence across the Victorian health system”.⁽⁵²⁾

The selection of the interviewed explorations into the stakeholders’ views in outlined in Table 13.

Data was collected in the form of quantitative and qualitative feedback. The mixed methods approach was designed to provide open ended explorations into stakeholders’ views, while also providing structured tools for annual trending reports.^(53, 54)

Table 13: Interviewed stakeholders

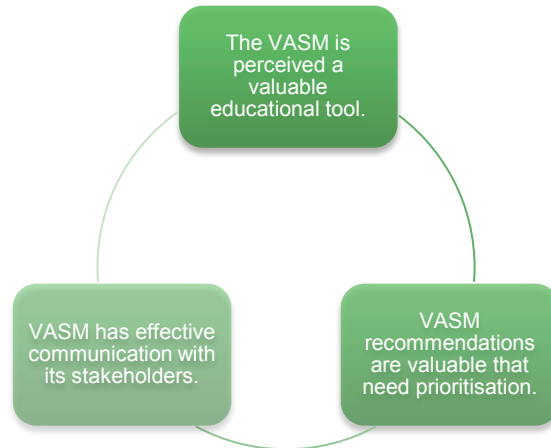
Role	2014–2016			2016–2017		
	Target n	Interview n	% from Target	Target n	Interview n	% from Target
Total DHHS governance	3	3	100.0	2	2	100.0
Private hospital administration	3	3	100.0	2	2	100.0
Private hospital medical records	3	3	100.0	2	4	200.0
Private hospital management	8	10	125.0	4	4	100.0
Total private hospitals	14	16	114.3	8	10	125.0
Public hospital administration	6	7	116.7	3	3	100.0
Public hospital medical records	5	9	180.0	3	3	100.0
Public hospital management	18	18	100.0	9	11	122.2
Total Public hospitals	29	34	117.2	15	17	113.3
Total stakeholders	46	53	115.2	25	29	116.0

DHHS: Department of Health and Human Services.

Three major themes per category emerged from the interviews (see Figure 33) and the results showed that the audit is viewed as a valuable educational tool. Communication with stakeholders was considered effective and efficient. Some respondents highlighted that the VASM recommendations, and the subsequent implementation of those recommendations, are useful for improving surgical care.

Detailed analysis of the qualitative interviews is provided in the 2016–2017 VASM Technical report.⁽¹¹⁾

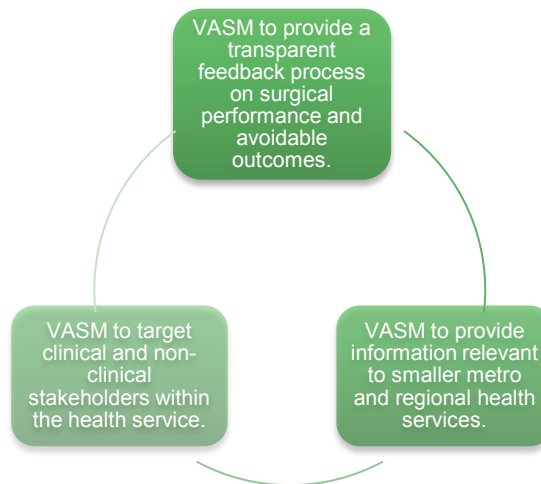
Figure 34: Major themes regarding the perceived usefulness of the VASM



A few recommendations for improvement highlighted in 2015 are still relevant in this audit period. The current emphasis was on the VASM’s role in providing a transparent feedback on the avoidable outcomes.

Figure 34 outlines the VASM’s goals in these areas.

Figure 35: Recommendations for VASM's improvement



As is the nature of qualitative research, the results from this sample cannot be generalised to represent those of a broader population. Whilst the data did reach saturation, with such a diverse pool of participants it is possible that intricate nuances between different stakeholder types might not have emerged.

The main recommendations came from stakeholders emphasising the importance for a transparent, identifiable feedback process on measurable outcomes that may be beneficial to all health services to improve surgical care. In general, VASM does continue to identify, assess and review factors associated with surgical mortality. In light of this project, VASM will continue to develop action plans, educational programs and recommendations for further patient care improvements in Victoria.

6.4. VASM educational activities

The VASM annual educational seminars commenced in 2012 as a collaborative effort between the VASM, the DHHS, the VSCC and the Victorian Managed Insurance Authority. The seminars and workshops are intended for interns, surgeons (rural and urban), nurse managers and educators, health specialists, administrators, chief executive officers, and quality and safety officers. All VASM educational programs can be downloaded from www.surgeons.org/VASM.

6.5. Audit limitations and data management

As an audit the data is collected to provide feedback to surgeons, rather than for academic research.

The data is self-reported and a certain level of bias may be present, but independent assessors make their own assessments on the facts presented.

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

VASM conducts quality assessments of the coding associated with diagnosis, cause of death, operations and deficiencies of care, and every effort is made to review closed cases to ensure accuracy.

The Queensland Audit of Surgical Mortality investigated the validity of routine reporting of surgical information in the SCFs through a comparison with patient medical records. The analysis found 98.2% concordance between the data reported by the treating surgeon and the hospital medical records information. It was noted that the majority of the discordances were due to omissions.⁽⁵⁵⁾

Use of the electronic Fellows' Interface for data submission should ease the data submission process, and will lead to improved data integrity in the future. Data submission via the Fellows Interface was mandated from 1 January 2017.

6.6. Conclusion

The VASM audit continues to identify, assess and review factors associated with surgical mortality, and will continue to develop action plans, educational programs and recommendations for improving patient care in Victoria.^(49, 56)

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