

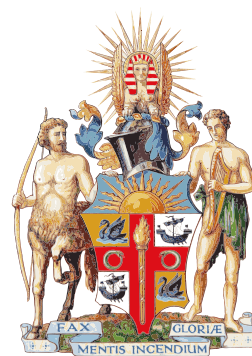


# Victorian Audit of Surgical Mortality

VASM

## Supplementary Report

2018



ROYAL AUSTRALASIAN  
COLLEGE OF SURGEONS



## Contact details

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

Web: [www.surgeons.org/VASM](http://www.surgeons.org/VASM)  
Email: [vasm@surgeons.org](mailto:vasm@surgeons.org)  
Telephone: +61 3 9249 1153  
Facsimile: +61 3 9249 1130

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

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## 2. Acknowledgements

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

- Public and private Victorian hospitals
- Victorian treating surgeons, and surgeons who have acted as assessors, for the time and effort providing detailed and valuable case note reviews
- Victorian Department of Health and Human Services, for funding the project
- RACS, for infrastructure and oversight of this project
- SCV, VAHI, DHHS, VSCC, VCCAMM, AOA, RANZCOG and ANZCA
- Dr Nick Andrianopoulos Senior Research Fellow, Department of Epidemiology and Preventive Medicine, School of Public Health and Preventive Medicine, Monash University
- Anje Scarfe, Editor and Research Officer, Research, Audit and Academic Surgery, RACS
- Marguerite Russell, for providing the image on the front cover, “*Ghost Gum at Ormiston Gorge*” acrylic painted on canvas.

## VASM Management Committee Members and Staff

Dr	Anil	Shirin	Manager, Consultative Council Unit
Associate Professor	Babidge	Wendy	General Manager, Research, Audit and Academic Surgery Division
Mr	Chen	Andrew	Project Officer, Victorian Audit of Surgical Mortality
Mr	Choi	Wai-Ting	Plastic Surgery representative
Mr	Faragher	Ian	General Surgery representative
Mr	Hansen	Dylan	Data Analyst, Victorian Audit of Surgical Mortality
Dr	Kattula	Andrea	The Australian and New Zealand College of Anaesthetists representative
Dr	Knight	Rachel	RANZCOG representative
Dr	Kopunic	Helena	Surgical Audit Manager, Research, Audit and Academic Surgery Division
Mr	Lo	Patrick	Neurosurgical Society of Australasia representative
Professor	Loh	Erwin	Royal Australasian College of Medical Administrators representative
Mr	Maloney	Ryan	Data Analyst, Australian and New Zealand Audit of Surgical Mortality
Dr	Mandaleson	Avanthi	Australian Orthopaedic Association representative
Ms	Manescu	Mary	Director, Victorian Agency for Health Information
Associate Professor	McCahy	Phillip	Clinical Director, Victorian Audit of Surgical Mortality
Mr	Peck	Malcolm	Consumer Representative
Dr	Raj	Mariolyn	Urological Society of Australia and New Zealand representative
Ms	Retegan	Claudia	Project Manager, Victorian Audit of Surgical Mortality
Ms	Rizzoli	Helen	Director, Stewardship and Support
Dr	Shand	Jocelyn	Dental Practice Board representative
Mr	Taylor	Russell	Australasian Association of Paediatric Surgery representative
Ms	Vinluan	Jessele	Senior Project Officer, Victorian Audit of Surgical Mortality
Mr	Vithanage	Ushan	Research Assistant, Victorian Audit of Surgical Mortality
Mr	Wagner	Timothy	Australian Vascular Association representative
Mr	Zimmet	Adam	Cardiothoracic Craft Group representative



# 1. 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 Anaesthesiologists
CCU	critical care unit / critical care utilisation
CHASM	Collaborating Hospitals' Audit of Surgical Mortality
CMI	clinical management issue
CPD	continuing professional development
DHHS	Department of Health and Human Services
DVT	deep vein thrombosis
FLA	first-line assessment
GI	gastrointestinal
Hrs	hours
NOD	notification of death
NSQHS	National Safety and Quality Health Service
PE	pulmonary embolism
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
VAHI	Victorian Agency for Health Information
VASM	Victorian Audit of Surgical Mortality
VCCAMM	Victorian Consultative Council on Anaesthetic Mortality and Morbidity
VPCC	Victorian Perioperative Consultative Committee

## 2. About this supplementary report

The Victorian Audit of Surgical Mortality (VASM) is part of the Australian and New Zealand Audit of Surgical Mortality (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, like its regional counterparts, identifies clinical management issues via independent peer review assessments to actively manage and improve patient safety. Strategies have been developed to redress these issues.

The audit was mandated in 2012 by the Royal Australasian College of Surgeons (RACS) as part of the Continuing Professional Development (CPD) program. Compliance to the audit is determined by the number of cases that completed the audit process. Detailed information on the VASM's audit process flow chart is reported in the Governance Structure and Data Management sections of the Supplementary Report.

The VASM monitors trends in mortalities and clinical management as a method of case detection, and identifies areas for improvement in the care delivered by health services in Victoria.

This report, therefore, presents recommendations and key findings from **1 July 2017 to 30 June 2018**. Trending for the tables and figures starts from 2012 to 2018, to illustrate changes over time from the mandated audit year. The change in data over time was attributed to cases that completed the audit process.

Cases from public and private hospitals, and surgical clinicians is compared using the VASM data, with the ANZASM data as a benchmark to further determine emerging trends of outcomes from surgical care.

The VASM is externally audited by Aspex Consulting to assess the functionality of the VASM. The third review since 2012 was conducted in 2018. The current Aspex Consulting recommendations<sup>(1)</sup> are presented in this report as part of the key findings.

The Key Findings from the current year's audit highlight the need for hospitals and surgeons to improve the clinical management issues and preventable outcomes, as identified in the Outcomes of Peer-Review section, as well as how the VASM data can be utilised to meet National Safety and Quality Health Service (NSQHS) Standards. The message from the key findings are reiterated in the Key Recommendations section. Other areas of improvement for the VASM are outlined in the Future Goals section.

### 3. Governance structure

The VASM is a quality assurance program funded by Safer Care Victoria (SCV) at the Department of Health and Human Services (DHHS).

The VASM monitors trends in mortalities and clinical management issues via independent peer review as a method of case detection. The VASM identifies areas for improvement in the care delivered by health services in Victoria that:

- recognises a range of different healthcare professionals involved in the delivery of care to patients undergoing surgery;
- fosters a no-blame culture of reporting; and
- utilises findings with other information to maximise the quality and safety of health care and the outcomes experienced by patients.

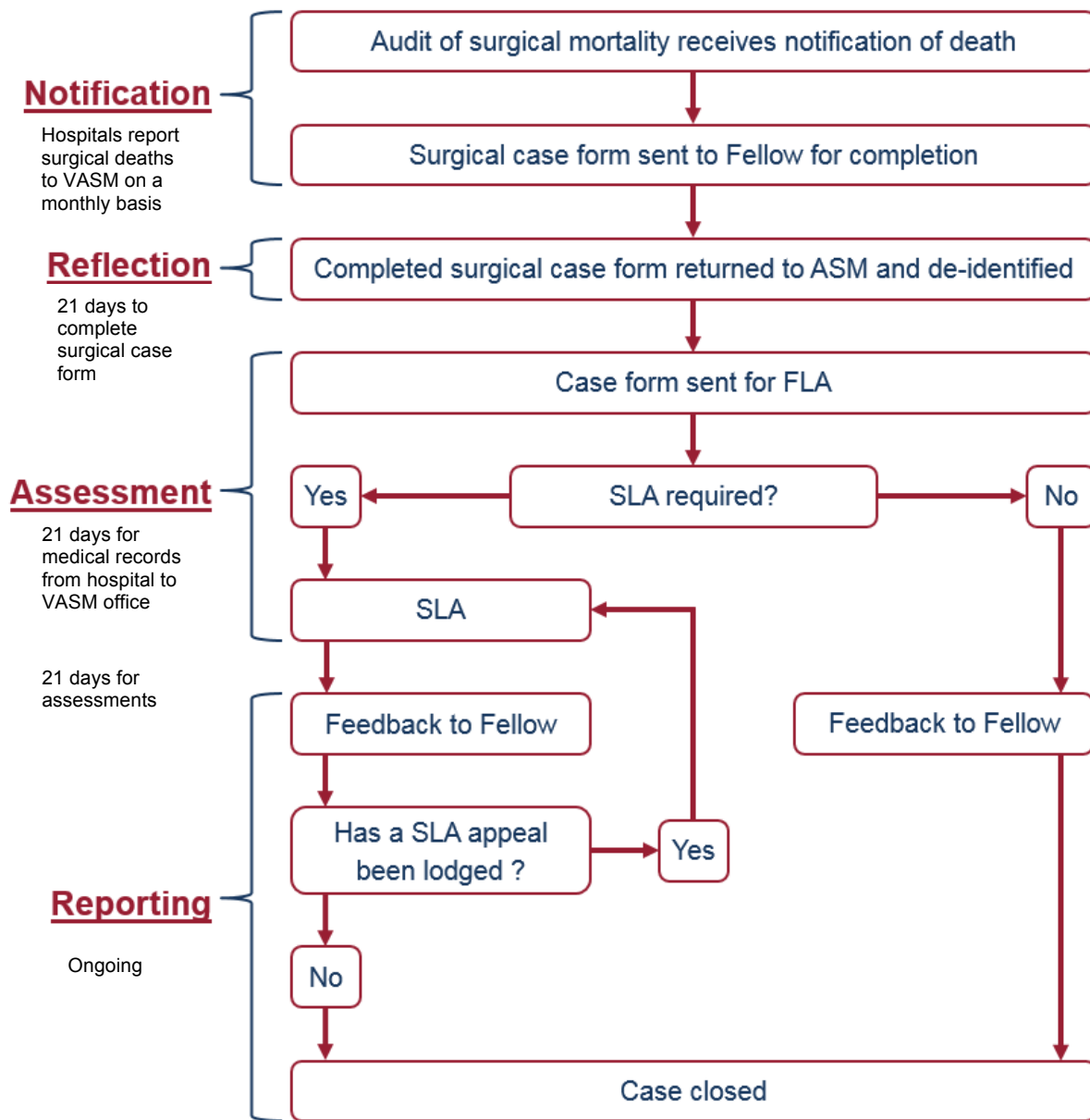
The VASM is part of the ANZASM, a national network of regionally-based audits of surgical mortality with the aim of ensuring the highest standard of safe and comprehensive surgical care.

The RACS provides infrastructure support and oversees the project. RACS also provide ongoing surgical training, and the audit is one of the mandatory components of attaining a surgeon's CPD accreditation. Surgeons participating in the audit gain points in Category 1: 'Clinical Governance and Evaluation of Patient Care'.

## 4. Audit process

The audit process consists of the following phases from when the surgical death is reported to VASM to being closed, as listed below.

Figure 1: VASM audit process



### Comments:

**Phase 1** - Notification: VASM receives a NOD through a participating hospital or Coroner's Court.

**Phase 2** - Reflection: Fellows provide a CRF that captures all the details regarding a NOD. Goal timeframe for each audit step is 21 days.

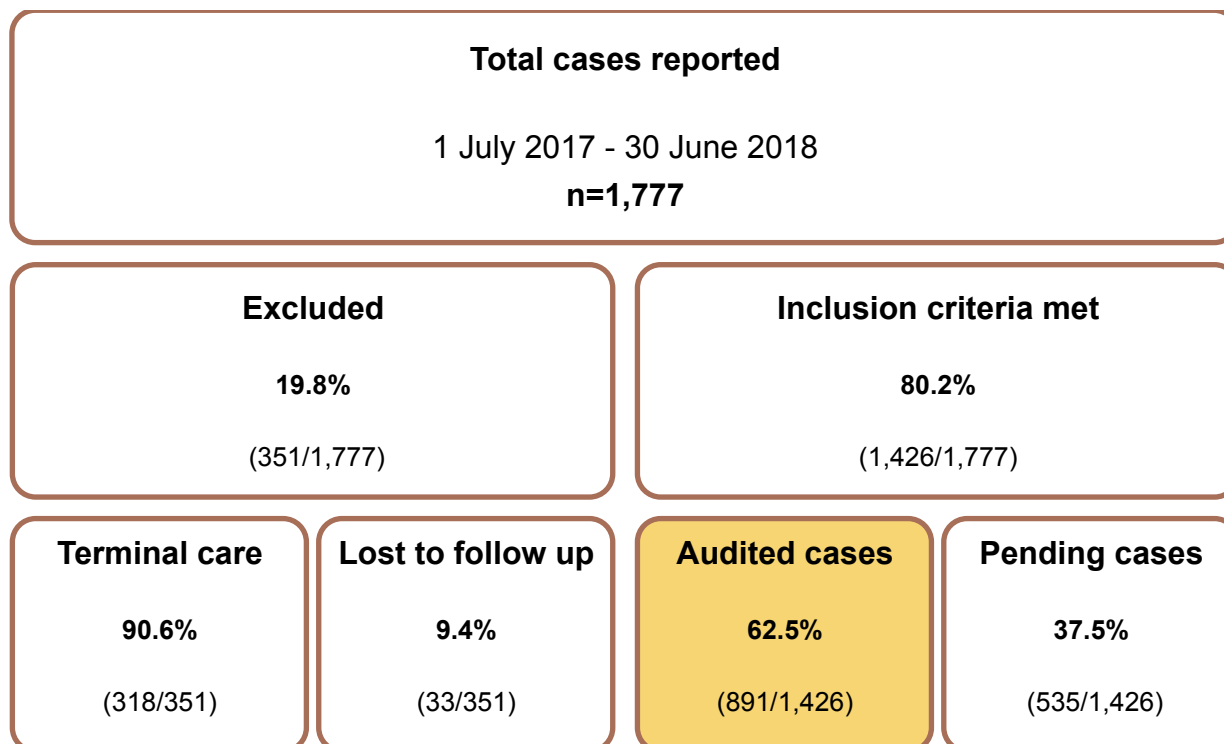
**Phase 3** - Assessment: CRFs undergo peer review and the medical notes are requested from the hospital if it goes for second-line assessment.

**Phase 4** - Reporting: All information obtained from a case is collated for data analysis and reporting.

## 5. Audit Numbers

From 1 July 2017 to 30 June 2018, the VASM received 1,777 notifications of deaths associated with surgical care. Cases that were pending from the previous audit period (2016-2017) have been included in the current audit period for analysis. VASM report upon clinical outcomes only on closed cases (n=891) that completed the audit process.

Figure 2: Audit numbers



### Comments:

- The findings on 19.8% (351/1,777) of the reported mortalities were excluded from further analysis due to terminal care admissions in 318 of the 351 cases or were lost to follow up in 33 of the 351 (due to reporting errors or cases wrongly attributed to surgical units, due to the surgeon moving interstate, abroad, retiring, the unattainability of medical records, or fellows non-compliant).
- The timeframe given for each step of the audit process is 21 working days for all of the data collection forms such as: The Surgical Case Form (SCF), First-Line Assessment (FLA) and Second-Line Assessment (SLA). Obtaining medical records and documentation de-identification processes can take up to 4 months for complex cases.
- The return rate for SCFs from 2017-2018 was 79.0% (1,404/1,777). The remainder of the cases are pending return and will be reported in future publications.
- The peer review assessment rate for 2017-2018 data will increase as the cases undergo the full audit process.
- The VASM's goal is to review all mortality cases within 3 months of notification.
- The specialties with the highest reports in 2017-2018 were: General Surgery (35.7%, 634/1,777), Orthopaedic Surgery (19.9%, 353/1,777), Neurosurgery (12.9%, 229/1,777), Cardiothoracic Surgery (12.9%, 229/1,777) and Vascular Surgery (7.9%, 140/1,777).
- Work is being undertaken to achieve a more effective peer review system.



## 5.1 Data dictionary

### PREVENTABLE ADVERSE EVENTS

Definition	The count of each READ code for preventable adverse events identified by the highest-level assessor that each case has undergone by financial year.
Inclusions	All cases which have completed the entire audit process. Counts greater than one only included.
Exclusions	All cases which have not completed the entire audit process.

### POTENTIALLY PREVENTABLE CLINICAL MANAGEMENT ISSUES

Definition	The count and percentage of deaths with a potentially preventable clinical management issue that that caused the death of the patient by hospital.
Inclusions	All cases which have completed the entire audit process. Counts greater than five only included.
Exclusions	All cases which have not completed the entire audit process.

### DEATHS NOTIFIED

Definition	Number of deaths notified from the hospital, grouped by surgical specialty
Data Notes	Specialty 'other' includes: oral-maxillofacial, paediatrics, obstetrics & gynaecology and ophthalmology. Where there are too few numbers such that the identity of the patient or surgeon is compromised, the surgical specialties will not be listed and all deaths will be aggregated under the specialty of 'other'.
Inclusions	All deaths notified to VASM from hospital
Exclusions	Any cases notified to VASM that do not fall within the inclusion criteria (i.e. case status: excluded error)

### COMPLIANCE

Definition	The count and percentage of NODs (Notification of Death) with complete surgical case forms by specialty by financial year.
Inclusions	All cases where a surgical case form was returned.
Exclusions	Cases in which a surgical case form was not returned.

### SECOND-LINE REVIEW

Definition	The count and percentage of audited cases that underwent a second-line review by financial year, compared to like-state and like-national hospitals (based on AIHW peer grouping. See 10.1)
Inclusions	All cases which have completed the entire audit process.
Exclusions	All cases which have not completed the entire audit process.

### COMPLIANCE BY SPECIALTY

Definition	Count of deaths notified to VASM by financial year, with percentages of notified deaths where a surgical case form has been completed compared to like-state and like-national hospitals (based on AIHW peer grouping. See 10.1).
Inclusions	All deaths notified to VASM from hospital and all cases in which a surgical case form has been completed and returned to the Audit office
Exclusions	Any cases notified to VASM that do not fall within the inclusion criteria (i.e. case status: excluded error)

**DELAY IN DIAGNOSIS**

Definition	Counts and percentage of closed cases in a hospital where there was a delay in diagnosis by financial year. The same is shown for like state hospital and like national hospitals.
Inclusions	All cases which have completed the entire audit process.
Exclusions	All cases which have not completed the entire audit process.

**DELAY IN TRANSFER**

Definition	Counts and percentage of closed cases in a hospital where there was a delay in transfer by financial year. The same is shown for like state hospitals and like national hospitals.
Inclusions	All cases which have completed the entire audit process.
Exclusions	All cases which have not completed the entire audit process.

**CCU CARE**

Definition	Counts and percentage of closed cases where there was no use of ICU or HDU as indicated by the treating surgeon by financial year. The same is shown for like state hospitals and like national hospitals.
Inclusions	All cases which have completed the entire audit process.
Exclusions	All cases which have not completed the entire audit process.

**DVT USE**

Definition	Counts and percentage of cases where the use of DVT was deemed inappropriate by the highest level assessor for each case by financial year. The same is shown for like state and like national hospitals.
Inclusions	All cases which have completed the entire audit process.
Exclusions	All cases which have not completed the entire audit process.

**ELECTIVE ADMISSIONS**

Definition	Counts and percentage of elective admissions where there was at least one operation with timing of "elective" by financial year. The same is shown for like state and like national hospitals.
Inclusions	All operative cases which have completed the entire audit process where there was an elective admission.
Exclusions	Completed cases where there was an emergency admission or where no operation was performed.

**CONSULTANT SURGEON OPERATIVE STATUS**

Definition	Counts and percentage of all operations where the consultant surgeon was either operating, assisting or in theatre by financial year. The same is shown for like state and like national hospitals.
Inclusions	All operative cases which have completed the entire audit process where a consultant was present in theatre.
Exclusions	Cases which have not completed the audit process or where no operation was performed.

**POSTOPERATIVE COMPLICATION**

Definition	Counts and percentage of closed cases with a postoperative complication by financial year. The same is shown for like state and like national hospitals.
Inclusions	All operative cases which have completed the entire audit process where a postoperative complication was noted.
Exclusions	Cases which have not completed the audit process or where no operation was performed.

**UNPLANNED RETURN TO THEATRE**

Definition	Counts and percentage of closed cases with a unplanned return to theatre by financial year. The same is shown for like state hospitals and like national hospitals.
Inclusions	All operative cases which have completed the entire audit process where an unplanned return to theatre was noted.
Exclusions	Cases which have not completed the audit process or where no operation was performed.

**UNPLANNED ICU ADMISSION**

Definition	Counts and percentage of closed cases with an unplanned ICU admission by financial year. The same is shown for like state and like national hospitals.
Inclusions	All cases which have completed the entire audit process where an unplanned admission to ICU was noted.
Exclusions	Cases which have not completed the audit process.

**UNPLANNED READMISSION**

Definition	Counts and percentage of closed cases with an unplanned readmission by financial year. The same is shown for like state and like national hospitals.
Inclusions	All cases which have completed the entire audit process where an unplanned readmission.
Exclusions	Cases which have not completed the audit process.

**FLUID BALANCE**

Definition	Counts and percentage of cases with fluid balance issues as identified by the treating surgeon by financial year. The same is shown for like state and like national hospitals.
Inclusions	All cases which have completed the entire audit process.
Exclusions	Cases which have not completed the audit process.

**CLINICALLY SIGNIFICANT INFECTION**

Definition	Count and percentage of cases with a clinically significant infection as identified by the treating surgeon by financial year. The same is shown for like state and like national hospitals.
Inclusions	All cases which have completed the entire audit process.
Exclusions	Cases which have not completed the audit process.

**INFECTION PHASE**

Definition	Count and percentage of cases with an infection as identified acquired during admission by the treating surgeon by financial year. The same is shown for like state and like national hospitals.
Inclusions	All cases which have completed the entire audit process where the patient died with a clinically significant infection.
Exclusions	Cases which have not completed the audit process or where no clinically significant infection was present at time of death.

**CHARACTERISTICS**

Definition	Number of audited deaths, the mean age and range, the distribution of male and female, the percentage of emergency cases, the three most common comorbidities in descending order and the percentage of cases with at least one operation associated with them for the hospital, compared with like state and like national hospitals.
Inclusions	All cases which have completed the entire audit process.
Exclusions	All cases which have not completed the entire audit process.

**ASA STATUS**

Definition	Percentage of cases with each ASA status by hospital, like state hospitals and like national hospitals.
Inclusions	All cases which have completed the entire audit process.
Exclusions	All cases which have not completed the entire audit process.

**DEATH RISK STATUS**

Definition	Percentage of cases with each death risk status by hospital, like state hospitals and like national hospitals.
Inclusions	All cases which have completed the entire audit process.
Exclusions	All cases which have not completed the entire audit process.

**SURGICAL DIAGNOSIS**

Definition	The three most common READ Codes by specialty for surgical diagnosis. When there are multiple surgical diagnoses equal in ranking, they are listed in the same cell. Only READ Codes with a count greater than one are shown.
Inclusions	All cases which have completed the entire audit process. Counts greater than one only included.
Exclusions	All cases which have not completed the entire audit process.

**CAUSE OF DEATH**

Definition	The three most common READ Codes by specialty for cause of death. When there are multiple causes of death are equal in ranking, they are listed in the same cell. Only READ Codes with a count greater than one are shown.
Inclusions	All cases which have completed the entire audit process. Counts greater than one only included.
Exclusions	All cases which have not completed the entire audit process.

**OPERATIVE PROCEDURES**

Definition	The three most common READ Codes by specialty for operative procedures. Where there are multiple surgical procedures are equal in ranking, they are listed in the same cell. Only READ Codes with a count greater than one are shown.
Inclusions	All cases which have completed the entire audit process. Counts greater than one only included.
Exclusions	All cases which have not completed the entire audit process.

## 5.2 Data management

Data management involves the collection of information from the hospitals and the clinicians. Data reported to VASM needs to meet the reporting criteria, and information collected comes from multiple sources. The aim is to identify any system or process errors and develop strategies to redress these.

## 5.3 Reporting criteria

The first objective of the VASM is to obtain details on surgical mortalities within Victoria. Cases reported to the VASM complete the full surgical peer review process when meeting the following reporting criteria:

- The patient was under the care of a surgeon (surgical admission), whether an operation was performed, or
- The patient was under the care of a physician (medical admission) and subsequently underwent a surgical procedure.

Terminal care patients are excluded from the full audit process, although their deaths are included in the annual reportable figures.

There are cases excluded from this report that did not meet the audit reporting criteria. Exclusion was due to terminal care, the case being lost to follow up due to 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.

Cases that do not fulfil either of the above-listed criteria are excluded from the audit by the notifying hospital or by the audit staff.

## 5.4 Reviewing clinical incidents

The second objective of the VASM is to analyse the clinical incidents identified by assessors.

These clinical incidents are categorised as follows:

- Area of consideration is where the clinician believes an area of care could have been improved or been different but recognises that there may be debate.
- Area of concern is where the clinician believes that areas of care should have been better.
- An adverse event is an unintended injury caused by medical management, rather than by the disease process, and is sufficiently serious to lead to prolonged hospitalisation or to temporary or permanent impairment or disability of the patient at the time of discharge, or which contributes to or causes death.

## 5.5 Participation requirements

Participation in the audit is initially confirmed by the VASM when the surgeon signs a participation form which is returned to the local project office. Fellows, for the purposes of CPD, are required to register at the local project office even if they have not had a death. Participation is required if a surgeon is in an operative-based practice and the surgeon's hospital actively participates in the VASM.

Surgeons can check their compliance status via CPD Online, which will show their outstanding surgical case forms in real time. Until the outstanding SCF are completed, these surgeons remain non-compliant for CPD verification purposes. Participation by Royal Australian and New Zealand College of Obstetrics and Gynaecology (RANZCOG) Fellows is currently considered voluntary under RANZCOG CPD requirements.

Fellows' participation in the VASM may be formally verified by CPD at RACS, the Medical Board of Australia or hospital Quality Committees.

Non-compliance is defined as non-submission of the data collection form on a patient's surgical mortality case where they were the treating surgeon.



## 5.6 Audit strength and limitations

While the accuracy of self-reporting cannot be guaranteed, reliability of reporting is supported by the protection offered by Qualified Privilege. The most recent VASM publication examined the accuracy and quality of source data provided by the treating surgeon for peer review.<sup>(2)</sup>

## 5.7 Analysis

### Data export and analysis

All deaths occurring in Victorian hospitals while the patient is under the care of a surgeon are notified to the VASM, and are audited. Cases admitted for terminal care and deaths incorrectly attributed to surgery are excluded from the full audit process. The multiple rate-limiting steps in the audit process result in a mean time to completion of 3 months. Some deaths that occurred during the reporting period are still under review and will be included in future publications.

Data is encrypted in the web database. This data is sent to, and stored in, a central Structured Query Language server database that includes a reporting engine. All transactions are time-stamped. All changes to audit data are written to an archive table, enabling a complete audit log to be created for each case.

An integrated workflow rules engine supports the creation of letters, reminders and management reports. This system was designed by the Alcidion Corporation and is currently supported by the RACS IT department. All communications are encrypted with Secure Sockets Layer certificates.

Data is downloaded from the secure database and analysed using the statistical package Stata version 13.1 and Microsoft Office Excel (2010). Demographic data and summary statistics have been presented. Continuous variables have been compared using Student's t-test or the non-parametric rank-sum test as appropriate. Categorical variables have been compared using Pearson's Chi-square test. Some variables have also been tested for yearly trend. Gwet scores have been used as measures of agreement for concordance between data points collected.

Numbers in the parentheses in the text (n) represent the number of cases analysed. This number varies as some data fields were not completed by the surgeon, and thus constitute missing values.

### Exclusion of identifiable data

Where there are too few reported cases such that the identity of the patient or surgeon is compromised, the surgical specialties will not be listed separately, and these deaths will be aggregated under the specialty of 'other'. Please note missing data has been excluded from analysis so there may be a change in the denominator.

### Clinical indicators and comparisons to national data

The indicators presented in this report include a comparison between VASM and national data from the ANZASM for the current financial year.

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 staff as it is independently managed by the Clinical Excellence Commission of New South Wales, which has a different data lock and different timeframe requirements for analysis. As a result, the ANZASM national data comparisons exclude audit outcomes for New South Wales.

### Interpretation of Gwet score and p values

A p value less than 0.05 is considered statistically significant.

The Gwet AC score is used to understand the difference between agreement levels beyond chance where:

<0 = no agreement.

0.00–0.19 = poor agreement.

0.20–0.39 = fair agreement.

0.40–0.59 = moderate agreement.

0.60–0.79 = substantial agreement.

0.80–1.00 = almost perfect agreement.

### **Interpretation of ASA status (an international measure of patient risk used by anaesthetists)**

ASA 1 - normal healthy patient.

ASA 2 - patient with mild systemic disease.

ASA 3 - patient with severe systemic disease.

ASA 4 - patient with severe systemic disease that is a constant threat to life.

ASA 5 - moribund patient who is not expected to survive without the operation.

ASA 6 - declared brain-dead patient whose organs are being removed for donor purposes.

## 6. Case studies

The case studies are taken from the 'VASM Case Note Review' booklets, 2017-2018 and 'Cases of the Month'.<sup>(3)</sup>

### 6.1 Improved leadership in patient care

#### **Case Study: Surgical decision-making for high-risk patients is complex and requires senior surgical leadership**

An elderly patient presented from home with a bleeding duodenal ulcer. The patient underwent gastroscopy and endoscopic treatment for this ulcer. The patient subsequently suffered further bleeding and was not given timely ICU treatment due to communication issues between treating teams. The patient died from blood loss despite ongoing resuscitation.

#### **Assessor:**

This case highlights the complexities of shared decision-making between teams and the importance of individuals understanding their roles. The surgical team was ultimately the treating team and made a treatment plan that did not have the support of other teams. The surgical team made the appropriate decision to proceed with an urgent repeat gastroscopy in this deteriorating patient with recurrent duodenal ulcer bleeding. Gastroscopy is a relatively low-morbidity procedure that may have saved this patient's life. Angio-embolisation of the gastroduodenal artery was another alternative, but availability and timeliness of this depends on the hospital. Laparotomy with under running of this vessel, should endoscopic control fail, carries much higher morbidity and a lower chance of the patient retaining an acceptable quality of life. The ICU physician and the anaesthetist questioned the benefits of this.

The anaesthetist went further in deciding that the patient was unfit for any intervention. This patient was going to die without intervention, and full palliation should have been instituted once this decision was made, rather than wasting precious blood products in futile resuscitation.

When an elderly patient is admitted to an ICU, the limits of treatment in particular scenarios should be discussed between ICU and surgical staff. The decision for gastroscopy was the surgeon's call, as that was their expertise. The ICU physician may have reasonably refused to support the patient after a laparotomy, but the decision for laparotomy is again ultimately the surgeon's call. This highlights the need for a shared decision requirement among clinicians. While anaesthetists can advocate strongly about the futility of anaesthetising sick, elderly patients or preoperative patient optimisation, decisions about treatment interventions are the domain of the surgical team. In the situation of communication issues affecting timely treatment, the surgeon may have contacted the senior hospital officer for support. This is obviously more difficult in a time-critical situation overnight.

#### **Surgical lessons:**

Surgical decision making for high-risk patients is complex. Senior surgical leadership is imperative in steering the multidisciplinary team towards an early consensus opinion that can be communicated to patients and their families.<sup>(4)</sup>

#### **Reference:**

Glance LG, Osler TM, Neuman MD. Redesigning surgical decision making for high-risk patients. N Engl J Med. 2014;370(15):1379-81.

## 6.2 Futile surgery and end-of-life care

### **Case Study: Decision to operate despite decision to palliate, futile surgery**

This patient, in their mid-80s, presented with blackouts and was found to have a large posterior fossa meningioma. The patient was taken to theatre and underwent craniotomy with attempted excision of the tumour. At operation it was found that there was significant dural bleeding. The tumour itself was heavily calcified, resulting in significant difficulty excising it with the cavitation ultrasonic surgical aspirator (CUSA). The decision was made to partially debulk the tumour and, if needed, return for resection of further tumour at a later date.

#### **Assessor:**

With an ageing population the finding of more incidental abnormalities on imaging is an increasing problem. Treating surgeons must be deliberate in their assessments and be honest in their discussions with families regarding the futility of intervention in such cases to avoid such complicated scenarios from developing.

#### **Surgical lessons:**

Surgeons with specific clinical expertise are often expected to present facts and information to members of the public who may not have the same level of knowledge in matters related to disease states. It is a duty of the operating surgeon to inform patients and relatives as to the natural history of the disease, purpose of interventions, and need or otherwise for such interventions.

This case illustrates the importance of knowing when surgery should or should not be performed, irrespective of whether surgery can be performed. In some situations, as in this case, it is better to not operate than to operate in the first instance.

There are certain surgical conditions, not only in neurosurgery, that require advanced training in order for the surgeon to perform the definitive surgical procedure. It is vital that surgeons be aware of their individual limitations, skill level and experience, as well as the pitfalls and risks associated with the condition. Adequate planning for these difficult cases is vital. In this instance, adequate planning in relation to the recognised heavy calcification of the meningioma, along with a request for another neurosurgeon's assistance, may have avoided this devastating outcome. As a surgeon, it should never be an issue to ask for assistance or advice.

Once a decision is made for palliation there may be a tendency for surgeons to persist in our approach: to 'complete' the procedure in the hope that something miraculous occurs. This goes completely against the first lesson learned as medical practitioners, let alone surgeons: we should first do no harm. This case illustrates how the most basic philosophy in medicine may become lost when a surgeon becomes single-minded about completing the original task, failing to recognise that it is the patient, not the disease that is the priority. Futile and unnecessary procedures often lead to further pain and suffering along with emotional stresses to both patients and relatives<sup>(5)</sup>

#### **Reference:**

Royal Australasian College of Surgeons. End of life care, Melbourne: Royal Australasian College of Surgeons; 2017 [17 Jan 2017]. Available from: [https://www.surgeons.org/media/24971463/2016-10-26\\_pos\\_fes-pst-057\\_end\\_of\\_life\\_care.pdf](https://www.surgeons.org/media/24971463/2016-10-26_pos_fes-pst-057_end_of_life_care.pdf).

### 6.3 Improved perioperative management

#### **Case Study: No apparent plan of management**

A frail, elderly person with a history of transitional cell carcinoma of the bladder was admitted with acute renal failure. Comorbidities included chronic obstructive airway disease, diverticular disease and urinary tract infections. There had been a recent cystoscopy and while there was no information in the notes it was implied that this was muscle invasive disease. A Computed Tomography (CT) scan on admission demonstrated bilateral hydronephrosis with an obstructed left system due to a distal ureteric calculus and an obstructed right system, possibly related to the bladder cancer. An attempt was made to access to both ureters in a retrograde fashion that failed due to technical reasons. It is unclear whether this was performed by a consultant urologist or trainee. Bilateral nephrostomies and antegrade double-J (JJ) stents were inserted over the subsequent weeks of the patient's admission, who ultimately died of multi-organ failure.

#### **Assessor:**

More information about events leading to this admission would have been helpful. The significant delays between recognising clinical issues and responding appropriately in this frail, elderly patient almost certainly contributed to the ultimate demise. Some examples of areas of concern include:

- Although admitted with acute renal failure and evidence of bilateral ureteric obstruction, it was 48 hours from the time of admission until the first procedure was performed.
- It may have been more advisable to place a nephrostomy tube in the left rather than the right kidney. It is likely this would have been the best option given the history of an obstructing calculus compared with malignant obstruction of the right kidney. No notes were made discussing the rationale for placing an initial right nephrostomy tube.
- It took 48 hours for the medical staff to note that the nephrostomy tube was not draining. The implications of this in terms of either a misplaced nephrostomy tube or poor renal function was never expressed and possibly not understood. It was not until nearly a week later that an antegrade JJ stent was inserted.
- Most of the notes were made by junior residents. There was no clear evidence of consultant urologist input throughout the case.
- When clinical deterioration occurred, no attempt was made to clear the left ureter until nearly three weeks after admission.

#### **Surgical lessons:**

The quality of care this patient received was inadequate. Given the considerable comorbidities there was only ever going to be a short window of opportunity to reverse the processes. It took over two weeks to clear both ureters by which time multi-organ failure was established and there was little chance of reversal. There was no documented evidence of consultant urologist input. These comments must be taken in the context of an elderly patient with multiple comorbidities and possibly an advanced malignancy.



## 6.4 Infection control

### Case Study: Colovesical fistula repair in a septic patient; when is a patient too ill for surgery?

A patient who lived alone presented to the ED of a hospital by ambulance with 1 month urinary tract infection (UTI) symptoms following two courses of antibiotics administered by the local medical officer. The patient had been reviewed four days previously for loose bowels and abdominal pain. Comorbidities included COPD and the patient was a smoker.

No vital signs were taken in triage despite ambulance observations (Systolic Blood Pressure [SBP] 90/Diastolic Blood Pressure [DBP] unrecorded, heart rate [HR] of 120 beats per minute [bpm], respiration rate of 24). The patient was subsequently transferred to a resuscitation cubicle. Initial blood results were Sodium (Na)/Potassium (K)/Urea/Creatinine (Cr) 130/4.1/22/357, Prothrombin time/International Normalised Ratio (INR)/Activated Partial Thromboplastin Time 17.0/1.3/51, lactate 10.0.

A CT scan showed sigmoid diverticular disease with pericolic inflammatory stranding and pericolic collection.

There was no indication as to what time the surgical team was notified. The ED notes at 9:24 pm state that the CT was reviewed by the surgical registrar. The surgical admission time was annotated at 9:00 pm but the name blanked with no designation or signature. It indicates "discussed with on-call consultant" and an initial plan for non-surgical management. This included triple antibiotic therapy and deep vein thrombosis (DVT) prophylaxis (an initial dose of dalteparin was given at 9:45 pm) despite the admission coagulation screen showing early coagulopathy. All further chemical prophylaxis was withheld.

The ICU admission/discharge notes show that the patient was reviewed by a surgical registrar and discussed with a consultant. "the patient is too unstable for theatre and risks outweigh benefits given contained perforation rather than frank peritonitis." Additional investigation included an ECG which indicated moderately severe global impairment left ventricular systolic function. The notes went on to explain that "if continues to require increasing inotropic/vasopressor support, to re-discuss with surgeon for source control tonight." and "O2 to maintain saturation at 92 per cent".

By morning the patient was on noradrenaline, vasopressin and adrenaline. The desired O2 saturation was never quite achieved despite increasing oxygen flow rates and delivery systems before eventual intubation and ventilation at 8:10 am. The patient was reviewed in ICU by the surgical registrar at 8:10 am and again discussed with the surgical consultant. A decision was now made for laparotomy. At surgery, a Hartmann's procedure with suture repair of the vesical defect was performed. A drain was placed to the pelvic abscess. Despite the appropriate surgical intervention, the patient continued to deteriorate postoperatively. The decision was made to withdraw inotropic support and the patient died less than 24 hours after being returned to the ICU from theatre.

#### Surgical lessons:

It is current practice to prescribe gentamicin-based regimes as the treatment of choice for most intra-abdominal infections; however, the regimen prescribed for this patient did not conform to the guidelines. Gentamicin was substituted by ceftriaxone. Penicillin sensitivity was not an issue as the patient appears to have been given ampicillin. This is not the recommendation (i.e. piperacillin and tazobactam) for non-sensitive patients if an amino glycoside is contraindicated. A single dose of gentamicin is not unreasonable in such a desperately ill patient. Almost an hour after the initial blood tests were performed and the renal impairment identified, the patient was given IV contrast for the CT scan (the eventual blood culture result - *Escherichia coli*, *Enterococcus faecium*, anaerobic gram positive bacilli, *staphylococcus aureus* - indicates a very extreme situation).

The decision not to operate at presentation is a judgement call. Surgery should not be undertaken before adequate resuscitation.

## 6.5 Improved awareness of surgical emergencies and sharing of care

### **Case Study: Difficult prolonged surgery should use two surgeons**

A patient in their early 60s was admitted with a small bowel obstruction. The patient was transferred from a rehabilitation facility following a recent intracerebral haemorrhage from which they were bed bound. The patient also had significant comorbidities, including ischaemic heart disease, Type 2 diabetes mellitus, hypertension and multiple previous laparotomies for small bowel obstruction. The patient had a history of a total colectomy and ileorectal anastomosis for inflammatory bowel disease. The patient was also difficult to assess due to a history of chronic abdominal pain.

The patient was treated conservatively for 3 weeks with total parenteral nutrition and nasogastric tube (NGT). The patient developed recurrent small bowel obstruction and peritonism after an initial response and was clinically assessed to have probable dead bowel. A laparotomy was performed after extensive discussions with the patient about their high operative risk. It took approximately 6 hours, with dense adhesions and multiple enterotomies made and repaired. The patient developed severe sepsis. Second-look laparotomies were performed on each of the two following days, which revealed a missed enterotomy and two other leaking repaired enterotomies. At the second relook, most of the patient's small bowel was infarcted secondary to shock and inotropes, and this led to the discontinuation of active treatment.

#### **Assessor:**

The patient was a high risk for laparotomy given the comorbidities and multiple previous laparotomies, and this was recognised. There was no immediate indication for laparotomy on admission and a period of conservative management was undertaken. This included the use of water-soluble contrast. The obstruction appeared to resolve, and discharge plans were made for rehabilitation 12 days after admission.

The patient then appeared to re-obstruct, and eleven days later laparotomy was performed. Documentation was lacking as to the reason for operating at this time, rather than earlier following re-obstruction. It was reported in the case record form that the patient developed peritonism with concern for ischaemic bowel.

It was uncertain as to whether the patient was given total parenteral nutrition during the period of re-obstruction. Albumin levels were 22 g/L at the time of initial laparotomy. There were no records of preoperative total parenteral nutrition being administered even though this was reported in the case record form. Poor nutritional status may have adversely affected the patient's ability to recover

Laparotomy, adhesiolysis, small bowel resection and repair of enterotomies were performed. The patient was in the operating room for around 6 hours and extensive, dense adhesions were noted. Small bowel was noted to have herniated behind the superior mesenteric artery. A preoperative note was made in the patient's history that two consultant surgeons would likely be required for a laparotomy. The seniority of the assistant was not recorded in the case record form.

At the second laparotomy the missed enterotomy was repaired, as were two previously repaired enterotomies that were leaking. These would appear to represent technical errors. The patient continued to deteriorate and at a third laparotomy the next day, 1 metre of infarcted bowel was present along with global ischaemia of the small intestine. The situation was determined to be non-salvageable.

Appropriately, a consultant general surgeon performed all three of the patient's laparotomies. Once the patient re-obstructed, laparotomy was indicated and it was unclear why a further 11 days of conservative management was undertaken. The high risk of death was posed, and the likely technical difficulties had been acknowledged by the treating surgical team. The use of a two-surgeon team may be useful in such difficult laparotomies.

#### **Surgical lessons:**

The patient's death was, however, not directly attributable to any delay in operating. Ultimately the patient died from an unrecognised enterotomy and leaking repaired enterotomy sites. These represent technical errors and were reported as such in the case record form by the operating surgeon. Once again, perhaps the presence of a second consultant at such a difficult operation may have recognised these errors at the initial laparotomy and prevented the patient's death.

## 6.6 Improved communication

### Communication failure in the deteriorating patient

A patient in their mid-80s who was independent with a history of Atrial Fibrillation (AF), hypertension, asthma and transient ischaemic attack, underwent elective laparoscopic right hemicolectomy for a large tubulovillous adenoma. The patient was admitted the day before for bowel preparation with IV hydration. There was consideration for postoperative ICU, but the patient was sent to the ward after a stable procedure.

Afternoon of Day 1 post-surgery, a medical emergency call (MET) call occurred for rapid AF. Medical treatment was instituted but the pulse rate remained around 100–150 overnight. By Day 2, evening, the patient had developed marked oliguria despite positive fluid balances. At this time the jugular venous pressure was noted to be 4-6 cm on separate medical reviews. Over the course of Day 2 the patient was also nauseated and had “several large vomits” but oral intake was continued.

The second MET call on the morning of Day 3 was for oliguria and hypoxia. The patient was also noted to have patchy consolidation on CXR but remained on the ward. Later in the morning complete anuria was noted and acute renal failure diagnosed. Discussion with the medical registrar by overnight staff did not lead to an escalation of care. The third MET call was in the morning of Day 3 post-operation for oliguria and hypoxia, and the patient was eventually transferred to ICU with anuric renal failure with rising lactate as well as pneumonia. The patient was intubated and investigated with CT to rule out abdominal catastrophe. The scan did not show any obvious surgical calamity but there was evidence of ileus. A diagnostic laparoscopy to rule out ischaemic gut was negative. The patient continued to deteriorate further, with renal and respiratory failure, before passing away postoperatively on Day 4. It had been agreed after discussion with the family that the patient was not for haemofiltration.

#### Assessor:

The documentation in this case was adequate. However, there was no indication of any involvement or discussion with the surgical consultant in charge over the period of the patient's deterioration until the re-laparoscopy was performed.

It appears that the patient died essentially from acute renal failure with contributions from poor cardiac output (uncontrolled rapid AF) and uncertain fluid balance in the setting of surgical ileus. Pulmonary oedema, abdominal distension and pneumonia may have all had a part in the progression of respiratory failure.

The most pertinent issue here is early recognition of the deteriorating patient. Transferring this elderly patient to the ward to manage a rapid AF with deteriorating urine output, ileus and declining respiratory function was incorrect. The evidence of deterioration was present from Day 1, and an escalation to ICU with central line monitoring was indicated on, at very latest, day 2 post-operation. Unfortunately, multiple reviews by medical, surgical and intensive care staff failed to lead to an appropriate escalation of care, which raises the question of whether the surgical consultant was informed and involved in the decision making over the first few days. Poor communication with senior staff may have been an issue here.

In conclusion, elderly patients with comorbidities can deteriorate quickly and there should be a low threshold for escalating the level of care, particularly after MET calls have been attended.

#### Surgical lessons:

Communication with senior staff in the event of deterioration of the surgical patient is essential and consultants must ensure that junior staff (who change jobs regularly) are aware of their expectations.

The consultant in charge should always be informed if a MET call is instituted on one of their patients.

## 6.7 In-house falls prevention

### **Case Study: Delayed diagnosis, communication, choice of operation, medical management**

An elderly patient living at home and ambulating on a four wheeled frame was admitted under a general medicine physician after a fall, while attending an outpatient visit to investigate falls. There was a past history of a left total hip replacement eight years prior. The medical team felt the left hip pain was from bursitis and a sacral fracture. An X-ray and CT scan of the left hip replacement were discussed with an orthopaedic registrar.

The patient made slow progress, and significant pain made mobilising difficult. On day thirty-nine of admission they were transferred to the orthopaedic ward after new X-rays showed a mildly displaced peri-prosthetic fracture from greater trochanter to proximal shaft, and they underwent a revision of the femoral component with a long-stem uncemented component with multiple cables. Post-operative day five saw development of *Clostridium difficile* diarrhoea and urinary sepsis, and after failing to respond to antibiotics, active treatment was withdrawn and they passed away.

#### **Assessor:**

The first-line assessor raised concerns regarding a lack of orthopaedic input on admission, and the clinical notes confirm that the patient was probably not examined or seen by the orthopaedic team in the first five weeks of admission. Review by a registrar or consultant on admission, with a follow-up one week later to ensure that the patient was mobilising, and if not, repeat the X-ray, may well have shortened the five-week delay in diagnosis to a one-week delay.

There were several areas of concern relating to preoperative assessment and choice of procedure. After the fracture was diagnosed, a resident wrote of the need for an anaesthetic review but there is no documentation to show that an anaesthetic, medical or ortho-geriatric review was performed in the 36 hours between diagnosis and operation. This should have been acted on and pursued by the orthopaedic registrars while the warfarin was being reversed preoperatively. None of the notes made by members of the orthopaedic unit preoperatively make any reference to what investigations were needed and whether any of the patient's recent health problems required attention.

Performing a cabling of the fracture without revision, in view of the patient's recent UTI, necrotic heel pressure sore, anaemia (8 g/dL), intermittent hypotension and bradycardia, chronic renal failure, loss of 6% body weight in six weeks with hypoalbuminaemia despite dietary supplements, and prolonged immobilisation, should have been given serious thought.

Also, of concern is the lack of involvement by the orthopaedic unit in the initial management and diagnosis of this patient's orthopaedic problem. This may have been a problem related to a single registrar, or it may be that the unit has a culture that does not encourage its registrars to see patients from other units whose orthopaedic problems are discussed with the registrars.

The patient was treated on Day 12 with oral cephalexin for a positive urine culture without evidence of sepsis or leucocytosis, so this organism may have been a colonisation rather than an infection. Coupled with 48 hours of intravenous cefazolin postoperatively, as opposed to the usual recommendation of two postoperative doses, these could have contributed to the *C. difficile* diarrhoea which began eight days later, and which probably contributed to the patient's death.

#### **Surgical lessons:**

Implement adequate preoperative assessment and consider choice of operation.

Better documentation and improve communication.

## 6.8 Better documentation of care plans and clinical events

### **Case Study: Non-operative rather than operative treatment of high-risk patients with pretibial lacerations would be a good initiative**

A patient in their mid-70's was admitted to the emergency department with a laceration to the left leg following a fall. The patient had persistent bleeding from the wound secondary to an uncontrolled international normalised ratio (INR) of 4.2. The patient had multiple cardiovascular co-morbidities and a history of falls and skin lacerations that were predominantly treated in the primary care environment. Medical and allied health teams were consulted appropriately from admission for four days until death. Initial admission was under the surgical team with a plan to control the INR, and once the level dropped to less than two, for a split skin graft to be undertaken.

On the second day the patient was reviewed by a plastic surgery junior doctor (possibly an intern) who made the decision that surgery was appropriate, but also that the patient should be discussed with an anaesthetist with a view to undertaking the procedure under local anaesthetic.

On the third day a plastic surgical registrar reviewed the patient and decided that a procedure should be undertaken that evening. The wound was debrided under local anaesthetic and a split thickness skin graft performed. The patient deteriorated and died 24 hours post-surgery from ongoing cardiovascular issues unrelated to the procedure.

#### **Assessor:**

Whilst it is clear that the procedure did not contribute to the patient's demise, the following comments are worth addressing:

- There is no record of consultant surgeon involvement in the decision making.
- Was the procedure necessary? Why were conservative treatment options not documented as discussed? Were they discussed?
- Was the choice of a split thickness skin graft a reasonable choice on the lower limb of a patient with a low albumin and significant co-morbidities?
- Over the last few years, high risk patients with pretibial soft tissue injuries are frequently treated operatively and succumb to their pre-existing comorbidities, where conservative management might be more appropriate.

#### **Surgical lessons:**

A protocol for managing this type of high-risk patient with pretibial lacerations would be a good initiative. There are a number of such protocols already published, which place an emphasis on non-operative rather than operative treatment.

## 6.9 Action on evidence of clinical deterioration

### **Case Study: Cerebral event in the anticoagulated patient that preoperative control and early insertion of a pressure monitor and intubation may have avoided**

A patient in their early-60s presented with left hemiparesis and dysphasia on a background of mitral valve disease and warfarin anticoagulation for AF. The patient's INR on admission was subtherapeutic at 1.8. The first CT brain scan showed low attenuation in the right insula, posterior frontal and parietal lobes but no haemorrhage or midline shift. The CT perfusion scan showed a luminal filling defect in proximal right internal carotid territory with an associated extensive perfusion abnormality in the right hemisphere, and occluded left vertebral artery. It was decided to admit to the neurology ward, withhold (but not reverse) warfarin and observe the patient. The patient was given 40 mg enoxaparin (Clexane) subcutaneously on admission for thromboprophylaxis as well. On the morning of day 2 the Glasgow Coma Score (GCS) deteriorated, so the patient was intubated for a second CT brain scan. This showed significant oedema in the right hemisphere with marked mass effect. Comment was also made by the radiologist about an abnormality suspicious for infarct in the right cerebellar hemisphere.

The patient underwent a right frontotemporal decompressive craniectomy after administration of fresh frozen plasma, Prothrombinex and vitamin K. The patient was extubated and nursed in ICU post operation. That evening the patient deteriorated neurologically to decerebrate posturing with pupil dilatation, so was taken to radiology for a third CT. The main changes were the presence of the craniectomy and a new 1.5 × 1.0 × 1.3 cm haematoma in the right temporal lobe and mild increase in midline shift. Only after return from that CT was the patient intubated. The patient then returned to theatre for reopening of the craniectomy and evacuation of extradural and intraparenchymal haemorrhage, but the dura was not tense and the intracranial pressure (ICP) scores were low. An ICP monitor (EVD) was inserted. The patient was taken back to ICU and given maximal medical therapy but showed no neurological recovery. On the morning of day 3 a further CT was performed due to an increase in ICP. This fourth CT showed ongoing oedema and midline shift with increasing entrapment of the left lateral ventricle, but there was no change in management after the CT result. The patient's ICPs drifted higher so the patient was taken for yet another CT, however the patient arrested and died in radiology.

#### **Assessor:**

It was probably inappropriate to give the patient 40 mg Clexane when admitted. The warfarin was not reversed on the day of admission. Both these actions would have increased the risk of haemorrhagic transformation. Besides, it was a given that the patient would develop cerebral oedema the next day, as the area of infarction was so big. A decompressive craniectomy was always needed for this patient so coagulation parameters should have been normalised in anticipation of this. The surgeon should have inserted an ICP monitor at the time of the first operation. This used to be the routine, and would have provided the ICU with a better means of assessing ICP than continually taking the patient to CT. It was surprising that the patient was not intubated prior to the third CT, when the patient was said to have exhibited extensor posturing. Intubation would have assisted with ICP management. In the final analysis, this patient's prognosis was terrible and probably nothing would have changed the outcome. However, this case does expose some seeming errors in management, which if corrected, may save someone else's life.

#### **Surgical lessons:**

The role of decompressive craniectomy in ischaemic cerebral events and trauma remains debated. Multicentre reports have variously resulted in presenting a good short-term outcome with a poor medium to long term prognosis. Irrespective of these findings, however, once a decision is made to go down the path of decompression then all subsequent actions should aim to maximise the success of such an approach.

Several points were raised by the assessor in the review of this case. Each point of contention relates to the inability to fully commit to the success of the craniectomy. The misuse of Clexane in this setting, the lack of an ICP monitor, and the failure to protect the airway by re-intubating for transport of the patient at the time of maximum cerebral oedema, all contributed to setting the craniectomy up for failure. Although individually of minimal significance, when added together these factors certainly could have altered the outcome for this patient. The lesson here may well be that should any surgical approach be considered, then all actions must aim to give that surgical approach the best chance of success.<sup>(8)</sup>

#### **Reference:**

Cooper DJ, Rosenfeld JV, Murray L, Arabi YM, Davie AR, D'Urso P, et al. Decompressive Craniectomy in Diffuse Traumatic Brain Injury. *New Eng J Med.* 2011;364(16):1493-502.



## 6.10 Delay in surgical diagnosis

### **Case Study: Delay in diagnosing anastomotic leak**

A patient in their 70s with a past history of iron deficiency/anaemia, ischaemic heart disease, arthritis requiring bilateral knee replacements and hypocholesterolaemia, presented with abdominal pain three weeks after a coincidental mechanical fall. An abdominal examination and abdominal CT showed a mass in the left colon.

There was a one-week delay between admission and surgery. The patient had a laparoscopic left hemicolectomy for a bulky tumour. The immediate postoperative management on the ward was complicated by profound hypotension leading to a MET call. The patient needed admission to the Intensive Care Unit (ICU) for 48 hours with inotrope support and five units of blood. The patient was then returned to the ward and progressed poorly with abdominal pain, high nasogastric input and poor urine output. On Day 7 postoperatively, the patient was hallucinating, was hypotensive and had AF and atrial flutter requiring IV amiodarone with poor control of the AF. A CT at that time was thought to show a postoperative haematoma. For two days the patient continued to be quite unwell with confusion, poor urine output, ongoing abdominal pain and poorly controlled AF. A repeat CT on the ninth postoperative day still didn't prompt a diagnosis of a leak. Total parenteral nutrition had been started on the eighth postoperative day.

On the ninth postoperative day the patient returned to theatre to address a leak with contamination. The patient continued to deteriorate and succumbed to sepsis.

#### **Assessor:**

The patient had a profoundly low BP postoperatively, and required a MET call and five units of blood over the first 24 hours. This suggests that the patient had a haemorrhage. A diagnostic laparoscopy was required.

The profound hypotension and the required inotrope support that the patient needed to maintain BP led to poor gut perfusion. This is certainly the cause of the anastomotic leak.

On the seventh postoperative day the patient developed AF and atrial flutter, which were poorly controlled. AF seven days after a bowel resection with anastomosis means that there is a leak until proven otherwise. Though the patient had a CT scan, rectal contrast was not used.

It took a further 48 hours of this patient being profoundly unwell before they were returned to theatre.

The patient was in hospital for a week before undergoing surgery. There is no evidence that there was any attempt or thought of a nutritional preload before the surgery. Postoperatively, it was not until the eighth day that total parenteral nutrition was commenced. At that point the patient would have been quite malnourished and therefore unable to mount a significant response to the sepsis.

The patient's admission, surgery and illness occurred during a period in which there were several major public holidays. It is not clear whether it was the same consultant/registrar/residents looking after the patient over the holiday period. It is quite possible that a variety of individuals looked after this patient. In turn, this "tag team" approach may have resulted in periods of indecision because there wasn't a continuous team looking out for the patient or a continuous authority on hand to make decisions.

#### **Surgical lessons:**

Clinical deterioration following colorectal surgery should prompt surgical review followed by appropriate investigation, particularly CT scan, to rule out an anastomotic leak<sup>(24)</sup>

#### **Reference:**

Hyman N, Manchester TL, Osler T, Burns B, Cataldo PA. Anastomotic leaks after intestinal anastomosis: It's later than you think. *Ann Surg.* 2007;245(2):254-8.



## 6.11 Postoperative complications

### **Case Study: Complex cases need careful preoperative planning**

This patient had been rushed into an anterior resection within a few days of colonoscopy and gastroscopy for anaemia, at which point the diagnosis of stenosing upper rectal cancer was made (histology confirmed with low grade adenocarcinoma). The preoperative preparation was a magnetic resonance imaging (MRI), then a preparatory iron infusion and a surgical registrar clinic review. There was no multi-disciplinary meeting (MDM), and a decision was made to proceed with laparoscopic anterior resection rather than neoadjuvant chemoradiotherapy. It is possible that the multidisciplinary team was not documented in the current file and perhaps did take place. The patient was known to have a poor chest. More rehabilitation could have been considered.

There are serious concerns that this patient did not go to ICU postoperatively as a routine. Even with two MET calls the patient did not reach ICU until after the anastomotic leak. It is hard to know whether their poor state (hypotension and hypoxia) encouraged ischaemia at the anastomosis, or the anastomotic leak resulted in the patient's confusion, and hypotension in the early postoperative period. The patient was probably not fit for transfer to the ward when they were discharged from ICU, and there is no statement of being discharged specifically for palliation. This patient deserved some step down, high dependency unit type bed with active monitoring.

#### **Surgical lessons:**

Was an anastomosis a reasonable decision to offer?

Should the patient have had a covering loop ileostomy at the first operation?

Should the decision have been made to operate so soon? Stenosing lesions often look stenosing from below but are not always functionally so from above. Perhaps the lesion was too low for a stent but were options such as a colostomy and chemotherapy considered?

Given there was little contamination and a small ischaemic leak, could an anastomotic leak have been diagnosed earlier? This patient was very frail on admission. Although the patient's state was declining, perfusion and oxygen supply to the tissues could have been systemically impaired rather than a technical issue with the anastomosis.

Was this patient fully continent – registrar notes do not say. Would a Hartmann's resection have been safer?

## 7. Concordant validity considerations

From 1 July 2017 to 30 June 2018 the lowest agreement level between the treating surgeons and the assessors was in the clinical management issues, while first-line and second-line assessors' lowest level of agreement was in the use of critical care unit, in particular the HDU. Postoperative care was also one of the lowest agreement levels between the treating surgeons and the second-line reviewers.

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 calculated. These responses to the area for consideration have been also compared between the first- and second-line assessors and the degree of concordance was calculated.

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 practical or logistical reasons.

Gwet's Agreement Coefficient 1 (AC) 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.<sup>(49)</sup> See the Data Management section for the Gwet score values.

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 the areas of fluid balance; timing of the operation; decision to operate; preoperative, intraoperative and postoperative care; and clinical management, with second-line assessors perceiving more issues than first-line assessors. The question of whether a particular patient should have surgery is complex and may have broader implications for surgical decision making.<sup>(50)</sup>
- 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.

The following tables present the level of agreement between the treating surgeon and the peer reviewers. The interpretation of the Gwet AC score are outlined in Interpretation of Gwet score and p values section of this report.

Table 1: Concordant validity between treating surgeon and first-line assessor in 2012-2018

Concord area	n	Concord	Gwet's AC score	95% CI	p value
ICU care benefit if not received	1,673	97.01%	0.97	0.96 - 0.92	<0.001
HDU care benefit if not received	1,614	92.38%	0.92	0.90 - 0.93	<0.001
Fluid balance	4,679	93.87%	0.93	0.92 - 0.94	<0.001
Clinical management issues	6,479	78.30%	<b>0.64</b>	0.62 - 0.66	<0.001
Preoperative management/preparation	5,959	88.87%	0.86	0.85 - 0.87	<0.001
Decision to operate at all	6,000	88.15%	0.86	0.85 - 0.87	<0.001
Choice of operation	5,996	93.45%	0.93	0.92 - 0.94	<0.001
Timing of operation	5,953	93.42%	0.92	0.92 - 0.93	<0.001
Intraoperative/technical management	5,878	94.08%	0.93	0.93 - 0.94	<0.001
Grade/experience of surgeon deciding	5,889	98.51%	0.98	0.98 - 0.99	<0.001
Grade/experience of surgeon operating	5,895	98.20%	0.98	0.98 - 0.99	<0.001
Postoperative care	5,836	92.39%	0.91	0.90 - 0.92	<0.001

Note: a total of 6,714 surgical case forms and first-line assessments were available for analysis. There were 6,161 surgical procedures with 8,672 operative episodes. Audit period from 1 July 2012 to 30 June 2018. Gwet's AC kappa score interpretation is outlined in the Data Management section. CI: confidence interval; HDU: high dependency unit; ICU: intensive care unit.

**Comments:**

- High concordance levels were achieved between the treating surgeon and first-line assessor.
- The area with the lowest concordance between surgeon and first-line assessor was clinical management issues. This was an expected finding and supports the value of independent peer review.

Table 2: Concordant validity between treating surgeon and second-line assessor in 2012-2018

Concord area	n	Concord	Gwet's AC score	95% CI	p value
ICU care benefit if not received	173	87.28%	0.85	0.79 - 0.92	<0.001
HDU care benefit if not received	169	78.11%	0.71	0.61 - 0.81	<0.001
Fluid balance	1,002	83.93%	0.79	0.75 - 0.82	<0.001
Clinical management issues	1,219	55.70%	<b>0.13</b>	0.09 - 0.18	<0.001
Preoperative management/preparation	1,142	72.59%	0.58	0.54 - 0.63	<0.001
Decision to operate at all	1,151	78.45%	0.71	0.68 - 0.75	<0.001
Choice of operation	1,148	83.45%	0.80	0.77 - 0.83	<0.001
Timing of operation	1,146	82.81%	0.78	0.74 - 0.81	<0.001
Intraoperative/technical management	1,125	83.29%	0.79	0.75 - 0.82	<0.001
Grade/experience of surgeon deciding	1,130	96.55%	0.96	0.95 - 0.98	<0.001
Grade/experience of surgeon operating	1,132	96.02%	0.96	0.95 - 0.97	<0.001
Postoperative care	1,113	77.45%	<b>0.68</b>	0.64 - 0.72	<0.001

Note: a total 1,230 surgical case forms and second-line assessments were available for analysis. Audit period from 1 July 2012 to 30 June 2018. Gwet's AC kappa score interpretation is outlined in the Data Management section. CI: confidence interval; HDU: high dependency unit; ICU: intensive care unit.

**Comments:**

- Disagreement between the treating surgeon and second-line assessor was most marked in clinical management issues. It may be that treating surgeons are less objective when it comes to assessing the clinical management received by their own patients. This was an expected finding and again supports the value of independent peer review.

Table 3: Concordant validity between first-line assessor and second-line assessor in 2012-2018

Concord area	n	Concord	Gwet's AC score	95% CI	p value
ICU care benefit if not received	117	82.91%	0.76	0.65 - 0.87	<0.001
HDU care benefit if not received	120	64.17%	<b>0.36</b>	0.19 - 0.54	0.243
Appropriate DVT use	1,112	67.90%	<b>0.51</b>	0.46 - 0.57	<0.001
Fluid balance	544	82.90%	0.76	0.71 - 0.81	<0.001
Clinical management issues	1,079	73.49%	0.62	0.58 - 0.67	<0.001
Preoperative management/preparation	2,160	83.66%	0.71	0.68 - 0.74	<0.001
Decision to operate at all	1,015	72.51%	<b>0.57</b>	0.52 - 0.62	<0.001
Choice of operation	1,003	75.47%	0.64	0.59 - 0.68	<0.001
Timing of operation	970	76.80%	0.65	0.61 - 0.70	<0.001
Intraoperative/technical management	937	78.66%	0.67	0.63 - 0.72	<0.001
Grade/experience of surgeon deciding	945	93.12%	0.93	0.91 - 0.94	<0.001
Grade/experience of surgeon operating	954	92.14%	0.91	0.89 - 0.93	<0.001
Postoperative care	915	70.60%	<b>0.49</b>	0.43 - 0.55	<0.001

Note: a total of 1,230 cases with first line assessments sent for second-line assessments were available for analysis. Audit period from 1 July 2012 to 30 June 2018.

Gwet's AC kappa score interpretation is outlined in the Data Management section.

CI: confidence interval; DVT: deep vein thrombosis; HDU: high dependency unit; ICU: intensive care unit.

### Comments:

- Disagreement between first- and second-line assessors was most marked in the use of the critical care unit (CCU: HDU), postoperative care, appropriate DVT use and decision to operate at all. Second-line assessors perceived more issues than first-line assessors.
- The tendency of second-line assessors to be more critical of clinical management events than first-line assessors was foreseeable, as they have the benefit of medical case notes. However, the assessor evaluating the quality of the decisions made by the treating surgeon during the course to death allows for lessons to be learnt from clinical management issues identified and surgical cases.

## 8. VASM performance review

Table 4: Project schedule and delivery status since 2012 to 2018

Schedule of key deliverables	Status
Key performance reviews 2007–2012	✓ Completed 12 August 2012
VASM contract renewal 2013–2019	✓ Completed 12 August 2012
Enhancement of the Fellows' Interface	<ul style="list-style-type: none"> <li>✓ Completed 1 November 2013</li> <li>✓ Completed 1 February 2016</li> <li>✓ Completed 1 July 2017</li> <li>✓ Completed 1 June 2019</li> </ul>
Establishment of mortality audit at all Victorian public and private hospitals	✓ Completed 1 August 2013
Expansion of the mortality audit to the Royal Australian and New Zealand College of Obstetricians and Gynaecologists	✓ Completed 1 August 2012
Expansion of the mortality audit to the Australian and New Zealand College of Anaesthetists	✓ Completed 1 September 2016
Establishment of internal validation of the VASM audit processes 2013–2019 <ul style="list-style-type: none"> <li>• First-line validation</li> <li>• Second-line validation</li> <li>• Surgical case record form</li> </ul>	<ul style="list-style-type: none"> <li>✓ Completed 12 August 2013</li> <li>✓ Completed 12 August 2015</li> <li>✓ Completed 1 December 2018</li> </ul>
Establishment of treating surgeon feedback process <ul style="list-style-type: none"> <li>• First-line validation</li> <li>• Second-line validation</li> <li>• CRF validation</li> <li>• Terminal status validation</li> </ul>	<ul style="list-style-type: none"> <li>✓ Completed 1 January 2015</li> <li>✓ Completed 1 August 2017</li> <li>✓ Completed 1 December 2018</li> <li>✓ In progress 1 June 2019</li> </ul>
Establishment of individual hospital clinical governance reports	✓ Completed 1 January 2014
Establishment of individual hospital performance reports	✓ Completed 1 January 2018
Establishment of individual surgeon reports	✓ Completed 1 March 2016
Establishment of the perceived quality of VASM information project	<ul style="list-style-type: none"> <li>✓ Completed 1 February 2015 (stage 1)</li> <li>✓ Completed 1 February 2016 (stage 2)</li> <li>✓ Completed 1 July 2018 (stage 3)</li> </ul>
Provision of educational seminars to Fellows, hospital administrators and other healthcare professionals:	<ul style="list-style-type: none"> <li>✓ Completed 23 February 2012</li> <li>✓ Completed 30 October 2012</li> <li>✓ Completed 23 February 2013</li> <li>✓ Completed 18 October 2013</li> <li>✓ Completed 19 February 2014</li> <li>✓ Completed 1 May 2014</li> <li>✓ Completed 18 February 2015</li> <li>✓ Completed 16 October 2015</li> <li>✓ Completed 23 February 2016</li> <li>✓ Completed 7 March 2016</li> <li>✓ Completed 22 October 2016</li> <li>✓ Completed 21 February 2017</li> <li>✓ Completed 21 May 2017</li> <li>✓ Completed 16 June 2017</li> <li>✓ Completed 20 July 2017</li> <li>✓ Completed 21 February 2017</li> <li>✓ Completed 21 May 2017</li> <li>✓ Completed 16 June 2017</li> <li>✓ Completed 20 July 2017</li> <li>✓ Completed 22 July 2017</li> </ul>

	<ul style="list-style-type: none"> <li>✓ Completed 14 February 2018</li> <li>✓ Completed 12 July 2018</li> <li>✓ Completed 19 October 2018</li> <li>✓ Completed 5 September 2018</li> <li>✓ Completed 20 February 2019</li> </ul>
<p>Provision of educational publications:</p> <ul style="list-style-type: none"> <li>• Case Note Review Booklet</li> <li>• Scientific papers</li> <li>• VASM report released annually</li> <li>• Individual Hospital Clinical Governance Report</li> <li>• Hospital Performance Reports</li> </ul>	<ul style="list-style-type: none"> <li>✓ Completed 15 August 2014</li> <li>✓ Completed 15 August 2015</li> <li>✓ Completed 15 August 2015</li> <li>✓ Completed 15 August 2016</li> <li>✓ Completed 15 November 2013</li> <li>✓ Completed 15 October 2013</li> <li>✓ Completed 15 August 2014</li> <li>✓ Completed 15 November 2013</li> <li>✓ Completed 15 August 2014</li> <li>✓ Completed 15 August 2015</li> <li>✓ Completed 27 July 2016</li> <li>✓ Completed 18 April 2017</li> <li>✓ Completed 20 February 2018</li> <li>✓ Completed 18 May 2018</li> </ul>
Provision of external evaluation of the VASM audit processes by Aspex Consulting	✓ Completed 1 October 2018

Note: VASM: Victorian Audit of Surgical Mortality; VMIA: Victorian Managed Insurance Authority; VSCC: Victorian Surgical Consultative Council.  
FLA and SLA validation: examination of the agreement among two independent assessors performing assessments on the same case.



## 9. Future goals for the VASM

Over the past 11 years there has been a great deal of progress in quality and safety monitoring across Victoria. One of the most significant changes during this period occurred after several neonatal deaths raised questions about the health system's capacity to successfully monitor adverse events causing harm to Victorians.

Safer Care Victoria was established to achieve this objective and minimise avoidable harm that might occur across the Victorian public health care system. A key mandate of SCV is to make better use of existing information to inform improvements in patient care, including information arising from VASM.

Many of the core objectives of SCV are already aligned to the work of the audit. The VASM has developed successful partnerships with clinicians to review and respond to episodes of surgical mortality across the state. The audit process identified a number of areas for improvement for the VASM and implementation of these improvements commenced in late 2018.

From the Aspex Evaluation on VASM, the recommendations are presented as our new goals which we see as strengthening the capacity of the VASM. We anticipate further collaboration with our stakeholders with educational events as well as a contribution to the quality and safety improvements of surgical interventions across the Victorian health sector. These goals are:

- Collaboration with SCV to improve information-sharing in Victoria.
- Presentation of the VASM information to consumers.
- Review of the deidentification of hospital records in Victoria to align with ANZASM's processes.
- Development of a system for expediting cases flagged for urgent multidisciplinary panel review
- Development of a method for recognising potentially preventable adverse events characterised by common underlying issues.
- Reporting of information about the care pathway identified in the peer review as feedback to individual surgeons, hospitals and other stakeholders.
- Identification of changes in clinical management implemented by the treating surgeon and the shared care team in response to the peer review outcome of a case.

## 10. Supplementary Data Appendices

### 10.1 AIHW public peer group classifications

Peer Group - Code	Peer Group Name/Description
Principal referral	Provide a very broad range of services, including some very sophisticated services, and have very large patient volumes. Most include an intensive care unit, a cardiac surgery unit, a neurosurgery unit, an Infectious diseases unit and a 24-hour emergency department.
Public acute group A hospitals	Provide a wide range of services to a large number of patients and are usually situated in metropolitan centres or inner regional areas. Most have an intensive care unit and a 24-hour emergency department. They are among the largest hospitals, but provide a narrower range of services than the Principal referral group. They have a range of specialist units, potentially including bone marrow transplant, coronary care and oncology units.
Public acute group B hospitals	Most have a 24-hour emergency department and perform elective surgery. They provide a narrower range of services than the Principal referral and Public acute group A hospitals. They have a range of specialist units, potentially including obstetrics, paediatrics, psychiatric and oncology units.
Public acute group C hospitals	These hospitals usually provide an obstetric unit, surgical services and some form of emergency facility. Generally smaller than the Public acute group B hospitals.
Public acute group D hospitals	Often situated in regional and remote areas and offer a smaller range of services relative to the other public acute hospitals (groups A-C). Hospitals in this group tend to have a greater proportion of non-acute separations compared with the larger acute public hospitals.
Very small hospitals	Generally provide less than 200 admitted patient separations each year.
Children's hospitals	Specialise in the treatment and care of children.
Women's hospitals	Specialise in treatment of women.
Women's and children's hospitals	Specialise in the treatment of both women and children.
Early parenting centres	Specialise in care and assistance for mothers and their very young children.
Drug and alcohol hospitals	Specialise in the treatment of disorders relating to drug or alcohol use.
Psychiatric hospitals	Specialise in providing psychiatric care and/or treatment for people with a mental disorder or psychiatric disability.
Psychogeriatric hospitals	Specialise in the psychiatric treatment of older people.
Child, adolescent and young adult psychiatric hospitals	Specialise in the psychiatric treatment of children and young people.
General acute psychiatric hospitals	Provide acute psychiatric treatment.
General non-acute psychiatric hospitals	Provide non-acute psychiatric treatment—mainly to the general adult population.
Forensic psychiatric hospitals	Provide assessment and treatment of people with a mental disorder and a history of criminal offending, or those who are at risk of offending.
Same day hospitals	Treat patients on a same-day basis. The hospitals in the same day hospital peer groups tend to be highly specialised.
Other day procedure hospitals	Provide a variety of specialised services on a same day basis.
Other acute specialised hospitals	Specialise in a particular form of acute care, not grouped elsewhere. This group is too diverse to be considered a peer group for comparison purposes. It includes hospitals that specialise in the treatment of cancer, rheumatology, eye, ear and dental disorders.
Rehabilitation and geriatric evaluation and management hospitals	Primarily provide rehabilitation and/or geriatric evaluation and management in which the clinical purpose or treatment goal is improvement in the functioning of a patient.
Mixed subacute and non-acute hospitals	Primarily provide a mixture of subacute (rehabilitation, palliative care, geriatric evaluation and management, psychogeriatric care) and non-acute (maintenance) care that is not covered by the hospitals in the rehabilitation and geriatric evaluation and management hospital peer group.
Outpatient hospitals	Provide a range of non-admitted patient services. Generally do not admit patients.

## 10.2 AIHW private peer group classifications

Peer Group - Code	Peer Group Name/Description
Private acute group A hospitals	Private acute hospitals that have a 24-hour emergency department and an intensive care unit, and provide a number of other specialised services such as coronary care, special care nursery, cardiac surgery and neurosurgery.
Private acute group B hospitals	Private acute hospitals that do not have a 24-hour emergency department, but do have an intensive care unit and a number of other specialised services including coronary care, special care nursery, cardiac surgery and neurosurgery.
Private acute group C hospitals	Private acute group C hospitals are those private acute hospitals that do not provide emergency department services or have an intensive care unit, but do provide specialised services in a range of clinical specialities.
Private acute group D hospitals	Private acute group D hospitals are those private acute hospitals that do not provide emergency department services or have an intensive care unit, do not provide specialised services in a range of clinical specialities, but had 200 or more separations.
Other acute specialised hospitals	Other acute specialised hospitals are hospitals that specialise in a particular form of acute care, not grouped elsewhere.
Private rehabilitation hospitals	Private rehabilitation hospitals are private hospitals that primarily provide rehabilitation and/or geriatric evaluation and management.
Eye surgery centres	Eye surgery centres are hospitals that specialise in providing eye surgery on a same day basis.
Mixed day procedure hospitals	Mixed day procedure hospitals are day hospitals that do not meet the service profile of any specialised day hospital peer groups and Other specialist day hospitals. Rather than having a strong focus on one specialised clinical area, these hospitals typically provide a variety of specialised services on a same day basis.
Other women's & children's hospitals	Specialise in the treatment of both women and children.
Unpeered hospitals	Unpeered hospitals are those hospitals with unique characteristics that could not be assigned to one of the peer groups.
Women's hospitals	Specialise in treatment of women.

## 10.3 Audit compliance

Table 5: Summary of notified deaths with completed SCF compared to national data in 2012-2018

Year	VASM % of notified deaths with completed SCF	National % of notified deaths with completed SCF
2012-2013	78.2% (1,181/1,511)	91.1% (3,614/3,969)
2013-2014	85.5% (1,324/1,549)	95.2% (4,013/4,214)
2014-2015	94.0% (1,526/1,624)	98.4% (4,244/4,315)
2015-2016	95.9% (1,620/1,690)	99.5% (4,411/4,432)
2016-2017	90.1% (1,558/1,729)	96.7% (4,328/4,477)
2017-2018	79.0% (1,404/1,777)	85.1% (3,905/4,590)
<b>Total</b>	<b>87.2%</b> <b>(8,613/9,880)</b>	<b>94.3%</b> <b>(24,515/25,997)</b>

Table 6: Notified deaths reported by surgical speciality to VASM in 2012-2018

Specialty	2012-2013	2013-2014	2014-2015	2015-2016	2016-2017	2017-2018	Total
Cardiothoracic Surgery	11.5% (174/1,516)	12.7% (196/1,549)	13.6% (221/1,624)	12.2% (206/1,690)	12.4% (215/1,729)	12.9% (229/1,777)	12.6% (1,241/9,885)
General Surgery	39.2% (595/1,516)	37.6% (582/1,549)	34.2% (556/1,624)	36.0% (609/1,690)	36.5% (631/1,729)	35.7% (634/1,777)	36.5% (3,607/9,885)
General Surgery - Colorectal	0.0% (0/1,516)	0.0% (0/1,549)	0.0% (0/1,624)	0.0% (0/1,690)	0.0% (0/1,729)	0.1% (2/1,777)	0.0% (2/9885)
Neurosurgery	11.3% (171/1,516)	10.8% (168/1,549)	11.5% (186/1,624)	12.2% (206/1,690)	12.0% (207/1,729)	12.9% (229/1,777)	11.8% (1,167/9,885)
Obstetrics & Gynaecology	1.3% (19/1,516)	1.0% (15/1,549)	0.6% (10/1,624)	0.5% (8/1,690)	0.6% (11/1,729)	0.6% (11/1,777)	0.7% (74/9,885)
Ophthalmology	0.0% (0/1,516)	0.1% (1/1,549)	0.0% (0/1,624)	0.0% (0/1,690)	0.1% (2/1,729)	0.2% (4/1,777)	0.1% (7/9,885)
Oral/Maxillofacial	0.0% (0/1,516)	0.0% (0/1,549)	0.1% (1/1,624)	0.1% (2/1,690)	0.2% (4/1,729)	0.1% (1/1,777)	0.1% (8/9,885)
Orthopaedic Surgery	19.7% (299/1,516)	21.8% (338/1,549)	23.8% (386/1,624)	20.2% (341/1,690)	19.8% (343/1,729)	19.9% (353/1,777)	20.8% (2,060/9,885)
Other*	0.0% (0/1,516)	0.0% (0/1,549)	0.1% (1/1,624)	0.1% (1/1,690)	0.2% (3/1,729)	0.1% (2/1,777)	0.1% (7/9,885)
Otolaryngology Head and Neck	1.3% (19/1,516)	1.0% (15/1,549)	0.9% (14/1,624)	0.8% (14/1,690)	1.3% (22/1,729)	1.6% (29/1,777)	1.1% (113/9,885)
Paediatric Surgery	0.7% (11/1,516)	0.7% (11/1,549)	0.8% (13/1,624)	0.9% (16/1,690)	0.9% (15/1,729)	0.7% (13/1,777)	0.8% (79/9,885)
Plastic Surgery	2.3% (35/1,516)	3.1% (48/1,549)	3.0% (48/1,624)	3.6% (60/1,690)	2.9% (51/1,729)	3.5% (63/1,777)	3.1% (305/9,885)
Urology	3.2% (48/1,516)	3.0% (46/1,549)	4.3% (70/1,624)	4.4% (75/1,690)	4.2% (72/1,729)	3.8% (67/1,777)	3.8% (378/9,885)
Vascular Surgery	9.6% (145/1,516)	8.3% (129/1,549)	7.3% (118/1,624)	9.0% (152/1,690)	8.8% (153/1,729)	7.9% (140/1,777)	8.5% (837/9,885)
<b>Total</b>	<b>100%</b> <b>(1,516/1,516)</b>	<b>100%</b> <b>(1,549/1,549)</b>	<b>100%</b> <b>(1,624/1,624)</b>	<b>100%</b> <b>(1,690/1,690)</b>	<b>100%</b> <b>(1,729/1,729)</b>	<b>100%</b> <b>(1,777/1,777)</b>	<b>100%</b> <b>(9,885/9,885)</b>

Note: \* Where there are too few cases such that the identity of the patient or surgeon is compromised, the surgical specialties will not be listed, and all deaths will be aggregated under the speciality of 'other'.

## 10.4 Peer review process

Table 7: Reason for referral for Second-Line Assessment

Reason for SLA	2012-2013	2013-2014	2014-2015	2015-2016	2016-2017	2017-2018
SLA not required	82.4% (822/997)	80.4% (879/1,093)	80.8% (1006/1,245)	79.8% (1,025/1,284)	82.6% (993/1,202)	85.0% (755/888)
SLA due to insufficient information	12.5% (125/997)	12.4% (136/1,093)	13.8% (172/1,245)	13.9% (178/1,284)	12.9% (155/1,202)	11.3% (100/888)
SLA due to further investigation	5.0% (50/997)	7.1% (78/1,093)	5.4% (67/1,245)	6.3% (81/1,284)	4.5% (54/1,202)	3.7% (33/888)

Table 8: Proportion of audited deaths that underwent a Second-Line Assessment

Year	VASM	National
2012-2013	17.5% (175/998)	12.8% (407/3,191)
2013-2014	19.6% (214/1,094)	14.2% (502/3,546)
2014-2015	19.2% (239/1,245)	15.0% (547/3,646)
2015-2016	20.2% (259/1,284)	15.5% (573/3,695)
2016-2017	17.4% (209/1,202)	14.7% (515/3,495)
2017-2018	15.0% (134/891)	12.3% (337/2,745)
<b>Total</b>	<b>18.3%</b> <b>(1,230/6,714)</b>	<b>14.2%</b> <b>(2,881/20,318)</b>

## 10.5 Classification of cause of death

Table 9: Top 28 Classification of cause of death in 2012-2018

Index	Classification	2012-2013	2013-2014	2014-2015	2015-2016	2016-2017	2017-2018	Total
1	Cardiac event	143	171	204	173	163	116	970
2	Respiratory failure	136	133	171	195	148	109	892
3	Septicaemia	105	130	185	164	183	115	882
4	Pneumonia	110	139	145	154	138	91	777
5	Multiple organ failure	134	145	182	183	196	138	978
6	Renal failure	70	73	61	63	54	43	364
7	Cerebrovascular accident	81	114	100	121	96	81	593
8	Cardiac failure	69	105	96	88	84	64	506
9	Gut ischaemia	19	29	34	42	29	33	186
10	Intestinal obstruction	11	8	9	9	9	11	57
11	Neurotrauma	31	63	86	92	71	71	414
12	Malignancy	48	29	36	64	50	46	273
13	Pulmonary embolism	20	24	37	34	33	18	166
14	Cause unknown	24	31	28	21	20	19	143
15	Ruptured aortic aneurysm	13	10	11	5	8	4	51
16	Fracture of neck of femur	6	4	5			6	21
17	GI haemorrhage	3	4	8	8	16	10	49
18	non-GI Haemorrhage	4	9	19	15	16	16	79
19	Peritonitis	11	9	7	7	15	3	52
20	Acute pancreatitis	1	6	2	6	5	4	24
21	Malnutrition	3	2		4	3	2	14
22	Hepatic failure	9	11	15	29	17	15	96
23	Cholangitis	1	1	2	4	1	5	14
24	Coagulopathy	9	5	8	15	16	10	63
25	Necrotising fasciitis	4	5			3	3	15
26	Acidosis	1	1	2	2	2	3	11
27	Dissecting aortic aneurysm		1	4	1	1	3	10
28	Hydrocephalus	1	1	3	8	5	3	21
	<b>Total</b>	<b>1,067</b>	<b>1,263</b>	<b>1,460</b>	<b>1,507</b>	<b>1,382</b>	<b>1,042</b>	<b>7,721</b>

Note: GI: gastrointestinal.

Table 10: All Classification of cause of death by Read Code in 2012-2018

Index	ReadCode ID	ReadCodeText	2012-2013	2013-2014	2014-2015	2015-2016	2016-2017	2017-2018	Total
0	70627	Other sudden death, cause unknown	7	3	2	0	0	4	16
0	65056	Hypoxaemia	3	6		1	3	1	14
0	7942	Morbidity index high	0	0	3	0	5	5	13
0	48273	Failure to thrive	2	0	1	3	4	2	12
0	28513	Peripheral vascular disease	1	0	2	4	2	1	10
0	57486	Palliative care	9	29	9	8	10	13	78
0	4266	Hypotension	2	3	6	2	5	3	21
1	69313	Other specified cardiac arrhythmias	4	3	2	3	5	1	18
1	4236	Cardiomyopathy	2	3	4	1	2	2	14
1	42875	Ventricular fibrillation	2	3	3	1	4		13
1	21390	Cardiac arrest	57	65	83	78	68	52	403
1	4219	Acute myocardial infarction	57	52	72	45	54	41	321
1	48329	Cardiogenic shock	13	18	25	28	18	14	116
1	1475	Ischaemic heart disease	4	7	3	5	7	2	28
1	7310	Myocardial infarction	2	7	3	7	5	0	24
1	42872	Atrial fibrillation		4	5	5		4	18
1	2423	Myocardial infarction	2	9	4	0	0	0	15
2	52121	Cardiorespiratory failure as a complication of care	0	3	8	4	6	4	25
2	1481	Acute respiratory infections	0	1	3	4	3	3	14
2	4727	Respiratory distress syndrome	3	0	1	2	4	0	10
2	4321	Respiratory failure	88	88	100	128	102	63	569
2	65057	Cardiorespiratory failure	18	19	16	19	16	16	104
2	65058	Respiratory arrest	8	9	12	17	5	4	55
2	21688	Acute respiratory failure	10	4	12	6	5	8	45
2	2284	Raised intracranial press	3	3	13	7	5	5	36
2	1484	Chronic obstructive pulmonary disease	1	4	4	4	1	5	19
2	21349	Primary pulmonary hypertension	5	2	2	4	1	1	15
3	3849	Septicaemia	93	118	158	146	160	104	779
3	48333	Septic shock	9	10	18	14	15	8	74
3	62805	Perforation of intestine	3	2	9	4	8	3	29
4	52126	Other aspiration pneumonia as a complication of care	35	60	54	55	63	43	310
4	68856	Delirium, unspecified	3	0	2	6	4	3	18
4	29368	Debility, unspecified	1	3	2	4	5	1	16
4	62331	Chest infection	1	4	2	4	1	4	16
4	8040	Pneumonia	46	31	27	28	11	1	144
4	1483	Pneumonia and influenza	16	31	33	19	24	17	140
4	5487	Pneumonia or influenza	4	3	16	27	16	10	76



4	4291	Pneumonia due to unspecified organism	1	3	6	9	14	11	44
4	4290	Bronchopneumonia due to unspecified organism	3	4	3	2	0	1	13
5	4077	Multiple organ failure	134	145	182	183	196	138	978
6	22016	Renal impairment	1	2	2	4	2	2	13
6	4387	Acute renal failure	29	37	30	32	25	22	175
6	43874	Renal failure	21	18	18	16	16	16	105
6	4389	Renal failure unspecified	12	6	8	8	9	1	44
6	22015	End stage renal failure	3	5	1	2	1	2	14
6	4388	Chronic renal failure	4	5	2	1	1		13
7	21411	Intracerebral haemorrhage, intraventricular	0	2	4	3	8	6	23
7	62232	Brainstem infarction	3	1	2	5	3	2	16
7	21407	Cerebellar haemorrhage	2	1	3	3	3	2	14
7	27191	Ruptured intracranial aneurysm(s)	4	2	2	3	2	1	14
7	52149	Intra-operative haemorrhage	2	2	3	2	1	1	11
7	4246	Stroke and cerebrovascular accident unspecified	16	28	21	31	32	29	157
7	4240	Subarachnoid haemorrhage	18	25	24	20	16	19	122
7	4241	Intracerebral haemorrhage	12	11	13	15	5	11	67
7	28502	Cerebral infarction	4	14	9	15	14	3	59
7	7309	CVA/stroke	8	14	8	12	3		45
7	21416	Subdural haematoma - nontraumatic	8	8	7	6	3	1	33
7	28499	Intracranial haemorrhage	4	6	4	6	6	6	32
8	21395	Acute heart failure	1	3	2	5	6	1	18
8	21394	Left ventricular failure	1	4	2	2	3		12
8	42889	Decompensated cardiac failure	1		2	2	2	3	10
8	4239	Heart failure	49	62	69	65	49	37	331
8	21393	Congestive heart failure	8	10	6	4	10	9	47
8	62520	Acute pulmonary oedema	5	10	4	4	3	3	29
8	64899	Congenital cardiac failure	2	9	2	2	2	7	24
8	62504	Pulmonary oedema	2	2	6	0	7	2	19
8	21686	Acute pulmonary oedema unspecified	0	5	3	4	2	2	16
9	21878	Acute intestinal vascular insufficiency	0	3	3	0	3	2	11
9	4362	Vascular insufficiency of the intestine	19	26	31	42	26	31	175
10	28692	Intestinal obstruction	11	8	9	9	9	11	57
11	71334	Brain Death	7	18	26	25	17	11	104
11	24879	Traumatic haematoma	2	3	5	0	0	2	12
11	20989	Unspecified encephalopathy	1	2	4	1	2		10

11	24479	Diffuse brain injury	7	10	20	25	16	21	99
11	27186	Severe head injury	3	7	8	10	11	7	46
11	24480	Focal brain injury	3	6	2	4	6	15	36
11	20987	Anoxic brain damage	2	5	6	8	9	5	35
11	24473	Traumatic subdural haemorrhage	1	4	7	5	6	5	28
11	20991	Cerebral oedema	2	5	5	10	2	3	27
11	24482	Head injury	3	3	3	4	2	2	17
12	3945	Malignant neoplasm of colon	8	2	2	6	6	7	31
12	3970	Malignant neoplasm of prostate	3	4	2	7	2	2	20
12	27840	Malignant neoplasm of bronchus or lung	2	2	1	2	2	6	15
12	3962	Malignant neoplasm of female breast	3	0	3	4	2	2	14
12	3949	Malignant neoplasm of pancreas	1	2	1	6	2	2	14
12	9028	Failure to thrive		4		3	7		14
12	20424	Glioblastoma	3	1	3	1	2	3	13
12	62494	Malignant pleural effusion	1	0	3	4	3	2	13
12	20034	Adenocarcinoma, metastatic	3	0	1	3	2	3	12
12	4028	Adenomas and adenocarcinomas	3	0	1	1	2	4	11
12	19752	Multiple myeloma	2	1	2	2	2	2	11
12	3942	Malignant neoplasm of oesophagus		2	1	3	3	1	10
12	19965	Carcinoma, metastatic	11	8	8	10	6	3	46
12	19954	Neoplasm, metastatic	5	0	4	6	7	7	29
12	19729	Disseminated malignancy	3	3	4	6	2	2	20
13	42777	Post operative pulmonary embolus	2	0	5	1	2	0	10
13	21347	Pulmonary embolism	14	21	27	29	30	18	139
13	8028	Pulmonary embolus	4	3	5	4	1		17
14	12690	Coroner's post mortem exam.	4	4	0	2	3	1	14
14	4756	Sudden death, cause unknown	13	23	22	12	14	13	97
14	48594	Death, not instantaneous cause unknown	7	4	6	7	3	5	32
15	21460	Abdominal aortic aneurysm which has ruptured	7	8	5	1	5	2	28
15	21462	Ruptured aortic aneurysm	6	2	6	4	3	2	23
16	4779	Fracture of neck of femur	6	4	5			6	21
17	52129	Complication of gastrointestinal anastomosis or by	0	1	1	2	5	3	12
17	4381	Gastrointestinal haemorrhage	3	3	7	6	11	7	37
18	40791	Hypovolaemia	1	1	3	4	3	3	15
18	28519	Haemorrhage	0	5	12	8	9	8	42
18	48332	Hypovolaemic shock	3	3	4	3	4	5	22
19	43664	Perforated diverticulum of colon	0	3	1	2	4	1	11

19	21892	Perforated diverticulum	2	2	2	3	1	0	10
19	4369	Peritonitis	9	4	4	2	10	2	31
20	21972	Acute pancreatitis	1	6	2	6	5	4	24
21	40501	Malnutrition	3	2	0	4	3	2	14
22	43757	Acute hepatic failure	0	0	3	9	3	2	17
22	4849	Injury to kidney	0	1	1	3	4	3	12
22	21939	Hepatic failure	9	10	11	17	10	10	67
23	21967	Cholangitis	1	1	2	4	1	5	14
24	4106	Coagulation defects	3	1	2	1	6	3	16
24	1460	Clotting and bleeding disorders	6	4	6	14	10	7	47
25	19100	Necrotising fasciitis	4	5	0	0	3	3	15
26	20620	Acidosis	1	1	2	2	2	3	11
27	21457	Dissecting aortic aneurysm	0	1	4	1	1	3	10
28	20912	Hydrocephalus	1	1	3	8	5	3	21
		<b>Total</b>	<b>1,091</b>	<b>1,304</b>	<b>1,483</b>	<b>1,525</b>	<b>1,411</b>	<b>1,071</b>	<b>7,885</b>

Note: CVA: cerebrovascular accident.

## 10.6 Classification of surgical diagnosis

Table 11: All Classification of surgical diagnoses by Read Code in 2012-2018

Index	ReadCode ID	ReadCodeText	2012-2013	2013-2014	2014-2015	2015-2016	2016-2017	2017-2018	Total
1	4770	Fracture of humerus	3	1	2	4	2	2	14
1	4779	Fracture of neck of femur	136	136	165	137	136	97	807
1	24190	Fracture of shaft of femur	4	2	6	4	1	2	19
1	4802	Fracture-dislocation or subluxation hip	1	2	5	7	8	2	25
1	4780	Other fracture of femur	5	5	8	10	9	6	43
1	24184	Pertrochanteric fracture	3	2	2	7	4	3	21
1	24185	Subtrochanteric fracture	4	1	6	3	1	5	20
2	1490	Hernia of abdominal cavity	1	1	1	6	2	1	12
2	28692	Intestinal obstruction	45	45	55	55	54	48	302
2	69589	Intestinal obstruction	4	1	2	1	1	0	9
2	62752	Obstruction of intestine	6	0	0	2	3	0	11
3	20991	Cerebral oedema	1	3	2	3	3	1	13
3	4241	Intracerebral haemorrhage	12	5	12	12	9	9	59
3	21411	Intracerebral haemorrhage, intraventricular	4	4	3	6	12	6	35
3	4240	Subarachnoid haemorrhage	24	34	28	30	25	30	171
3	21416	Subdural haematoma - nontraumatic	17	20	13	9	2	6	67
4	20991	Cerebral oedema	1	3	2	3	3	1	13
4	24482	Head injury	2	4	3	8	2	3	22
4	24879	Traumatic haematoma	4	13	13	5	7	4	46
4	24473	Traumatic subdural haemorrhage	2	7	15	21	26	18	89
5	20033	Adenocarcinoma	1	3	4	4	6	4	22
5	20034	Adenocarcinoma, metastatic	4	4	5	3	1	4	21
5	4028	Adenomas and adenocarcinomas	3	5	7	5	10	10	40
5	19965	Carcinoma, metastatic	16	14	21	9	10	1	71
5	40329	Cholangiocarcinoma	3	5	3	5	3	4	23
5	20424	Glioblastoma	5	2	2	6	2	2	19
5	20155	Malignant melanoma	0	4	3	2	4	2	15
5	19954	Neoplasm, metastatic	2	3	9	7	9	7	37
5	19995	Squamous cell carcinoma	6	10	4	8	8	5	41
5	39640	Cerebral metastasis	0	3	3	6	1	4	17
5	20991	Cerebral oedema	1	3	2	3	3	1	13
5	27840	Malignant neoplasm of bronchus or lung	5	2	3	5	8	7	30
5	19527	Malignant neoplasm of caecum	6	4	7	5	7	3	32

5	3945	Malignant neoplasm of colon	17	13	11	14	14	14	83
5	3962	Malignant neoplasm of female breast	6	2	3	2	4	3	20
5	19540	Malignant neoplasm of gallbladder	1	2	4	1	5	2	15
5	19523	Malignant neoplasm of hepatic flexure of colon	1	1	3		6	2	13
5	3942	Malignant neoplasm of oesophagus	3	3	8	7	6	8	35
5	3949	Malignant neoplasm of pancreas	5	8	5	8	8	7	41
5	3970	Malignant neoplasm of prostate	2	6	5	11	14	4	42
5	19533	Malignant neoplasm of rectum	8	13	9	9	5	5	49
5	19526	Malignant neoplasm of sigmoid colon	4	2	8	10	3	3	30
5	19530	Malignant neoplasm of splenic flexure of colon	1	1	3	3	3	1	12
5	3943	Malignant neoplasm of stomach	2	3	0	4	3	2	14
5	3973	Malignant neoplasm of urinary bladder	10	9	5	12	7	2	45
5	62494	Malignant pleural effusion	3	5	8	14	9	5	44
6	48329	Cardiogenic shock	2	4	6	3	4	4	23
6	4219	Acute myocardial infarction	1	7	13	15	8	9	53
6	42815	Aortic stenosis alone, cause unspecified	5	2	7	2	3	2	21
6	42813	Aortic stenosis, non-rheumatic	3	2	5	4	1	0	15
6	42816	Aortic valve stenosis with insufficiency	4	4	2	3	2	2	17
6	4251	Atherosclerosis	1	5	1	4		0	11
6	42872	Atrial fibrillation	2	2	3	5	4	2	18
6	21390	Cardiac arrest	1	7	3	2	5	5	23
6	29062	Coronary artery anomaly	6	5	2	4	3	4	24
6	21325	Coronary atherosclerosis	3	8	18	14	16	11	70
6	42772	Double coronary vessel disease	6	2	5	0	1	0	14
6	4239	Heart failure	3	6	8	6	2	3	28
6	1475	Ischaemic heart disease	2	4	9	5	9	6	35
6	21290	Mitral and aortic incompetence	1	3	5	4	3	0	16
6	21287	Mitral and aortic stenosis	2	6	4	7	6	5	30
6	21363	Mitral valve incompetence	0	1	2	6	6	3	18
6	42771	Single coronary vessel disease	3	6	2	2		1	14
7	21460	Abdominal aortic aneurysm which has ruptured	10	17	12	16	13	8	76
7	4252	Aortic aneurysm	1	1	3	7	1	3	16
7	21457	Dissecting aortic aneurysm	4	5	11	7	16	10	53
7	21462	Ruptured aortic aneurysm	11	9	5	8	6	4	43
8	23860	Perinatal necrotising enterocolitis	2	1	3	7	3	1	17

9	21421	Carotid artery stenosis	4	1	2	4		2	13
9	21407	Cerebellar haemorrhage	1	1	2	5	3	6	18
9	28502	Cerebral infarction	0	2	2	7	1	2	14
10	1559	Burns	0	5	2	3	1	1	12
11	16995	Admit trauma emergency	2	3	3	2		0	10
12	21973	Chronic pancreatitis	3	4	1	2	2	0	12
12	62786	Faecal peritonitis	1	3	1	5	4	2	16
13	21347	Pulmonary embolism	3	1	0	6	2	1	13
14	48333	Septic shock	2	5	7	1	2	4	21
14	63870	Infective arthritis of knee	0	1	5	3	2	4	15
14	3849	Septicaemia	10	18	28	43	26	23	148
		<b>Total</b>	<b>493</b>	<b>570</b>	<b>670</b>	<b>708</b>	<b>624</b>	<b>484</b>	<b>3,549</b>

## 10.7 Delay in surgical diagnosis

Table 12: Audited deaths with delay in surgical diagnosis

Year	VASM	National
2012-2013	6.7% (66/990)	6.9% (212/3,074)
2013-2014	7.4% (81/1,088)	7.2% (251/3,475)
2014-2015	6.4% (80/1,241)	6.8% (246/3,620)
2015-2016	7.3% (93/1,279)	6.6% (243/3,673)
2016-2017	6.6% (79/1,197)	5.7% (200/3,479)
2017-2018	7.2% (64/885)	7.1% (194/2,732)
<b>Total</b>	<b>6.9%</b> <b>(463/6,680)</b>	<b>6.7%</b> <b>(1,346/20,053)</b>

Data not available: n=34.



## 10.8 Delay in transfer to a hospital

Table 13: Audited deaths with transfer to a hospital with delay compared to national data in 2012-2018

Year	VASM	National
2012-2013	9.3% (19/204)	10.2% (75/738)
2013-2014	11.9% (27/226)	10.3% (83/805)
2014-2015	8.4% (23/273)	10.6% (92/866)
2015-2016	10.8% (29/268)	11.0% (96/876)
2016-2017	8.1% (20/248)	10.2% (85/830)
2017-2018	8.7% (16/184)	11.2% (73/652)
<b>Total</b>	<b>9.6%</b> <b>(134/1,403)</b>	<b>10.6%</b> <b>(504/4,767)</b>

Notes: Data not available: n=93.

Table 14: Interhospital transfer issues

Variable	2012-2013	2013-2014	2014-2015	2015-2016	2016-2017	2017-2018	Total
Transfer delay	9.3% (19/204)	11.9% (27/226)	8.4% (23/273)	10.8% (29/268)	8.1% (20/248)	8.7% (16/184)	9.6% (134/1,403)
Inappropriate transfer	5.4% (11/205)	6.6% (15/228)	4.3% (12/278)	3.0% (8/268)	6.1% (15/247)	4.8% (9/186)	5.0% (70/1,412)
Inappropriate level of care	3.0% (6/198)	5.3% (12/228)	2.9% (8/275)	3.0% (8/269)	4.1% (10/245)	2.2% (4/183)	3.4% (48/1,398)
Insufficient clinical documentation	6.0% (12/200)	6.2% (14/227)	3.7% (10/273)	4.1% (11/266)	4.9% (12/245)	4.9% (9/184)	4.9% (68/1,395)

Table 15: Perceived delays in transfer of patients to another hospital

Location	2012-2013	2013-2014	2014-2015	2015-2016	2016-2017	2017-2018	Total
Metro	7.4% (13/176)	10.0% (20/200)	7.1% (17/239)	9.8% (23/234)	8.7% (18/207)	7.7% (12/156)	8.5% (103/1,212)
Rural	21.4% (6/28)	26.9% (7/26)	17.6% (6/34)	17.6% (6/34)	4.9% (2/41)	14.8% (4/27)	16.3% (31/190)

## 10.9 Profile of operative procedures

Table 16: Operation with the consultant surgeon present in theatre compared to national data in 2012-2018

Year	VASM	National
2012-2013	78.0% (966/1,238)	70.5% (2,439/3,462)
2013-2014	80.0% (1,086/1,357)	74.2% (2,840/3,829)
2014-2015	80.3% (1,311/1,633)	73.9% (3,109/4,205)
2015-2016	80.2% (1,390/1,734)	75.3% (3,187/4,230)
2016-2017	81.5% (1,283/1,575)	75.7% (2,999/3,964)
2017-2018	84.2% (956/1,135)	75.0% (2,301/3,066)
<b>Total</b>	<b>80.6%</b> <b>(6,992/8,672)</b>	<b>74.2%</b> <b>(16,875/22,756)</b>

Note: n=8,672 episodes in 6,714 patients having operative treatment. Audit period 1 July 2012 to 30 June 2018.

Table 17: Operation with the consultant surgeon present in theatre compared to national data in 2012-2018

Year	VASM		National	
	Consultant present	Consultant not present	Consultant present	Consultant not present
2012-2013	78.0% (966/1,238)	22.0% (272/1,238)	70.5% (2,439/3,462)	29.5% (1,023/3,462)
2013-2014	80.0% (1,086/1,357)	20.0% (271/1,357)	74.2% (2,840/3,829)	25.8% (989/3,829)
2014-2015	80.3% (1,311/1,633)	19.7% (322/1,633)	73.9% (3,109/4,205)	26.1% (1,096/4,205)
2015-2016	80.2% (1,390/1,734)	19.8% (344/1,734)	75.3% (3,187/4,230)	24.7% (1,043/4,230)
2016-2017	81.5% (1,283/1,575)	18.5% (292/1,575)	75.7% (2,999/3,964)	24.3% (965/3,964)
2017-2018	84.2% (956/1,135)	15.8% (179/1,135)	75.0% (2,301/3,066)	25.0% (765/3,066)
<b>Total</b>	<b>80.6%</b> <b>(6,992/8,672)</b>	<b>19.4% (1,680/8,672)</b>	<b>74.2% (1,6875/2,2756)</b>	<b>25.8%</b> <b>(5,881/22,756)</b>

Note: n=8,672 episodes in 6,714 patients having operative treatment. Audit period 1 July 2012 to 30 June 2018.

## 10.10 Elective surgery performed as planned

Table 18: Proportion of elective admissions with elective surgery performed compared to national data in 2012-2018

Year	VASM	National
2012-2013	86.1% (155/180)	87.5% (363/415)
2013-2014	91.9% (171/186)	90.0% (475/528)
2014-2015	87.7% (206/235)	86.0% (460/535)
2015-2016	86.5% (179/207)	85.2% (438/514)
2016-2017	84.0% (184/219)	84.0% (416/495)
2017-2018	87.7% (135/154)	84.8% (328/387)
<b>Total</b>	<b>87.2%</b> <b>(1,030/1,181)</b>	<b>86.3%</b> <b>(2,480/2,874)</b>

Note: n=8,672 episodes in 6,714 patients having operative treatment. Data not available: n=43. Audit period 1 July 2012 to 30 June 2018.

## 10.11 Classification of surgical procedures

Table 19: Classification of the most frequent surgical procedures by Read Code with a total greater than 10 reported in 2012-2018

Index	ReadCode ID	ReadCodeText	2012-2013	2013-2014	2014-2015	2015-2016	2016-2017	2017-2018	Total
1	36839	Laparotomy approach	143	156	203	172	55	63	792
1	35054	Exploratory laparotomy	64	59	51	67	61	41	343
1	36841	Laparoscopic approach	34	43	42	34	13	21	187
1	35056	Reopening of laparotomy site	13	17	27	27	26	21	131
1	35053	Lavage of peritoneum	6	11	11	5	6	6	45
2	16067	Prosthetic cemented hemiarthroplasty of hip	37	32	34	24	20	10	157
2	16069	Other prosthetic hemiarthroplasty of hip	7	5	28	28	20	25	113
2	35711	Debridement of bone	5	17	15	11	4	5	57
2	36006	Primary cemented hemiarthroplasty of hip	8	4	9	10	9	8	48
2	36366	Open irrigation joint	1	0	7	9	7	4	28
2	35956	Internal fixation of bone	2	7	5	8	4	0	26
2	36048	Arthroscopic irrigation of knee joint	0	0	6	5	4	7	22
2	59778	Total prosthetic replacement of hip joint	3	3	2	5	2	3	18
2	59787	Other prosthetic hemiarthroplasty of hip	2	0	3	3	6	2	16
2	35976	Debridement of open fracture	3	4	4	3	1	0	15
2	16068	Prosthetic uncemented hemiarthroplasty of hip	2	4	5	0	1	0	12
2	36051	Arthroscopic debridement of knee joint	1	0	3	3	3	0	10
3	15588	Other bypass of coronary artery	10	30	50	31	36	26	183
3	33090	Replacement of aortic valve	24	20	23	22	21	14	124
3	36833	Median sternotomy approach	8	10	24	10	12	11	75
3	33085	Replacement of mitral valve	8	7	9	12	9	11	56
3	15564	Plastic repair of aortic valve	7	6	11	2	7	8	41
3	15600	Drainage of pericardium	1	4	12	10	8	5	40
3	34940	Exploratory median	7	5	9	1	13	2	37

		sternotomy							
3	3252	Coronary artery operations	2	1	9	10	8	5	35
3	15563	Plastic repair of mitral valve	4	9	6	6	6	4	35
3	33677	Insertion of central venous catheter	4	7	11	9	0	3	34
3	15623	Plastic repair of aorta	3	5	7	4	5	1	25
3	33197	Implantation of ventricular assist device	7	9	3	2	3	0	24
3	33089	Prosthetic replacement of aortic valve	3	5	6	2	2	2	20
3	15565	Plastic repair of tricuspid valve	3	2	4	4	2	2	17
3	33087	Allograft replacement of aortic valve	1	6	7	1	0	2	17
3	32069	Lobectomy of lung	1	2	6	3	2	1	15
3	37033	Cardiopulmonary bypass	2	4	1	2	2	3	14
3	37034	Extracorporeal circulation	7	0	2	2	1	1	13
3	33084	Prosthetic replacement of mitral valve	2	3	3	3	0	1	12
3	33121	Annuloplasty of tricuspid valve	0	3	2	3	2	2	12
3	3255	Aorta operations	1	2	1	6	0	1	11
3	36706	Haemostasis of unspecified organ	0		7	3	0	0	10
4	34884	Debridement of skin	26	58	49	73	77	65	348
4	3326	Dressing of wound	28	31	34	36	20	22	171
4	35252	Debridement of muscle	29	25	24	10	19	10	117
4	16380	Change of dressing	9	14	11	12	8	7	61
4	3278	Skin flap and skin graft operations	4	12	3	5	1	8	33
4	34872	Debridement of burnt skin	1	5	4	9	9	2	30
4	15886	Split autograft of skin	1	1	8	5	6	1	22
4	36759	Irrigation of organ	0	1	2	5	7	6	21
4	1291	Surgical biopsy (admin)	4	6	2	3	1	4	20
4	34905	Incision and drainage of wound	1	4	2	8	4	1	20
4	34648	Excision malignant skin tumour	2	2	3	5	4	2	18
4	36702	Debulking of tumour of unspecified organ	2	2	2	7	3	2	18
4	15888	Other graft of skin	9	1	3	1	3	0	17
4	36399	Arthroscopic irrigation (not knee)	0		4	4	3	3	14
4	32815	Irrigation of bowel	0	1	3	4	3	1	12
4	34803	Allograft of skin	0		1	7	3	0	11

5	32615	Right hemicolectomy and anastomosis	25	9	18	19	28	20	119
5	32631	Sigmoid colectomy and exteriorisation of bowel	12	14	21	36	23	8	114
5	3242	Colon operations and sigmoidoscopy of rectum	4	9	7	12	4	5	41
5	32608	Total colectomy and ileostomy	5	4	7	7	11	7	41
5	32709	Anterior resection of rectum and anastomosis	10	4	8	4	5	5	36
5	32612	Extended right hemicolectomy and ileostomy	6	4	4	7	4	5	30
5	32637	Partial colectomy	1	8	3	9	2	4	27
5	8171	Ileostomy	4	5	8	4	2	0	23
5	32552	Anastomosis of ileum to colon	1	3	9	4	2	1	20
5	32635	Colectomy and ileostomy	1	3	7	4	2	3	20
5	32624	Left hemicolectomy and anastomosis	2	2	3	7	2	3	19
5	32650	Loop colostomy	4	3	2	4	1	3	17
5	32756	Reversal of Hartmann's procedure	5	3	3	3	1	2	17
5	27420	Colon operations or rectal sigmoidoscopy	3	2	3	5	2	0	15
5	8172	Colostomy	2	3	3	0	3	2	13
6	38427	Burrhole(s) for ventricular external drainage	34	36	65	83	60	60	338
6	30960	Evacuation of subdural haematoma	4	8	15	11	28	19	85
6	16570	Intracran. pressure monitoring	6	12	19	15	15	11	78
6	38528	Insertion of cranial monitor	9	8	4	14	17	12	64
6	38530	Cerebral angiogram + embolization/coil	8	8	11	8	5	12	52
6	38362	Craniotomy for chronic subdural haematoma	5	7	11	10	4	2	39
6	30916	Evacuation of intracerebral haematoma	2	5	2	6	4	5	24
6	38529	Cerebral angiogram	2	2	3	3	11	3	24
6	30957	Drainage of ventricle of brain	1	4	5	1	7	5	23
6	38370	Craniotomy for decompression of infarct	1	1	3	2	7	2	16
6	38372	Craniotomy for biopsy	2	2	2	5	1	2	14
6	38387	Craniotomy for other / unknown	3	3	0	3	2	1	12

7	15417	Excision of ileum	4	29	29	40	23	12	137
7	35080	Freeing of adhesions of peritoneum	3	7	21	15	13	17	76
7	15422	Creation of ileostomy	8	5	9	20	12	9	63
7	35083	Endoscopic division of adhesions of peritoneum	6	16	6	12	12	8	60
7	15933	Primary repair of incisional hernia	2	13	4	6	3	5	33
7	33007	Splenectomy	2	5	6	6	7	5	31
7	15928	Primary repair of inguinal hernia	6	3	5	5	5	5	29
7	36749	Freeing of adhesions of organ	0	1	3	4	11	8	27
7	32450	Open insertion of feeding tube into stomach	2	5	6	5	1	6	25
7	15930	Primary repair of femoral hernia	4	3	6	4	4	1	22
7	32576	Oversewing of small bowel	5	3	6	1	2	3	20
7	15932	Repair of umbilical hernia	1	7	4	4	1		17
7	15407	Operations on duodenal ulcer	2	4	4	1	2	3	16
7	15410	Jejunostomy	0	3	2	5	4	2	16
7	35052	Open drainage of abdominal abscess	0	1	2	6	4	2	15
7	32412	Total gastrectomy and interposition of jejunum	1	0	3	4	4	1	13
7	32562	Closure of ileostomy	2	4	4	0	2	1	13
7	37041	Insertion of nasogastric tube	0	2	4	2	2	3	13
7	32509	Closure of perforated duodenal ulcer	1	2	2	7	0	0	12
8	37035	Extra corporeal membrane oxygenation	12	28	17	30	36	26	149
8	36835	Thoracotomy approach	12	14	28	18	16	11	99
8	36836	Thoracoscopic approach	8	19	17	20	10	11	85
8	38560	Tracheostomy	2	10	25	15	5	11	68
8	30528	Bronchoscopy normal	4	4	11	5	4	4	32
8	34962	Open pleurodesis	1	4	4	11	4	6	30
8	34966	Endoscopic pleurodesis	5	2	8	5	7	2	29
8	34973	Insertion of tube drain into pleural cavity	3	8	7	5	3	3	29
8	34965	Endoscopic pleurodesis using talc	1	6	5	7	5	2	26
8	34952	Decortication of pleura	1	4	3	8	3	6	25

8	32082	Biopsy of lesion of lung	2	5	5	7	2	2	23
8	34971	Drainage of pleural cavity	1	5	2	4	6	3	21
8	34941	Exploratory thoracotomy	1	2	3	4	4	1	15
8	15917	Open drainage of pleural cavity	1		6	3	1	2	13
9	36761	Evacuation of haematoma	4	13	12	24	12	14	79
9	35354	Craniectomy unspecified	8	6	14	11	16	13	68
9	38367	Craniotomy for clipping of aneurysm	10	13	11	9	5	5	53
9	35338	Exploratory open craniotomy	4	6	8	3	6	14	41
9	38377	Craniotomy for other tumour resection	7	5	5	9	4	4	34
9	38378	Craniotomy for excision / drainage of abscess	5		5	4	3	6	23
9	33350	Clipping of aneurysm of cerebral artery	3	4	4	1	1	4	17
9	38361	Craniotomy for intra- and extradural haematomas	2	4	4	3	1	2	16
9	38359	Craniotomy for traumatic extradural haematoma	3	1	3	4	1	3	15
10	30527	Gastroscopy normal	21	19	37	39	40	22	178
10	10859	Colonoscopy normal	8	3	8	9	16	2	46
10	32473	Diagnostic gastroscopy	1	6	12	5	12	2	38
10	16361	Gastric irrigation - lavage	0	4	5	9	6	2	26
10	32666	Operative colonoscopy	3	2	2	2	1	3	13
11	15616	Replacement of aneurysmal bifurcation of aorta	4	15	16	23	15	6	79
11	38531	Other angiograms	10	4	9	8	12	13	56
11	33706	Vein graft thrombectomy	4	5	12	8	6	3	38
11	33594	Open embolectomy of femoral artery	7	7	5	8	2	1	30
11	33523	Insertion of iliac artery stent	7	6	3	1	7	5	29
11	35131	Fasciotomy leg	0	5	5	6	7	6	29
11	33592	Repair of femoral artery	3	3	6	3	7	4	26
11	15649	Other bypass of femoral artery or popliteal artery	1	7	5	3	1	0	17
11	33705	Prosthetic graft thrombectomy	0	2	4	4	5	1	16
11	33287	Axillo-bifemoral bypass graft	0	5	6		2	2	15
11	33582	Endarterectomy and patch repair of femoral artery	3	1	5	0	4	0	13



11	33675	Open thrombectomy of vein of lower limb	4	6	0	0	1	2	13
12	15714	Other therapeutic cystoscopy	3	3	10	9	10	10	45
12	33832	Endoscopic insertion of ureteric stent	4	2	5	13	10	3	37
12	15715	Diagnostic cystoscopy	6	3	3	5	4	2	23
12	33835	Endoscopic replacement of ureteric stent	1	3	6	7	2	4	23
12	33921	Manual bladder washout	3	2	3	6	7	0	21
12	57495	Cystoscopy normal	3	4	6	3	2	2	20
12	33892	Rigid cystoscopy and TUR bladder lesion	2	3	2	2	4	2	15
12	33986	Transurethral resection of male bladder neck	5	1	1	3	2	2	14
12	33893	Rigid cystoscopic diathermy of lesion of bladder	2	3	4	2	2	0	13
12	34036	Endoscopic insertion of urethral stent	0	6	3	1	1	0	11
13	16138	Amputation of toe	5	5	7	9	11	5	42
13	36481	Amputation below knee	5	4	4	9	12	6	40
13	36479	Amputation above knee	2	4	8	7	5	5	31
14	32856	Total cholecystectomy	4	5	12	10	14	6	51
14	32859	Endoscopic cholecystectomy	3	5	2	5	3	3	21
14	3508	Cholecystectomy planned	3	5	3	3	3	0	17
15	3339	Haemorrhage control by packing	1	3	7	13	7	8	39
15	16373	Other cannulation	6	0	8	2	5	3	24
15	32952	Percutaneous cholangiography	4	3	9	3	1	3	23
15	38541	Removal of shunt +/- insertion external drain	4	5	1	2	2	0	14
		<b>Total</b>	<b>1,005</b>	<b>1,282</b>	<b>1,646</b>	<b>1,641</b>	<b>1,323</b>	<b>1,041</b>	<b>7,938</b>

Note: TUR: transurethral resection.

## 10.12 DVT prophylaxis

Table 20: DVT prophylaxis use during the audit period compared to national data in 2012-2018

Year	VASM	National
2012-2013	76.2% (744/977)	77.9% (2,375/3,047)
2013-2014	80.2% (861/1,074)	78.2% (2,701/3,456)
2014-2015	82.6% (1,018/1,232)	80.6% (2,897/3,595)
2015-2016	81.0% (1,025/1,266)	80.3% (2,911/3,626)
2016-2017	80.6% (949/1,177)	80.6% (2,759/3,425)
2017-2018	82.0% (712/868)	80.2% (2,155/2,686)
<b>Total</b>	<b>80.5%</b> <b>(5,309/6,594)</b>	<b>79.6%</b> <b>(15,798/19,835)</b>

Note: n=5,309 episodes in 6,594 patients having operative treatment. Data not available: n=120. Audit period 1 July 2012 to 30 June 2018.  
DVT: deep vein thrombosis.

Table 21: Inappropriate DVT prophylaxis treatment as viewed by the assessor

Year	VASM	National
2012-2013	1.6% (15/961)	1.9% (56/3,010)
2013-2014	1.5% (16/1,060)	1.9% (65/3,403)
2014-2015	1.6% (20/1,226)	1.6% (57/3,509)
2015-2016	1.5% (19/1,269)	2.1% (73/3,556)
2016-2017	1.8% (22/1,193)	1.4% (48/3,381)
2017-2018	1.3% (11/875)	1.6% (41/2,625)
<b>Total</b>	<b>1.6%</b> <b>(103/6,584)</b>	<b>1.7%</b> <b>(340/19,484)</b>

Note: n=8,672 episodes in 6,594 patients having operative treatment. Data not available: n=120. Audit period 1 July 2012 to 30 June 2018.  
DVT: deep vein thrombosis.

## 10.13 Adequacy of provision of critical care support to patients

Table 22: Audited deaths without use of intensive care or high dependency unit compared to national data in 2012-2018

Year	VASM	National
2012-2013	39.1% (389/995)	39.8% (1,221/3,069)
2013-2014	35.0% (382/1,091)	37.6% (1,316/3,500)
2014-2015	32.9% (409/1,242)	36.2% (1,317/3,636)
2015-2016	32.6% (417/1,281)	36.2% (1,335/3,685)
2016-2017	33.0% (396/1,201)	37.0% (1,291/3,489)
2017-2018	33.7% (300/890)	36.6% (1,004/2,741)
<b>Total</b>	<b>34.2%</b> <b>(2,293/6,700)</b>	<b>37.2%</b> <b>(7,484/20,120)</b>

Note: n=8,672 operative cases. Data not available: n=14. Audit period 1 July 2012 to 30 June 2018.  
Reformat of the question was on ICU/HDU on 2011-2012.

## 10.14 Postoperative Complications

Table 23: Audited operative deaths with postoperative complications compared to national data in 2012-2018

Year	VASM	National
2012-2013	35.8% (309/864)	33.8% (808/2,388)
2013-2014	34.8% (329/946)	36.0% (964/2,681)
2014-2015	32.3% (377/1,167)	32.9% (962/2,920)
2015-2016	34.1% (410/1,204)	33.7% (1,020/3,028)
2016-2017	33.3% (368/1,106)	31.9% (893/2,797)
2017-2018	30.3% (248/818)	31.1% (687/2,208)
<b>Total</b>	<b>33.4%</b> <b>(2,041/6,105)</b>	<b>33.3%</b> <b>(5,334/16,022)</b>

Note: n=6,105 cases had postoperative complications out of 8,672 operative cases.  
Data not available: n=56. Audit period 1 July 2012 to 30 June 2018.

## 10.15 Unplanned return to theatre

Table 24: Audited operative deaths with unplanned return to theatre compared to national data in 2012-2018

Year	VASM	National
2012-2013	15.8% (137/867)	17.1% (402/2,350)
2013-2014	14.9% (141/947)	16.1% (428/2,655)
2014-2015	14.7% (172/1,173)	16.6% (486/2,924)
2015-2016	16.0% (193/1,210)	15.6% (475/3,040)
2016-2017	15.6% (174/1,115)	15.3% (432/2,817)
2017-2018	14.8% (122/827)	14.9% (331/2,226)
<b>Total</b>	<b>15.3%</b> <b>(939/6,139)</b>	<b>16.0%</b> <b>(2,554/16,012)</b>

Note: n= 6,139 had an unplanned return to theatre patients out of 8,672 operative cases.  
Data not available: n=22. Audit period 1 July 2012 to 30 June 2017.

Table 25: Audited operative deaths with unplanned return to theatre by specialty compared to national data in 2012-2018

Specialty	VASM	National
Cardiothoracic Surgery	24.7% (192/778)	24.4% (388/1,588)
General Surgery (Inclusive of Trauma and Colorectal)	20.7% (374/1,803)	20.2% (962/4,763)
Neurosurgery	16.3% (115/707)	14.5% (265/1,832)
Obstetrics & Gynaecology	12.5% (3/24)	11.8% (8/68)
Ophthalmology	0.0% (0/4)	5.9% (1/17)
Oral/Maxillofacial	0.0% (0/1)	0.0% (0/8)
Orthopaedic Surgery	4.3% (45/1,046)	4.8% (138/2,889)
Other*	0.0% (0/0)	100.0% (1/1)
Otolaryngology Head and Neck	20.7% (12/58)	16.1% (28/174)
Paediatric Surgery	7.7% (4/52)	12.8% (16/125)
Plastic Surgery	6.8% (13/190)	8.0% (27/336)
Urology	10.0% (21/211)	10.0% (58/578)
Vascular Surgery	18.5% (85/460)	20.3% (260/1,283)
<b>Total</b>	<b>16.2%</b> <b>(864/5,334)</b>	<b>15.8%</b> <b>(2,152/13,662)</b>

Note: \*Where there are too few cases such that the identity of the patient or surgeon is compromised, the surgical specialties will not be listed, and all deaths will be aggregated under the specialty of 'other'.

## 10.16 Unplanned return to CCU

Table 26: Audited deaths with unplanned admission to CCU compared to national data in 2012-2018

Year	VASM	National
2012-2013	18.8% (185/983)	17.8% (532/2,996)
2013-2014	18.0% (194/1,078)	18.7% (635/3,396)
2014-2015	19.8% (243/1,227)	18.4% (656/3,567)
2015-2016	17.5% (222/1,268)	17.2% (625/3,638)
2016-2017	19.6% (234/1,194)	19.5% (675/3,467)
2017-2018	17.9% (158/883)	17.2% (469/2,721)
<b>Total</b>	<b>18.6%</b> <b>(1,236/6,633)</b>	<b>18.2%</b> <b>(3,592/19,785)</b>

Note: n= 6,633 patients had an unplanned admission to ICU out of 8,672 operative cases.  
Data not available: n=81. Audit period 1 July 2012 to 30 June 2018.  
CCU: critical care unit.

## 10.17 Unplanned readmission

Table 27: Audited deaths with unplanned readmission

Year	VASM	National
2012-2013	2.2% (22/983)	2.4% (73/2,989)
2013-2014	2.2% (24/1,076)	2.9% (99/3,385)
2014-2015	3.7% (45/1,221)	3.3% (117/3,554)
2015-2016	3.5% (44/1,265)	3.1% (112/3,632)
2016-2017	3.7% (44/1,189)	3.2% (110/3,452)
2017-2018	4.8% (42/880)	2.9% (80/2,717)
<b>Total</b>	<b>3.3%</b> <b>(221/6,614)</b>	<b>3.0%</b> <b>(591/19,729)</b>

Note: n= 6,614 patients had an unplanned readmission out of 8,672 operative cases.  
Data not available: n=76. Audit period 1 July 2012 to 30 June 2018.

## 10.18 Issues with fluid balance

Table 28: Audited deaths with fluid balance issues compared to national data in 2012-2018

Year	VASM	National
2012-2013	8.5% (83/981)	9.3% (279/2,988)
2013-2014	8.2% (88/1,073)	7.3% (248/3,384)
2014-2015	7.7% (94/1,227)	7.6% (272/3,560)
2015-2016	8.6% (109/1,269)	8.8% (320/3,637)
2016-2017	9.1% (109/1,193)	8.9% (307/3,463)
2017-2018	7.8% (69/887)	7.8% (212/2,726)
<b>Total</b>	<b>8.3%</b> <b>(552/6,630)</b>	<b>8.3%</b> <b>(1,638/19,758)</b>

Note: n= 6,630 patients had issues with fluid balance out of 8,672 operative cases.  
Data not available: n=84. Audit period 1 July 2012 to 30 June 2018.

## 10.19 Clinically significant infection

Table 29: Audited deaths with a clinically significant infection

Year	VASM	National
2012-2013	30.2% (286/948)	33.2% (924/2,784)
2013-2014	32.5% (345/1,062)	35.0% (1,206/3,445)
2014-2015	34.5% (422/1,223)	34.8% (1,247/3,586)
2015-2016	34.0% (430/1,266)	34.2% (1,248/3,645)
2016-2017	33.6% (398/1,186)	33.9% (1,172/3,456)
2017-2018	31.7% (279/879)	34.0% (925/2,721)
<b>Total</b>	<b>32.9%</b> <b>(2,160/6,564)</b>	<b>34.2%</b> <b>(6,722/19,637)</b>

Note: n= 6,564 out of 6,714 patients had clinically significant infection in 8,672 operative episodes.

Data not available: n=150. Audit period 1 July 2012 to 30 June 2018.

Data collection on clinically significant infections commenced in 2011-2012.

## 10.20 Trauma

Table 30: Audited deaths with causes of trauma in 2012-2018

Trauma causes	2012-2013	2013-2014	2014-2015	2015-2016	2016-2017	2017-2018	Total
Fall at home	40.2% (92/229)	42.3% (112/265)	40.7% (120/295)	33.5% (91/272)	40.6% (110/271)	42.5% (90/212)	39.8% (615/1,544)
Fall in a care facility	39.7% (91/229)	30.2% (80/265)	27.8% (82/295)	32.4% (88/272)	30.6% (83/271)	30.2% (64/212)	31.6% (488/1,544)
Fall in hospital	3.9% (9/229)	4.9% (13/265)	8.1% (24/295)	5.5% (15/272)	6.3% (17/271)	7.5% (16/212)	6.1% (94/1,544)
Fall unknown	1.3% (3/229)	2.6% (7/265)	2.4% (7/295)	2.2% (6/272)	3.0% (8/271)	2.4% (5/212)	2.3% (36/1,544)
Fall other*	5.7% (13/229)	7.2% (19/265)	7.1% (21/295)	8.1% (22/272)	4.8% (13/271)	5.7% (12/212)	6.5% (100/1,544)
Road accident	7.4% (17/229)	9.4% (25/265)	11.2% (33/295)	16.2% (44/272)	11.8% (32/271)	10.4% (22/212)	11.2% (173/1,544)
Violence	1.7% (4/229)	3.4% (9/265)	2.7% (8/295)	2.2% (6/272)	3.0% (8/271)	1.4% (3/212)	2.5% (38/1,544)

Note: n=1,611 trauma cases in 6,564 patients.

Data not available: n=110. Audit period 1 July 2012 to 30 June 2018.

\*Includes roads and public venues.

## 10.21 Trend in areas of clinical management issues

Table 31: Trend in areas of clinical management issues with *p* values

Characteristics	VASM		P value
	2012–2017	2017–2018	
			* <i>p</i> <0.05 statistically significant.
No issues identified	69.6% (4,021/5,781)	73.6% (653/887)	<b>0.015</b>
Area of consideration	17.2% (995/5,781)	14.1% (125/887)	<b>0.021</b>
Area of concern	8.4% (487/5,781)	7.1% (63/887)	0.190
Area of adverse event	4.4% (257/5,781)	5.1 (45/887)	0.39
Preventable issues	13.5% (783/5,781)	11.3% (100/887)	0.063
Adverse event or concern that was preventable	9.9% (571/5,781)	9.1% (81/887)	0.55

## 10.22 Classification of Areas of Concern and AE Clinical Management Issues

Table 32: Top 10 Classification of Areas of Concern and AE CMI in 2012-2018

Index	Classification	2012-2013	2013-2014	2014-2015	2015-2016	2016-2017	2017-2018	Total
1	Operative management issues	66	82	94	92	91	56	481
2	Delay issues	47	49	62	79	39	37	313
5	Postoperative care issues	36	40	59	46	35	40	256
3	Preoperative care issues	24	32	39	36	34	29	194
4	Protocol issues	14	26	26	28	32	20	146
8	Adverse Events	16	25	21	16	18	11	107
7	Communication or poor documentation	16	14	16	13	20	12	91
6	General complications of surgery	4	4	14	8	5	8	43
9	Anaesthetic and Critical care issues	4	13	7	6	6	5	41
10	Septicaemia and wound	1	1	5	1	6	1	15
	<b>Total</b>	<b>228</b>	<b>286</b>	<b>343</b>	<b>325</b>	<b>286</b>	<b>219</b>	<b>1687</b>

Note: AE: adverse event, CMI: clinical management issues.

Table 33: All Classification of Areas of Concern and AE CMI by ReadCode in 2012-2018

Index	ReadCode ID	ReadCodeText	2012-2013	2013-2014	2014-2015	2015-2016	2016-2017	2017-2018	Total
1	1094	Analgesia unsatisfactory	0	0	1	0	0	1	2
1	1078	Better not to have been treated endoscopically	0	0	0	0	1	0	1
1	1079	Better not to have been treated laparoscopically	0	0	0	0	1	0	1
1	1192	Better to have done different operation or procedure	28	25	30	31	22	16	152
1	1082	Better to have had more extensive surgery	1	0	1	2	0	1	5
1	1081	Better to have performed more limited surgery	2	3	5	2	4	1	17
1	1194	Decision to operate	18	40	38	45	40	30	211
1	1137	Duration of operation too long	0	2	4	0	1	0	7
1	70	ENDOSCOPIC SURGERY, ORGAN RELATED TECHNICAL	0	0	1	0	0	0	1
1	64	Failure to stop intra-operative bleed during laparotomy	1	0	0	0	0	0	1
1	1084	Inadequate drainage of peritoneal abscess/sepsis	0	0	0	2	0	0	2
1	999	Inadequate surgical assistance	1	0	1	1	0	0	3
1	413	LAPAROSCOPIC SURGERY, ORGAN RELATED	0	0	1	1	0	0	2



		TECHNICAL							
1	1114	More aggressive treatment of infection needed	1	0	0	0	0	0	1
1	215	OPEN SURGERY, ORGAN RELATED TECHNICAL	4	4	4	4	7	1	24
1	1190	Operating following recent cessation of anticoagulation	0	1	1	0	1	2	5
1	1123	Operation better deferred to daytime	2	0	0	0	1	0	3
1	1086	Operation should have been done	1	0	1	0	1	0	3
1	1088	Operation should not have been done or was unnecessary	0	1	0	0	0	0	1
1	979	Operation would have been better deferred or delay	1	0	1	0	1	0	3
1	1089	Operation would have been better delayed	1	2	1	0	0	0	4
1	1187	Other (Incorrect/inappropriate therapy)	0	1	0	0	1	0	2
1	861	Premature extubation	1	0	0	1	0	0	2
1	993	PROBLEMS WITH APPROPRIATE STAFFING	0	0	0	0	1	0	1
1	630	RADIOLOGICAL SURGERY, ORGAN RELATED TECHNICAL	0	0	0	1	1	0	2
1	1129	Suprapubic catheter removed too early	0	0	0	1	0	0	1
1	996	Surgeon too junior	4	3	4	1	4	4	20
1	1080	Wrong surgical approach used	0	0	0	0	4	0	4
2	1193	Delay in diagnosis	8	8	18	12	5	7	58
2	980	Delay in investigating the patient	1	1	2	1	1	2	8
2	967	Delay in patient presenting	0	0	1	2	0	1	4
2	969	Delay in recognising complications	6	9	2	14	8	5	44
2	975	Delay in recognising unspecified complication	0	0	0	0	0	1	1
2	988	Delay in transfer to HDU	0	0	0	2	0	0	2
2	990	Delay in transfer to HDU postoperatively	0	1	0	0	0	0	1
2	989	Delay in transfer to HDU preoperatively	0	0	0	0	1	0	1
2	957	Delay in transfer to surgeon by physicians	1	0	0	0	0	0	1
2	955	Delay in transfer to surgical unit	6	6	8	13	4	3	40

2	1184	Delay in transfer to tertiary hospital	4	6	3	4	1	4	22
2	987	Delay starting antibiotics	0	0	2	2	0	0	4
2	986	Delay starting medical treatment	1	0	3	3	2	1	10
2	959	Delay to blood transfusion	0	0	0	1	0	0	1
2	964	Delay to operation caused by missed diagnosis	4	1	0	1	0	2	8
2	985	Delay to re-operation	2	1	1	1	0	0	5
2	961	Delay to surgery (ie earlier operation desirable)	14	12	21	22	14	10	93
2	966	Delay to surgery whilst obtaining a CT scan	0	1	0	1	2	0	4
2	954	DELAYS	0	3	1	0	1	1	6
3	1168	ASSESSMENT PROBLEMS	0	0	1	0	0	1	2
3	1155	Cardiac monitoring inadequate	1	0	0	1	1	3	6
3	786	Cardiac preoperative assessment inadequate	2	1	1	1	1	1	7
3	909	CT scan not available	0	0	0	0	1	0	1
3	794	CT scan should have been done preoperatively	0	1	1	2	1	1	6
3	952	Diagnosis missed - no histology	0	0	1	0	0	0	1
3	942	Diagnosis missed - unspecified	1	2	4	3	4	1	15
3	950	Diagnosis missed by medical unit	1	0	0	2	0	0	3
3	953	Diagnosis missed by radiologist	0	1	0	1	0	1	3
3	951	Diagnosis missed by referring hospital	1	0	0	0	0	0	1
3	948	Diagnosis missed by surgeon at operation	0	0	1	0	0	1	2
3	944	Diagnosis missed by surgeons	1	1	0	0	0	2	4
3	945	Diagnosis missed on Xray	0	0	0	1	0	0	1
3	941	Diagnosis related complications	0	0	1	2	0	0	3
3	803	Failure to investigate or assess patient fully	6	6	5	3	9	3	32
3	811	Failure to recognise severity of illness	4	6	5	5	3	7	30
3	792	Inadequate preoperative vascular assessment	0	0	1	0	0	0	1
3	1113	Inappropriate treatment prior to	0	0	0	1	2	0	3

		surgical referral							
3	789	Laboratory preoperative assessment inadequate	0	0	1	0	0	0	1
3	926	Over anticoagulation before admission	0	0	0	1	0	0	1
3	1138	Patient lost to follow up from previous episode	0	0	1	0	0	0	1
3	1169	Preoperative assessment inadequate	6	10	12	11	6	4	49
3	1156	Preoperative cardiac monitoring inadequate	0	1	0	0	0	0	1
3	1020	Preoperative investigations either not seen or co	0	0	2	0	0	0	2
3	821	Preoperative nutrition poor	0	0	0	0	2	0	2
3	788	Preoperatively should have been referred to chest	0	1	0	0	0	1	2
3	810	Preoptimisation should have been used	0	0	1	0	0	2	3
3	1145	Problems during transfer	0	1	0	2	0	0	3
3	1144	Transfer problems	1	0	0	0	3	0	4
3	1148	Transfer should have occurred	0	0	0	0	1	1	2
3	1146	Transfer should not have occurred	0	1	1	0	0	0	2
4	1182	Adverse events related to treatment guidelines/pro	1	2	0	1	1	0	5
4	936	Blood/blood products complication	0	1	1	1	0	0	3
4	1092	Care unsatisfactory (not otherwise specified)	0	0	0	0	0	1	1
4	991	Delay starting DVT prophylaxis	0	1	1	0	0	0	2
4	1141	Displacement of tracheostomy tube	0	0	1	2	1	1	5
4	935	Drug interaction	0	0	1	0	0	0	1
4	963	Earlier operation desirable - no theatre available	1	0	1	2	2	0	6
4	908	Equipment not available	0	1	0	1	0	0	2
4	1132	Failure to catheterise preoperatively	0	0	0	0	1	0	1
4	1059	Failure to insert a drain	1	1	0	0	1	0	3
4	1061	Failure to treat malnutrition	0	0	0	1	1	0	2
4	1174	Failure to use a drug for treatment or	0	3	1	0	1	1	6

		prophylaxis							
4	1055	Failure to use a Specialist centre	0	0	0	0	1	0	1
4	1054	Failure to use antibiotic prophylaxis	1	1	0	0	0	1	3
4	1053	Failure to use DVT prophylaxis	2	4	4	0	2	1	13
4	1120	Hospital admission to wrong ward or specialty	0	0	0	0	0	1	1
4	1121	Inappropriate surgical admission	0	0	0	2	0	0	2
4	1128	Incorrect use of drains or catheters	0	1	0	0	3	5	9
4	1073	Incorrect/inappropriate therapy	0	0	1	3	3	1	8
4	1111	Lack of hospice beds	0	1	0	0	0	0	1
4	1067	Management error led to pressure ulcer	0	0	0	0	1	0	1
4	1133	Naso gastric tube not used	0	0	0	0	2	0	2
4	940	No blood available	0	1	0	0	0	0	1
4	1002	No interventional radiologist	1	0	1	0	0	0	2
4	1021	No protocol for DVT prophylaxis	0	1	3	1	3	1	9
4	1100	Nutritional care unsatisfactory	0	1	0	1	0	0	2
4	1116	Oral fluids commenced too soon	1	0	0	0	0	0	1
4	925	Over anticoagulation	0	1	0	0	1	1	3
4	927	Over anticoagulation during admission	0	0	1	0	0	0	1
4	931	Over sedation	0	0	0	0	1	0	1
4	1176	Overdose of narcotics	0	0	0	0	0	1	1
4	818	Patient refused treatment	0	0	0	0	2	0	2
4	817	Patient-related factors	0	2	2	2	1	0	7
4	1071	Premature discharge from hospital	0	0	1	0	1	1	3
4	814	Resuscitation inadequate	1	1	1	1	2	0	6
4	1125	Too early removal of naso gastric tube	0	0	0	2	0	0	2
4	1183	Treatment did not conform to guidelines/protocols	1	1	2	3	0	3	10
4	928	Under anticoagulation	1	0	2	1	1	0	5
4	1112	Unsatisfactory management of coagulopathy	0	0	0	2	0	0	2
4	1115	Unsatisfactory management of hypotension	1	0	2	1	0	0	4

4	924	Wrong dose of drug used	1	2	0	0	0	1	4
4	922	Wrong drug used	1	0	0	1	0	0	2
5	113	ADVERSE FACTORS IN MANAGEMENT	2	1	3	0	0	0	6
5	921	Anticoagulation causing postoperative bleeding	0	0	0	1	1	0	2
5	960	Delay in obtaining cardiac arrest team	0	0	1	0	0	0	1
5	974	Delay in recognising a bleeding complication	1	3	4	3	0	0	11
5	972	Delay in recognising a cardiac complication	1	4	0	3	2	2	12
5	971	Delay in recognising a respiratory complication	1	2	1	1	0	0	5
5	970	Delay in recognising anastomotic leak	0	1	2	1	1	0	5
5	911	Drug-related complication	1	1	3	0	3	1	9
5	815	Fluid and electrolyte resuscitation inadequate	2	0	1	1	1	0	5
5	1104	Fluid balance unsatisfactory	2	4	3	2	0	2	13
5	1106	Fluid overload	1	0	2	0	1	1	5
5	1167	Inadequate laboratory monitoring	0	0	0	1	0	0	1
5	1154	Inadequate monitoring	0	1	2	2	1	0	6
5	801	Inadequate postoperative vascular assessment	1	0	0	0	0	0	1
5	795	Inadequate postoperative assessment	5	2	2	2	1	4	16
5	796	Inadequate postoperative cardiac assessment	0	1	1	1	1	1	5
5	800	Inadequate postoperative metabolic assessment	0	0	0	1	0	0	1
5	1110	Poor terminal care management	1	0	1	0	2	1	5
5	121	Postoperative intracranial haematoma	0	0	1	0	0	0	1
5	1157	Postoperative cardiac monitoring inadequate	1	0	1	2	0	2	6
5	1093	Postoperative care unsatisfactory	5	6	2	2	6	4	25
5	1105	Postoperative fluid balance	3	0	0	1	0	1	5

		unsatisfactory							
5	1109	Postoperative fluid overload	0	0	1	1	1	0	3
5	1163	Postoperative inadequate respiratory monitoring	0	0	0	0	1	2	3
5	1101	Postoperative nutritional care unsatisfactory	0	1	0	0	0	0	1
5	912	Reaction to drugs	1	0	0	1	1	0	3
5	1091	Unsatisfactory medical management	8	13	28	20	12	19	100
6	229	Air embolism after surgery	0	1	0	0	0	0	1
6	127	Aspiration pneumonia	3	0	3	3	1	3	13
6	197	Bleeding or coagulation problems not related to op	0	0	1	0	0	0	1
6	441	Duodenal complication of laparoscopic operation	0	0	0	1	0	0	1
6	97	Duodenal complication related to endoscopic operation	0	0	0	1	0	0	1
6	895	Equipment related complication	0	0	0	0	1	0	1
6	347	Extension of ischaemia after open surgery	0	0	1	0	1	0	2
6	114	General complications of treatment	1	0	3	1	0	4	9
6	164	Heart complication	0	0	1	0	1	0	2
6	339	Heart complication of open surgery	0	0	1	0	0	0	1
6	225	Lung complication of open surgery	0	1	0	0	0	0	1
6	135	Pneumonia as a general complication of treatment	0	1	2	1	1	0	5
6	172	Renal failure	0	1	0	0	0	0	1
6	137	Upper GI complication	0	0	0	1	0	0	1
6	170	Urinary complication	0	0	1	0	0	0	1
6	342	Vascular complication of open surgery	0	0	1	0	0	0	1
6	733	Vascular complication of radiological operation	0	0	0	0	0	1	1
7	1006	Communication failures	4	3	6	6	8	2	29
7	1007	Failure of communication -	2	0	1	1	0	1	5

		unspecified							
7	1013	Failure of communication due to poor case notes	2	0	0	0	0	0	2
7	994	Failure of junior surgeon to seek advice	0	0	0	0	0	1	1
7	1014	Failure to communicate with senior staff	1	0	0	2	2	0	5
7	1197	Poor communication between nursing and surgical teams	1	2	0	0	0	0	3
7	1018	Poor communication between physician and surgeon	0	1	0	0	3	0	4
7	1012	Poor documentation	5	8	9	4	7	7	40
7	1188	Poor documentation on fluid charts	1	0	0	0	0	1	2
8	352	Accidental arterial puncture	0	0	1	1	1	0	3
8	412	Anastomotic leak after open surgery	1	0	1	1	0	0	3
8	717	Anastomotic leak from biliary tree after radiological	0	0	0	0	1	0	1
8	519	Anastomotic leak from colon after endoscopic operation	0	0	1	0	0	0	1
8	262	Anastomotic leak from duodenum following open surgery	0	0	0	0	1	0	1
8	69	Anastomotic leak related to laparoscopic operation	0	0	1	0	0	0	1
8	574	Arterial complication of endoscopic operation	0	1	0	1	0	0	2
8	343	Arterial complication of open surgery	0	1	0	0	0	0	1
8	348	Arterial occlusion related to open surgery	1	1	0	0	0	0	2
8	462	Colonic complication of laparoscopic operation	0	0	0	0	0	1	1
8	281	Colonic complication of open surgery	0	1	1	0	0	0	2
8	118	CVA due to arterial injury	0	0	1	2	0	1	4
8	558	ERCP failed	0	0	0	0	1	0	1
8	406	Failure stop intraoperative bleed during open surgery	0	0	0	0	1	0	1
8	624	Failure stop intraoperative bleed during endoscopy	0	0	0	0	0	1	1
8	200	Failure to stop intraoperative	0	0	0	0	1	0	1

		bleeding due to co							
8	212	Haemorrhage after needle biopsy	0	0	0	0	1	0	1
8	823	Injury caused by fall in hospital	3	5	0	1	4	0	13
8	496	Injury to common bile duct during laparoscopic ope	0	0	0	1	0	0	1
8	317	Injury to common bile duct during open surgery	0	1	0	0	0	0	1
8	340	Injury to heart during open surgery	0	1	0	0	0	0	1
8	76	Injury to lung during endoscopic operation	0	0	0	0	0	1	1
8	226	Injury to lung during open surgery	1	0	1	0	0	0	2
8	331	Injury to pancreas during open surgery	1	0	0	0	0	0	1
8	109	Injury to small bowel during endoscopic operation	1	0	0	0	0	0	1
8	452	Injury to small bowel during laparoscopic operation	1	0	0	1	1	1	4
8	268	Injury to small bowel during open surgery	0	0	1	0	0	0	1
8	9	Injury to spleen during laparoscopic operation	0	0	0	0	0	1	1
8	435	Injury to stomach during laparoscopic operation	1	0	0	0	0	0	1
8	367	Injury to ureter during open surgery	0	0	0	1	0	0	1
8	199	Intraoperative bleeding due to coagulopathy	0	0	0	1	0	0	1
8	63	Intraoperative bleeding during laparoscopic opera	0	1	1	0	0	1	3
8	405	Intraoperative bleeding during open surgery	0	0	0	1	1	1	3
8	623	Intraoperative bleeding related to endoscopic ope	0	0	1	0	0	0	1
8	386	Intraoperative bone fracture	0	1	1	0	0	0	2
8	140	Oesophageal perforation	0	2	0	0	0	0	2
8	282	Perforation of colon after open surgery	0	0	1	1	0	0	2
8	514	Perforation of colon during endoscopic operation	0	0	1	0	0	0	1
8	463	Perforation of colon related to laparoscopic opera	0	0	0	0	0	1	1
8	540	Perforation of gall bladder during	0	0	1	0	0	0	1



		endoscopic operation							
8	82	Perforation of oesophagus during endoscopic operation	0	1	0	0	0	0	1
8	108	Perforation of small bowel during endoscopic opera	0	0	0	0	1	0	1
8	451	Perforation of small bowel during laparoscopic ope	1	0	0	0	0	0	1
8	267	Perforation of small bowel during open surgery	0	0	0	0	1	0	1
8	403	Perioperative bleeding problems after open surgery	1	0	0	0	0	0	1
8	621	Perioperative bleeding related to endoscopic operation	0	0	1	0	0	0	1
8	65	Postoperative bleed after laparoscopic operation	0	1	0	0	0	0	1
8	407	Postoperative bleeding after open surgery	1	2	0	0	0	1	4
8	201	Postoperative bleeding due to coagulopathy	0	1	0	0	0	0	1
8	625	Postoperative bleeding related to endoscopic operation	1	0	0	1	0	1	3
8	370	Prostatic complication of open surgery	0	0	1	0	0	0	1
8	132	Pulmonary embolus	0	0	2	0	0	0	2
8	932	Respiratory depression due to drug overdosage	0	0	1	0	0	0	1
8	224	Respiratory tract complication of open surgery	0	1	0	0	0	0	1
8	205	Secondary haemorrhage	0	1	1	2	2	0	6
8	149	Small bowel complication	0	0	1	0	0	0	1
8	450	Small bowel complication of laparoscopic operation	0	0	0	1	0	0	1
8	8	Splenic complication of laparoscopic operation	0	1	0	0	0	0	1
8	1177	Unpreventable adverse events, open surgery	2	2	0	0	0	0	4
8	25	Venous bleeding, laparoscopic operation	0	0	0	0	1	0	1

9	838	Anaesthesia related	0	1	0	0	1	1	3
9	865	Aspiration complicating general anaesthetic	0	0	0	0	1	0	1
9	131	Aspiration pneumonia after anaesthetic	0	0	0	0	1	0	1
9	850	Better not to have a general anaesthetic	0	0	1	0	0	0	1
9	880	Cardiac arrhythmia complicating regional anaesthetic	0	1	0	0	0	0	1
9	869	Cardiac complication during general anaesthetic	0	0	0	1	0	0	1
9	1142	Delay in re-inserting a tracheostomy tube	0	0	0	1	0	0	1
9	1038	Failure to use HDU	1	2	2	2	1	2	10
9	1044	Failure to use HDU postoperatively	1	1	1	0	0	1	4
9	1023	Failure to use ITU	0	0	0	0	0	1	1
9	1029	Failure to use ITU, Post-operatively	0	2	0	0	0	0	2
9	1047	HDU not used postoperatively, error in management	0	1	0	0	0	0	1
9	1045	HDU not used postoperatively, HDU full	0	0	1	0	0	0	1
9	1046	HDU not used postoperatively, no HDU in hospital	0	0	0	1	0	0	1
9	872	Hypotension complicating general anaesthetic	0	0	0	1	0	0	1
9	843	Inadequate monitors available for general anaesthetic	1	0	0	0	0	0	1
9	1049	Premature discharge from HDU	0	3	0	0	1	0	4
9	1034	Premature discharge from ITU	0	1	1	0	1	0	3
9	1124	Premature discontinuation of treatment	0	0	1	0	0	0	1
9	1090	Wrong anaesthetic technique	1	1	0	0	0	0	2
10	1118	Complications of dressings	0	0	1	0	0	0	1
10	615	Deep wound dehiscence after endoscopic operation	0	0	1	0	0	0	1
10	617	Failure to heal wound after endoscopic operation	0	1	0	0	0	0	1
10	57	Failure to heal wound after laparoscopic operation	1	0	0	0	0	0	1

10	385	Infection of hip prosthesis	0	0	0	0	0	1	1
10	210	Septicaemia- cause unspecified	0	0	0	0	2	0	2
10	213	Theatre acquired infection	0	0	0	0	1	0	1
10	190	Wound dehiscence	0	0	1	0	0	0	1
10	185	Wound infection	0	0	1	1	1	0	3
10	609	Wound infection after endoscopic operation	0	0	1	0	0	0	1
10	391	Wound infection after open surgery	0	0	0	0	2	0	2
		<b>Total</b>	<b>228</b>	<b>286</b>	<b>343</b>	<b>325</b>	<b>286</b>	<b>219</b>	<b>1687</b>

Note: AE: adverse event; CMI: clinical management issues; CT: computed tomography; CVA: cerebrovascular accident; DVT: deep vein thrombosis; ERCP: endoscopic retrograde cholangiopancreatography; GI: gastrointestinal; HDU: high dependency unit; ITU: intensive treatment unit.

## 10.23 Areas of preventable clinical outcomes

Table 34: Preventable clinical outcomes at each phase of care as peer assessed in 2017-2018

Variable	VASM	National	P value
	2017–2018	2017–2018	*p<0.05 statistically significant.
<b>Adverse event or concern that was preventable and caused the outcome</b>	1.9% (17/887)	1.4% (39/2,726)	0.347
<b>Decision to operate at all</b>	0.3% (3/887)	0.4% (11/2,726)	1.000
<b>Pre-operative care</b>	1.5% (13/887)	0.7% (20/2,726)	0.065
<b>Operative Care</b>	1.0% (9/887)	0.8% (22/2,726)	0.534
<b>Post-operative care</b>	0.7% (6/887)	0.5% (13/2,726)	0.434

## 10.24 Classification of preventable clinical outcomes

Table 35: All Classification of preventable clinical outcomes as peer assessed by ReadCode in 2017-2018

Index	ReadCode ID	ReadCodeText	2012-2013	2013-2014	2014-2015	2015-2016	2016-2017	2017-2018	Total
1	1094	Analgesia unsatisfactory	0	0	1	0	0	0	1
1	921	Anticoagulation causing postoperative bleeding	0	0	0	1	1	0	2
1	1078	Better not to have been treated endoscopically	0	0	0	0	1	0	1
1	1079	Better not to have been treated laparoscopically	0	0	0	0	1	0	1
1	1192	Better to have done different operation or procedure	27	23	23	26	15	13	127
1	1082	Better to have had more extensive surgery	1	0	1	1	1	1	5
1	1081	Better to have performed more limited surgery	1	3	4	1	3	0	12
1	1194	Decision to operate	15	38	35	43	34	30	195
1	1137	Duration of operation too long	0	2	3	0	1	0	6
1	64	Failure to stop intraoperative bleed during laparotomy	1	0	0	0	0	0	1
1	1084	Inadequate drainage of peritoneal abscess/sepsis	0	0	0	1	0	0	1
1	999	Inadequate surgical assistance	0	0	1	1	0	0	2
1	413	LAPAROSCOPIC SURGERY, ORGAN RELATED TECHNICAL	0	0	1	2	0	0	3
1	215	OPEN SURGERY, ORGAN RELATED TECHNICAL	0	1	2	0	1	0	4
1	215	OPEN SURGERY, ORGAN RELATED TECHNICAL (NOS)	4	3	2	4	4	1	18
1	1190	Operating following recent cessation of anticoagulation	0	1	0	0	0	1	2
1	1123	Operation better deferred to daytime	2	0	0	0	1	0	3
1	1086	Operation should have been done	1	0	1	0	1	0	3
1	1088	Operation should not have been done or was unnecessary	0	1	0	1	0	0	2

1	979	Operation would have been better deferred or delay	0	0	1	0	1	0	2
1	1089	Operation would have been better delayed	1	2	1	0	0	0	4
1	1187	Other (Incorrect/inappropriate therapy)	0	1	0	0	1	0	2
1	861	Premature extubation	1	0	0	1	0	0	2
1	993	PROBLEMS WITH APPROPRIATE STAFFING	0	0	0	0	1	0	1
1	630	RADIOLOGICAL SURGERY, ORGAN RELATED TECHNICAL	0	0	0	1	0	0	1
1	996	Surgeon too junior	4	3	1	1	4	3	16
1	1080	Wrong surgical approach used	0	0	0	0	2	0	2
2	1193	Delay in diagnosis	8	6	15	9	5	5	48
2	980	Delay in investigating the patient	2	1	1	1	1	2	8
2	967	Delay in patient presenting	0	0	0	1	0	1	2
2	969	Delay in recognising complications	7	7	2	10	8	5	39
2	988	Delay in transfer to HDU	0	0	0	2	0	0	2
2	990	Delay in transfer to HDU postoperatively	0	1	0	0	0	0	1
2	989	Delay in transfer to HDU preoperatively	0	0	0	0	1	0	1
2	957	Delay in transfer to surgeon by physicians	1	0	0	0	0	0	1
2	955	Delay in transfer to surgical unit	6	4	5	11	4	2	32
2	1184	Delay in transfer to tertiary hospital	3	5	2	4	1	4	19
2	987	Delay starting antibiotics	0	0	2	2	0	0	4
2	986	Delay starting medical treatment	2	0	1	2	2	0	7
2	959	Delay to blood transfusion	0	0	0	1	0	0	1
2	964	Delay to operation caused by missed diagnosis	4	1	0	1	0	2	8
2	985	Delay to re-operation	2	0	1	1	0	0	4
2	961	Delay to surgery (i.e. earlier operation desirable)	14	12	17	21	15	7	86
2	966	Delay to surgery whilst obtaining a CT scan	0	1	0	1	2	0	4
2	954	DELAYS	0	3	1	0	0	1	5
3	1168	ASSESSMENT PROBLEMS	0	0	1	0	0	1	2
3	1155	Cardiac monitoring inadequate	1	0	0	1	0	3	5
3	786	Cardiac preoperative assessment inadequate	1	2	1	1	1	1	7
3	909	CT scan not available	0	0	0	0	1	0	1
3	794	CT scan should have been done preoperatively	0	0	1	2	1	1	5
3	952	Diagnosis missed - no histology	0	0	1	0	0	0	1
3	942	Diagnosis missed - unspecified	1	0	4	3	2	1	11
3	950	Diagnosis missed by medical unit	1	0	0	2	0	0	3
3	953	Diagnosis missed by radiologist	0	1	0	1	0	1	3
3	951	Diagnosis missed by referring hospital	1	0	0	0	0	0	1
3	948	Diagnosis missed by surgeon at operation	0	0	0	0	0	1	1
3	944	Diagnosis missed by surgeons	1	1	0	0	0	2	4

3	945	Diagnosis missed on xray	0	0	0	1	0	0	1
3	941	DIAGNOSIS RELATED COMPLICATIONS	0	0	0	2	0	0	2
3	803	Failure to investigate or assess patient fully	8	6	5	3	8	3	33
3	811	Failure to recognise severity of illness	5	6	4	5	3	5	28
3	792	Inadequate preoperative vascular assessment	0	0	1	0	0	0	1
3	1113	Inappropriate treatment prior to surgical referral	0	0	0	1	2	0	3
3	789	Laboratory preoperative assessment inadequate	0	0	1	0	0	0	1
3	1138	Patient lost to follow up from previous episode	0	0	1	0	0	0	1
3	1169	Preoperative assessment inadequate	6	10	10	10	5	6	47
3	1156	Preoperative cardiac monitoring inadequate	0	1	0	0	0	0	1
3	1020	Preoperative investigations either not seen or co	0	0	2	0	0	0	2
3	821	Preoperative nutrition poor	0	0	0	0	2	0	2
3	788	Preoperatively should have been referred to chest	0	1	0	0	0	1	2
3	810	Preoptimisation should have been used	0	0	1	0	0	2	3
3	1145	Problems during transfer	0	1	0	2	0	0	3
3	1144	TRANSFER PROBLEMS	1	0	0	0	2	0	3
3	1148	Transfer should have occurred	0	0	0	0	1	1	2
3	1146	Transfer should not have occurred	0	1	0	0	0	0	1
4	1182	Adverse events related to treatment guidelines/pro	1	2	0	1	1	0	5
4	936	BLOOD/BLOOD PRODUCTS COMPLICATION	0	1	1	2	0	0	4
4	1092	Care unsatisfactory (not otherwise specified)	0	0	0	0	0	1	1
4	991	Delay starting DVT prophylaxis	0	1	1	0	0	0	2
4	1141	Displacement of tracheostomy tube	0	0	1	2	1	1	5
4	935	Drug interaction	0	0	1	0	0	0	1
4	963	Earlier operation desirable - no theatre available	1	0	1	2	2	0	6
4	908	Equipment not available	0	1	0	0	0	0	1
4	1132	Failure to catheterise preoperatively	0	0	0	0	1	0	1
4	1059	Failure to insert a drain	1	1	0	0	1	0	3
4	1061	Failure to treat malnutrition	0	0	0	1	1	0	2
4	1174	Failure to use a drug for treatment or prophylaxis	0	3	1	0	1	1	6
4	1055	Failure to use a Specialist centre	0	0	0	0	1	0	1
4	1054	Failure to use antibiotic prophylaxis	1	1	0	0	0	1	3
4	1053	Failure to use DVT prophylaxis	1	3	4	0	2	0	10
4	1120	Hospital admission to wrong ward or specialty	0	0	0	0	0	1	1
4	1121	Inappropriate surgical admission	0	0	0	2	0	0	2
4	1128	Incorrect use of drains or catheters	0	0	0	0	3	4	7

4	1073	INCORRECT/INAPPROPRIATE THERAPY	0	0	1	2	3	1	7
4	1111	Lack of hospice beds	0	1	0	0	0	0	1
4	1133	Naso gastric tube not used	0	0	0	0	2	0	2
4	940	No blood available	0	1	0	0	0	0	1
4	1002	No interventional radiologist	1	0	1	0	0	0	2
4	1021	No protocol for DVT prophylaxis	0	1	2	1	3	1	8
4	1100	Nutritional care unsatisfactory	0	1	0	1	0	0	2
4	1116	Oral fluids commenced too soon	1	0	0	0	0	0	1
4	925	Over anticoagulation	0	2	0	0	1	1	4
4	927	Over anticoagulation during admission	0	0	1	0	0	0	1
4	818	Patient refused treatment	0	0	0	0	1	0	1
4	817	PATIENT-RELATED FACTORS	1	1	2	1	2	0	7
4	1071	Premature discharge from hospital	0	0	1	0	1	1	3
4	814	Resuscitation inadequate	1	1	1	1	2	0	6
4	1125	Too early removal of naso gastric tube	0	0	0	2	0	0	2
4	1183	Treatment did not conform to guidelines/protocols	1	0	2	2	0	2	7
4	928	Under anticoagulation	1	0	2	1	1	0	5
4	1112	Unsatisfactory management of coagulopathy	0	0	0	2	0	0	2
4	1115	Unsatisfactory management of hypotension	1	0	1	1	0	0	3
4	924	Wrong dose of drug used	1	2	0	0	0	0	3
4	922	Wrong drug used	1	0	0	0	0	0	1
4	915	Anaphylactic shock related to drug treatment	0	0	0	0	1	0	1
5	113	ADVERSE FACTORS IN MANAGEMENT	2	0	3	0	2	0	7
5	960	Delay in obtaining cardiac arrest team	0	0	1	0	0	0	1
5	974	Delay in recognising a bleeding complication	1	3	4	3	0	0	11
5	972	Delay in recognising a cardiac complication	1	3	0	3	2	2	11
5	971	Delay in recognising a respiratory complication	1	2	0	1	0	0	4
5	970	Delay in recognising anastomotic leak	0	0	2	1	1	0	4
5	911	DRUG-RELATED COMPLICATION	1	1	2	0	2	1	7
5	815	Fluid and electrolyte resuscitation inadequate	2	0	0	1	1	0	4
5	1104	Fluid balance unsatisfactory	2	4	3	2	0	2	13
5	1106	Fluid overload	1	0	2	0	0	1	4
5	1167	Inadequate laboratory monitoring	0	0	0	1	0	0	1
5	1154	Inadequate monitoring	0	0	2	0	0	0	2
5	1154	Inadequate monitoring (NOS)	0	1	1	2	1	0	5
5	801	Inadequate postoperative vascular assessment	1	0	0	0	0	0	1
5	795	Inadequate postoperative assessment	5	2	2	2	0	3	14

5	796	Inadequate postoperative cardiac assessment	0	1	1	1	0	1	4
5	800	Inadequate postoperative metabolic assessment	0	0	0	1	0	0	1
5	1110	Poor terminal care management	1	0	1	0	1	1	4
5	121	Postoperative intracranial haematoma	0	0	1	0	0	0	1
5	1157	Postoperative cardiac monitoring inadequate	1	0	1	2	0	2	6
5	1093	Postoperative care unsatisfactory	4	5	2	2	4	3	20
5	1105	Postoperative fluid balance unsatisfactory	3	0	0	0	0	0	3
5	1109	Postoperative fluid overload	0	0	1	1	1	0	3
5	1163	Postoperative inadequate respiratory monitoring	0	0	0	0	1	1	2
5	1101	Postoperative nutritional care unsatisfactory	0	1	0	0	0	0	1
5	912	Reaction to drugs	1	0	0	1	1	0	3
5	1091	Unsatisfactory medical management	9	12	24	15	12	17	89
6	229	Air embolism after surgery	0	1	0	0	0	0	1
6	127	Aspiration pneumonia	2	0	1	3	1	3	10
6	197	Bleeding or coagulation problems not related to op	0	0	1	0	0	0	1
6	441	Duodenal complication of laparoscopic operation	0	0	0	1	0	0	1
6	97	Duodenal complication related to endoscopic operation	0	0	0	1	0	0	1
6	895	EQUIPMENT RELATED COMPLICATION	0	0	0	0	1	0	1
6	347	Extension of ischaemia after open surgery	0	0	1	0	0	0	1
6	114	GENERAL COMPLICATIONS OF TREATMENT	1	0	2	1	0	2	6
6	164	Heart complication	0	0	1	0	1	0	2
6	339	Heart complication of open surgery	0	0	1	0	0	0	1
6	225	Lung complication of open surgery	0	1	0	0	0	0	1
6	135	Pneumonia as a general complication of treatment	0	0	1	0	1	0	2
6	172	Renal failure	0	1	0	0	0	0	1
6	137	Upper GI complication	0	0	0	1	0	0	1
6	170	Urinary complication	0	0	1	0	0	0	1
6	342	Vascular complication of open surgery	0	0	1	0	1	0	2
7	1006	COMMUNICATION FAILURES	4	3	4	6	7	2	26
7	1007	Failure of communication - unspecified	2	0	1	1	0	1	5
7	1013	Failure of communication due to poor case notes	2	0	0	0	0	0	2
7	994	Failure of junior surgeon to seek advice	0	0	0	1	0	1	2
7	1014	Failure to communicate with senior staff	1	0	0	1	2	0	4
7	1197	Poor communication between nursing and surgical teams	1	2	0	0	0	0	3
7	1018	Poor communication between physician and surgeon	0	1	0	0	2	0	3



7	1012	Poor documentation	4	10	9	3	8	4	38
7	1188	Poor documentation on fluid charts	1	0	0	0	0	1	2
8	352	Accidental arterial puncture	0	0	1	0	1	0	2
8	412	Anastomotic leak after open surgery	1	0	0	1	0	0	2
8	574	Arterial complication of endoscopic operation	0	1	0	1	0	0	2
8	343	Arterial complication of open surgery	0	1	0	0	0	0	1
8	348	Arterial occlusion related to open surgery	1	0	0	0	0	0	1
8	462	Colonic complication of laparoscopic operation	0	0	0	0	0	1	1
8	281	Colonic complication of open surgery	0	1	1	0	0	0	2
8	118	CVA due to arterial injury	0	0	1	1	0	1	3
8	558	ERCP failed	0	0	0	0	1	0	1
8	200	Failure to stop intra-operative bleeding due to co	0	0	0	0	1	0	1
8	212	Haemorrhage after needle biopsy	0	0	0	0	1	0	1
8	823	Injury caused by fall in hospital	3	5	0	1	4	0	13
8	317	Injury to common bile duct during open surgery	0	1	0	0	0	0	1
8	340	Injury to heart during open surgery	0	1	0	0	0	0	1
8	226	Injury to lung during open surgery	1	0	1	0	0	0	2
8	331	Injury to pancreas during open surgery	1	0	0	0	0	0	1
8	109	Injury to small bowel during endoscopic operation	1	0	0	0	0	0	1
8	452	Injury to small bowel during laparoscopic operation	1	0	0	1	1	1	4
8	268	Injury to small bowel during open surgery	0	0	1	0	0	0	1
8	9	Injury to spleen during laparoscopic operation	0	0	0	0	0	1	1
8	435	Injury to stomach during laparoscopic operation	1	0	0	0	0	0	1
8	367	Injury to ureter during open surgery	0	0	0	1	0	0	1
8	199	Intraoperative bleeding due to coagulopathy	0	0	0	1	0	0	1
8	63	Intraoperative bleeding during laparoscopic opera	0	1	1	0	0	1	3
8	405	Intraoperative bleeding during open surgery	0	1	0	1	0	0	2
8	386	Intraoperative bone fracture	0	1	1	0	0	0	2
8	140	Oesophageal perforation	0	1	0	0	0	0	1
8	282	Perforation of colon after open surgery	0	0	1	1	0	0	2
8	514	Perforation of colon during endoscopic operation	0	0	1	0	0	0	1
8	463	Perforation of colon related to laparoscopic opera	0	0	0	0	0	1	1
8	540	Perforation of gall bladder during endoscopic operation	0	0	1	0	0	0	1
8	82	Perforation of oesophagus during endoscopic operation	0	1	0	0	0	0	1
8	451	Perforation of small bowel during laparoscopic ope	1	0	0	0	0	0	1

8	403	Perioperative bleeding problems after open surgery	1	0	0	0	0	0	1
8	621	Perioperative bleeding related to endoscopic operation	0	0	1	0	0	0	1
8	65	Postoperative bleed after laparoscopic operation	0	1	0	0	0	0	1
8	407	Postoperative bleeding after open surgery	1	2	0	0	0	1	4
8	625	Postoperative bleeding related to endoscopic operation	0	0	0	1	0	0	1
8	370	Prostatic complication of open surgery	0	0	1	0	0	0	1
8	132	Pulmonary embolus	0	0	2	0	0	0	2
8	932	Respiratory depression due to drug overdosage	0	0	1	0	0	0	1
8	224	Respiratory tract complication of open surgery	0	1	0	0	0	0	1
8	205	Secondary haemorrhage	0	0	1	2	2	0	5
8	149	Small bowel complication	0	0	1	0	0	0	1
8	8	Splenic complication of laparoscopic operation	0	1	0	0	0	0	1
8	1177	Unpreventable adverse events, open surgery	2	2	0	0	0	0	4
8	25	Venous bleeding, laparoscopic operation	0	0	0	0	1	0	1
9	838	ANAESTHESIA RELATED	0	0	0	0	0	1	1
9	865	Aspiration complicating general anaesthetic	0	0	0	0	1	0	1
9	131	Aspiration pneumonia after anaesthetic	0	0	0	0	1	0	1
9	880	Cardiac arrhythmia complicating regional anaesthetic	0	1	0	0	0	0	1
9	869	Cardiac complication during general anaesthetic	0	0	0	1	0	0	1
9	1142	Delay in re-inserting a tracheostomy tube	0	0	0	1	0	0	1
9	1038	Failure to use HDU	1	1	2	2	1	2	9
9	1044	Failure to use HDU postoperatively	0	1	1	0	0	1	3
9	1023	Failure to use ITU	0	0	0	0	0	1	1
9	1029	Failure to use ITU, Post-operatively	0	2	0	0	0	0	2
9	1047	HDU not used postoperatively, error in management	0	1	0	0	0	0	1
9	1045	HDU not used postoperatively, HDU full	0	0	1	0	0	0	1
9	1046	HDU not used postoperatively, no HDU in hospital	0	0	0	1	0	0	1
9	872	Hypotension complicating general anaesthetic	0	0	0	1	0	0	1
9	843	Inadequate monitors available for general anaesthesia	1	0	0	0	0	0	1
9	1049	Premature discharge from HDU	0	3	0	0	1	1	5
9	1034	Premature discharge from ITU	0	1	1	0	1	0	3
9	1124	Premature discontinuation of treatment	1	0	1	0	0	0	2
9	1090	Wrong anaesthetic technique	1	1	0	0	0	0	2
10	1118	Complications of dressings	0	0	1	0	0	0	1
10	617	Failure to heal wound after	0	1	0	0	0	0	1

		endoscopic operation							
10	57	Failure to heal wound after laparoscopic operation	1	0	0	0	0	0	1
10	210	Septicaemia- cause unspecified	0	0	0	0	2	0	2
10	190	Wound dehiscence	0	0	1	0	0	0	1
10	185	Wound infection	0	0	0	1	2	0	3
10	391	Wound infection after open surgery	0	0	0	0	2	0	2
		<b>Total</b>	<b>221</b>	<b>260</b>	<b>283</b>	<b>286</b>	<b>247</b>	<b>183</b>	<b>1480</b>

Note: DVT: deep vein thrombosis; ERCP: endoscopic retrograde cholangiopancreatography; GI: gastrointestinal; HDU: high dependency unit; ITU: intensive treatment unit.

## 11. References

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## Contact details

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

**Web:** [www.surgeons.org/vasm](http://www.surgeons.org/vasm)

**Email:** [vasm@surgeons.org](mailto:vasm@surgeons.org)

**Telephone:** + 61 3 9249 1153

**Facsimile:** + 61 3 9249 1130

## Postal address:

Victorian Audit of Surgical Mortality (VASM)  
GPO Box 2821  
Melbourne VIC 3001 Australia

ROYAL AUSTRALASIAN  
COLLEGE OF SURGEONS

