



2010

ANNUAL REPORT





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

Email: 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



CONTENTS

Contact details	2
Contents	3
Figures	4
Tables	7
Chairman's report	8
Abbreviations	10
Executive summary	11
Recommendations	13
1. Introduction	14
1.1 Background	14
1.2 Objectives	14
1.3 Performance review	14
1.4 Structure and governance	14
1.5 Data management and statistical analysis	15
2. Audit results	17
2.1 Audit numbers	17
2.2 Audit participation rates	18
2.3 Demographic profile of audited cases	24
2.4 Risk profile and cause of death in audited cases	30
2.5 Risk management strategies	38
2.6 Causes of death reported in audited cases	45
2.7 Establishing the cause of death	46
2.8 Profile of operative procedures	47
2.9 Postoperative complications	55
2.10 Anaesthetic problems	58
2.11 Delay in diagnosis	59
3. Peer-review outcomes	61
3.1 Second-line assessments	61
3.2 Clinical management issues	64
4. Data management and data quality	73
4.1 First and second-line assessment validation studies	73
5. Establishment of external evaluation	74
6. VASM performance review	75
References	77
Acknowledgments	79



FIGURES

Figure 1: Victorian Audit of Surgical Mortality (VASM) project governance structure	15
Figure 2: Synopsis of audit numbers over sequential audit periods	17
Figure 3: Surgeon agreement to participate as percentage of eligible College Fellows in Victoria	18
Figure 4: Surgeon agreement to participate by surgical specialty	19
Figure 5: Case record form return rate	19
Figure 6: Case record form return rate by surgical specialty	20
Figure 7: Case record form return rate by hospital	20
Figure 8: Hospital origin of cases that could not be reviewed due to non participation by treating surgeon	21
Figure 9: Specialty origin of cases that could not be reviewed due to non participation by treating surgeon	21
Figure 10: Seniority of surgeons completing the case record form	22
Figure 11: Hospitals participating in the audit	22
Figure 12: Comparison of mortalities reported by VAED compared to hospitals	23
Figure 13: Gender and age distribution of deceased as notified	24
Figure 14: Age distribution of deceased by hospital	25
Figure 15: Age distribution of deceased by admission status	26
Figure 16: Age distribution of deceased by region	26
Figure 17: Age and gender of deceased by local government area	27
Figure 18: Urgency status of deceased over sequential audit periods	28
Figure 19: Urgency status of deceased by hospital	28
Figure 20: Urgency status of deceased by surgical specialty	29
Figure 21: Urgency status of deceased by region	29
Figure 22: ASA grades of deceased over sequential audit periods	30
Figure 23: ASA grades of deceased by hospital	31
Figure 24: ASA grades of deceased by surgical specialty	31
Figure 25: ASA grades of deceased by region	32
Figure 26: ASA grades of deceased by urgency status	32
Figure 27: Frequency of comorbidities reported over sequential audit periods	33
Figure 28: Prevalence of individual comorbidities over sequential audit periods	33
Figure 29: Frequency of multiple comorbidities in individual patients over sequential audit periods	34
Figure 30: Frequency of comorbidities reported by hospitals	34
Figure 31: Surgeon's perception of risk of death over sequential audit periods	35
Figure 32: Surgeon's perception of risk of death by surgical specialty	36
Figure 33: Surgeon's perception of risk of death by admission status	36
Figure 34: Surgeon's perception of risk of death by region	37
Figure 35: Surgeon's perception of risk of death by hospital	37
Figure 36: VTE prophylaxis use during the audit period	38



Figure 37: Type of VTE prophylaxis used	38
Figure 38: VTE prophylaxis use by region	39
Figure 39: Type of VTE prophylaxis used by region	39
Figure 40: Reasons given (by treating surgeon) for not providing VTE prophylaxis	40
Figure 41: Assessor perception of appropriateness of decision to withhold VTE prophylaxis	40
Figure 42: Provision of critical care support during the audit period	41
Figure 43: Provision of critical care support by admission type	41
Figure 44: Provision of critical care support by hospital	42
Figure 45: Provision of critical care support by region	42
Figure 46: Provision of critical care support to patients by specialty	43
Figure 47: Surgeon and assessor perception of appropriateness where critical care support provided	43
Figure 48: Perception of fluid balance appropriateness	44
Figure 49: Frequency of reported causes of death	45
Figure 50: Postmortem utilisation by urgency status	46
Figure 51: Operative procedures performed	47
Figure 52: Operative intervention by urgency type	47
Figure 53: Operative intervention by region	48
Figure 54: Frequency of individual surgical procedures reported (if $n \geq 10$)	48
Figure 55: Frequency of operative intervention by hospital	49
Figure 56: Operative procedures by urgency type	49
Figure 57: Frequency of multiple operative procedures by region	49
Figure 58: Seniority of surgeons deciding on and performing surgery	50
Figure 59: Timing of operative procedures in emergency admissions	50
Figure 60: Unplanned return to operating room	51
Figure 61: Seniority of surgeons performing surgery at unplanned return to operating room	51
Figure 62: Seniority of surgeons performing unplanned procedures	52
Figure 63: Unplanned return to the operating room by urgency status	52
Figure 64: Unplanned return to the operating room by hospital	53
Figure 65: Unplanned return to the operating room by surgical specialty	53
Figure 66: Unplanned return to the operating room by region	53
Figure 67: Seniority of surgeons performing unplanned procedures by area	54
Figure 68: Postoperative complications recorded by treating surgeon	55
Figure 69: Frequency of specific postoperative complications by urgency status	55
Figure 70: Postoperative complications by specialty	56
Figure 71: Postoperative complications by region	56
Figure 72: Postoperative complications by urgency status	57
Figure 73: Postoperative complications by hospital	57
Figure 74: Anaesthetic delays	58



Figure 75: Perceived delays in establishing a diagnosis	59
Figure 76: Patients requiring transfer to another hospital	59
Figure 77: Care of patient during transfer to another hospital	60
Figure 78: Referral for second-line assessment	61
Figure 79: Reason for referral for second-line assessment	62
Figure 80: Frequency of need for second-line assessment in individual hospitals	62
Figure 81: Frequency of need for second-line assessment by admission type	63
Figure 82: Frequency of need for second-line assessment in surgical specialties	63
Figure 83: Clinical management issues as perceived by assessors	64
Figure 84: Spectrum of clinical management issues during the audit period	65
Figure 85: Spectrum of clinical management issues by specialty	65
Figure 86: Spectrum of clinical management issues by region	66
Figure 87: Frequency of clinical management issues by urgency type for areas of concern and adverse event group	66
Figure 88: Adverse events (AE) and areas of concern by operative status	67
Figure 89: Adverse events (AE) and areas of concern by hospital during the audit period	67
Figure 90: Adverse events (AE) and areas of concern by surgical specialty	68
Figure 91: Attribution of responsibility for clinical management issues	68
Figure 92: Frequency of specific clinical issues of management	69
Figure 93: Clinical incidents outcomes	70
Figure 94: Adequacy of information provided by hospital case record	70
Figure 95: Limitations of the audit due to missing data	73
Figure 96: Victorian Audit of Surgical Mortality (VASM) audit process	76



TABLES

Table 1: Assigning severity to clinical incidents	72
Table 2: Clinical incidents	72
Table 3: Project schedule and delivery status	75



CHAIRMAN'S REPORT

The death of a patient can be a learning experience.

The end of a calendar year encourages many to both look back and also towards what may lie ahead. The Victorian Audit of Surgical Mortality (VASM) can look back on three years of activity and, with the ongoing support of the Victorian Government and its Department of Health, it can look forward to at least a further three years. This support has been augmented to permit recruitment of the private health sector to participate in VASM and to provide some remuneration to our second-line assessors who put in many hours of work reviewing cases.

In 2010 the Australian and New Zealand Audits of Surgical Mortality (ANZASM) did become 'national' and plans commenced for a bi-national expansion in 2011. The commencement of the Australian Capital Territory and the Northern Territory means all states and territories are now participating. New Zealand is still looking at an audit model that best suits their needs. We hope it will be compatible with Australia. ANZASM published the first 'national' report in 2010. This featured the dataset results from participating States during the course of 2009. The 2011 national report will include data from the territories and is anticipated to be produced during the middle of 2011.

Over the past three years VASM has successfully recruited all eligible Victorian public hospitals providing surgical services and has already gained promising support from our foray into the private hospital sector.

The positive recruitment story would have less meaning if not accompanied by a rise in participation by surgeons. Such participation is now at 89.0% and is still rising slowly. In 2010, for the first time, the College has required participation as an essential component of recertification for Continuing Professional Development (CPD). Whatever the reason, I thank all participating hospitals and surgeons for the ongoing support. Perhaps we need to define 'participation' however? As you will see in the last section of this report, missing data is an issue that continues to hinder our progress and ability to identify trends. We have

reviewed the frequency with which individual questions are not completed and have listed these. The question which resulted in the most incomplete answers has already been reformatted to make it user friendly. We would really like to see this trend in missing data reversed!

This annual report contains clinical information on some 1,886 deaths associated with surgical care and the outcomes of the peer-review process in 1,113 of these. Although the information presented in this report is still a relative snapshot of surgical deaths in Victoria, some trend data is emerging. Significant among these is an increase in the direct involvement of consultant surgeons in cases where there is need for an unplanned return to the operating room, usually occasioned by a complication of the initial surgery.

We must pay attention to clinical issues that have been raised in the course of the audit. The issue raised with the greatest frequency is delay in delivery of definitive care to patients. This is a multifaceted issue, echoed by other states, with delays occurring at a number of levels in the patient journey. The factor that seems to underpin the delay issue is 'delay in establishing the true diagnosis'. Causes suggested are patients presenting with problems outside the comfort zone of one specialty having an inappropriate diagnosis entertained for too long. This is an important issue where there is increasing specialised and fragmented care. In some instances, there still seems to be a relative failure to recognise early clinical deterioration.

Those responsible for delivery of care are encouraged to review relevant practices in their institutions.

We recently published our second 'Case Note Review Booklet' and hope the themes presented resonated with many of you. Some of these themes emerge in this annual report, in particular 'delays in implementing definitive treatment'. We feel the themes in the case note review booklet are of interest to a wide range of healthcare workers. The initial booklet required a second print run to ensure we could expand the readership to junior medical staff, nursing staff and others involved in patient care.



As a part of the ongoing support provided by the Victorian Department of Health we are required to undergo periodic external evaluation. To this end we have appointed a group of external consultants with considerable experience in the area of health care. We look forward to their report and the opportunities this might present. As this is the first major review of any of the audits of surgical mortality, emerging opportunities will be shared.

Our management committee has been very supportive and continues to provide good advice and constructive ideas. VASM continues to work closely with the Victorian Surgical Consultative Council (VSCC) to monitor, analyse and report trends associated with potentially preventable surgical mortality. We would

also like to acknowledge the cooperation of the quality and health information management departments in all participating hospitals. It is important to note that the VASM staff make all this possible. Their attention to detail and adherence to protocol is the solid foundation on which the audit is built. With their help, and the support we receive from many others, I can only remain confident about the future.

Colin Russell
VASM Chairman



ABBREVIATIONS

AAA	Abdominal Aortic Aneurysm
AE	Adverse Event
ANZASM	Australian and New Zealand Audit of Surgical Mortality
ASA	American Society of Anaesthesiologists
AST	Advanced Surgical Trainee
CHASM	Collaborating Hospital's Audit of Surgical Mortality
CPD	Continuing Professional Development
CRF	Surgical Case Record Form
DH	Victorian Department of Health
DRG	Disease Related Groups
ENT	Ear, Nose and Throat
FLA	First-Line Assessment
GIS	Geographic Information Systems
GP	General Practitioner
ICU	Intensive Care Unit
IQR	Interquartile Range
IVC	Inferior Vena Cava
LGA	Local Government Area
NSTEMI	Non-ST Segment Elevation Myocardial Infarction
QASM	Queensland Audit of Surgical Mortality
RAAS	Research, Audit and Academic Surgery
RACS	Royal Australasian College of Surgeons
SAAPM	South Australian Audit of Peri-operative Mortality
SASM	Scottish Audit of Surgical Mortality
SD	Standard Deviation
SLA	Second-Line Assessment
SQL	Structured Query Language
SSL	Secure Sockets Layer
TASM	Tasmanian Audit of Surgical Mortality
TED	Thrombo Embolic Deterrent
VAED	Victorian Admitted Episodes Dataset
VASM	Victorian Audit of Surgical Mortality
VSCC	Victorian Surgical Consultative Council
VTE	Venous Thromboembolism Prophylaxis
WAASM	Western Australian Audit of Surgical Mortality



EXECUTIVE SUMMARY

Audit participation

In 2010, the Audits of Surgical Mortality (ASM) were extended to all states and territories in Australia. The Royal Australasian College of Surgeons also determined in 2010 that participation in the Australian and New Zealand Audit of Surgical Mortality (ANZASM) should be a required component of recertification in the Continuing Professional Development Program (CPD). This places a greater onus on Fellows of the College to participate in their State audit of surgical mortality. Participation in VASM by Victorian Fellows has risen to 89.0% since its commencement in January 2008. This increase in intention to participate is matched by evidence of actual participation. The return of case record forms, necessary for the audit to function, has risen to 79.0%. However, compliance in completing all necessary fields in the various forms can still improve. In the majority of instances, the clinical information provided in these forms was provided by the treating consultant and not by junior medical staff. This is further acknowledgement of the level of surgeon participation.

All public hospitals with relevant surgical activity are also now participating by providing notifications of death associated with surgery. It is acknowledged that the majority of hospital deaths occur in the public sector. This is not a reflection on the level of care provided in the public sector, but is a result of the less complex case-mix generally receiving care in the private hospital sector. This is very much the case when compared with the national data set. It is important, however, to review deaths that occur in the private sector, and to this purpose our funding has been increased and we are currently encouraging Victorian private hospitals to join the audit process. At the time of writing this report in 2011 a total of 24 (43.0%) of 56 eligible private hospitals have agreed to participate.

The number of patients in whom death has been attributed to surgery is 2,551 over the 2.5 year period covered by this audit. In one single year, financial year 2009/10, some 352,677 patients underwent surgical procedures in the Victorian public sector. The number of deaths (2,551) attributed to surgery over a 2.5 year period is therefore a very small percentage of the number of patients who actually underwent surgery over the same period.

Demographic and risk profile

The Victorian Audit of Surgical Mortality (VASM) commenced auditing surgical mortality in Victorian public hospitals in January 2008. This report represents data collected to the end of June 2010. The many

rate-limiting steps in the audit process mean we have only completed the audit process in half of these cases. Review of the demographic and risk profiles of all cases that had completed the audit process (n=1,113) confirms the trends described in previous reports. The majority of surgical deaths have occurred in elderly patients with underlying health problems, admitted as an emergency with an acute life-threatening condition often requiring surgery. The actual cause of death was often linked to their pre-existing health status in that the cause of death frequently mirrored the pre-existing illness. Death was most often adjudged to be not preventable and to be a direct result of the disease processes involved, not the treatment provided. The most common causes of death reported are cardiac and respiratory failure. This is congruent with the most common comorbidities in this series of patients.

Risk management

Risk management strategies for this generally elderly, sicker group of patients are especially important. The audit looks at three parameters: VTE prophylaxis to reduce the likelihood of pulmonary embolus, use of critical care facilities and fluid balance management.

- **VTE prophylaxis:** Prophylaxis was provided in over two thirds of audited deaths. A conscious decision to withhold prophylaxis was the reason given for non-provision in the other one third. This was generally necessitated by some clinical contraindication to prophylaxis. Inadvertent omission of prophylaxis was rare, only occurring in 1.7% of cases.

When the appropriateness of withholding prophylaxis was reviewed, there was generally agreement by assessors that the decision was correct. However, in 5.0% of cases where it was withheld, assessors felt the decision was questionable, although the decision did not affect the final outcome.

- **Use of critical care facilities:** Close to half of the patients in this audited series received critical care support during the course of their hospital stay. This appears constant over the time period. The review process looks at the deaths where patients did not receive such support. Assessors felt critical care support might have benefited a higher percentage of patients. Second-line assessors were more likely to raise this criticism and did so in 19.0% of cases that did not receive critical care.



The reasons why support was not provided are a recent addition to the clinical information gathered and data is not yet available for analysis.

- **Fluid balance during treatment:** There was a perception that this may have been an issue of management in only 2.6% of cases reviewed.

Operative profile

In a small percentage of patients (12.9%, 144 patients) no operative intervention occurred. This was the result of an active decision not to proceed and usually occurred in patients admitted as an emergency for an irretrievable clinical problem. A total of 1,453 separate episodes of surgery occurred in 900 patients. In these surgical episodes, 1,752 operative procedures were recorded. The most frequent operative procedures described were for trauma or acute abdominal pathology. This reflects the high percentage of patients admitted as emergencies in this series. A consultant performed the surgery in 54.0% of instances and made the decision to proceed to surgery in 60.0%.

There was an unplanned return to the operating room in 132 (14.7%) of the 900 patients who underwent a surgical procedure. Unexpectedly the rate of unplanned return to the operating room was significantly higher in patients admitted electively. This has occurred despite a higher percentage of elective cases being operated on by a consultant surgeon. There is no obvious explanation for this trend. This will be monitored over time.

Unplanned return to the operating room is often, but not always, necessitated by a complication of the initial procedure and is associated with increased risk of death. Consultant involvement in such cases is highly desirable. Direct consultant involvement in such cases has risen from around 30.0% in 2007/08 to 80.0% in 2009/10. This recognition of the need for direct consultant involvement is to be commended.

The demand for time in the operating room to manage emergency cases remains a significant problem for hospitals. The issue is well recognised in this and other countries. The Victorian Department of Health has made a significant contribution to the issue in the form of a position paper on good practice in managing emergency surgery.

There continues to be a low rate of postoperative complications as reported by treating surgeons.

Inter-hospital transfers

Twenty-two per cent of cases in the audited series required inter-hospital transfer. Such transfers are usually necessitated by the need for higher levels of care. Issues of patient care related to transfer were raised in a third of these cases. The most common criticism was that transfer occurred inappropriately late in the course of the patient's illness.

Peer-review outcomes

Assessors involved in the audit process review and appraise the appropriateness of the clinical care provided to each case reported to VASM.

- **Second-line assessments:** The frequency of need for SLA could be seen as an indirect measure of quality of care. Second-line assessments are requested for cases in which the clinical care needs to be looked at more closely or the treating surgeon did not provide sufficient information to reach a conclusion. Such assessments were required in 17.5% of audited cases. This rate is similar to other states. Importantly the rate has decreased from 18.0% in 2007/08 to 8.6% in 2009/10.

It is disappointing that SLA was most commonly required because the clinical information provided by the treating surgeon was inadequate.

The need for SLA was similar among surgical specialties, and metropolitan and rural hospitals.

- **Clinical management issues:** Assessors use a standard spectrum of criticism to convey their perceptions of appropriateness of care. These are described in detail in section 3.2.

In 88.0% of audited deaths, no, or only minor, issues of patient care were perceived. However, in 12.0% of cases more major issues of care were identified (areas of concern and adverse events).

Over the audit period (2007 to 2010) there has been a significant decrease in the frequency with which assessors are identifying clinical management issues. The incidence of more major criticisms of clinical care is similar among the surgical specialties. It is of some interest that in cases in which there was no operative procedure there was a significantly higher rate of areas of concern or adverse events. The available data does not tell us the reason.



There is no clear evidence that specific hospitals or surgical specialties have attracted higher rates of criticism than others. It is important to remember that criticism of clinical care is not always attributable to the surgical team. A third of the issues identified were attributed to other specialty areas.

- **Perceived impact of identified issues on clinical outcome:** There was a perception that the clinical management might have been better in 395 of the 1,113 audited deaths (35.0%). In only 47 of these 395 patients (4.0% of audited series) the clinical management was deemed likely to have contributed to the adverse outcome. The perceived relationship of clinical management to outcome was less clear in the remaining cases.
- **Frequency of specific issues of clinical management:** The most common clinical issue among the 496 specific issues identified was delay in delivery of definitive care. This occurred at multiple levels in the care pathway (Figure 92). The underlying problem is usually delay in establishing the true diagnosis leading to late referral and delay in implementing definitive treatment. A similar pattern has been reported in recent reports by the Western Australian Audit of Surgical Mortality (WAASM) and the South Australian Audit of Peri-operative Mortality (SAAPM). The recent Case Note Review Booklet published by VASM features clinical cases that exemplify this problem. Patients with the clinical risk profile demonstrated in this audited series tolerate delay in treatment very poorly.

Data quality

Data quality is an essential component of this and other audits. We have looked at the frequency of missing data in this audit. The volume of missing data is most prevalent in a few sections. We have recently reformatted two of these sections to make it more user-friendly.

We take this opportunity to emphasise the importance of accuracy and completeness of all clinical information provided to VASM.

RECOMMENDATIONS

Many of our previous years recommendations have been implemented. Collaboration between the Department of Health, Victorian Surgical Consultative Council (VSCC), Coroner's Office, hospitals and health services continues to facilitate our progress.

Objectives for the coming year are:

- Improve the return rate of case record forms and increase participation by surgeons.
- Continue to collaborate with VSCC and other agencies like the Coroner's Office.
- Continue to disseminate important messages emanating from the audit.
- Enhance the electronic interface to allow Fellows to complete assessments online.
- Facilitate communication and information sharing with other state mortality audits.
- Contribute to the development of a national mortality audit report.
- Evaluate the audit program.



1. INTRODUCTION

1.1. Background

The Victorian Audit of Surgical Mortality (VASM) is part of the Australian and New Zealand Audit of Surgical Mortality (ANZASM), a bi-national network of regionally based audits of surgical mortality that aim to ensure the highest standard of safe and comprehensive surgical care.

1.2. Objectives

The objective of the audit is 'peer-review of all deaths associated with surgical care'. This includes:

- Deaths that occur in hospital following a surgical procedure.
- Deaths that occur in hospital whilst under the care of a surgeon, even though no procedure was performed.

If VASM receives notifications of deaths that have occurred following discharge from hospital but within 30 days of a procedure or inpatient stay under a surgical unit, these cases will also be reviewed.

The audit process is designed to highlight system and process errors, and trends in deficiencies of care. It is intended as an educational rather than a punitive exercise.

1.3. Performance review

Recommendations were included in the 2009 annual report. An important measure of the success of VASM is whether these recommendations have been addressed or achieved. Most key performance indicators, recommendations and progress against the indicators have been achieved.

1.4. Structure and governance

The audit is managed by the Research, Audit and Academic Surgery (RAAS) Division of the Royal Australasian College of Surgeons (the College) and is supported and funded by state and territory governments. ANZASM oversees the implementation and standardisation of each regional audit to ensure consistency in audit processes and governance structure across all of the jurisdictions involved.

Participation is now a mandatory component of attaining CPD recertification. Surgeons and assessors gain points in Category 3: 'Clinical Governance and Evaluation of Patient Care' of the CPD program for their participation.

VASM is funded by Quality, Safety and Patient Experience Branch of the Victorian Department of Health.

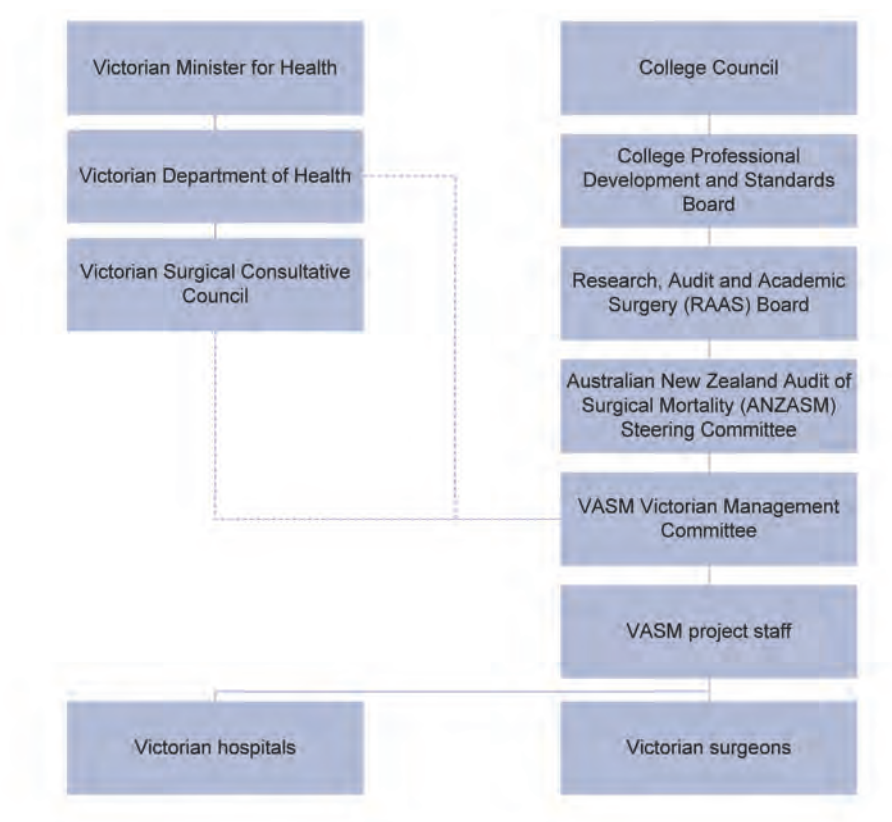
The College provides infrastructure support and conducts the oversight to the project. VASM works closely with the VSCC and provides regular reports to ANZASM, VSCC, hospitals, surgeons and the Department of Health (see Figure 1).

The VSCC was established by the state government in 2001 to review causes of avoidable mortality and morbidity associated with surgery, and to provide feedback to the medical profession on any systemic issues identified. VASM staff informs the VSCC of trends in surgical mortality and assists with the development of processes to enable the surgical community and health-care providers to address system issues.

The VSCC receives de-identified second-line assessment and aggregated reports from VASM that summarise all cases reviewed. The VSCC informs the surgical community about important issues arising from the collection and analysis of mortality and morbidity data. Along with the VSCC, VASM aims to support further improvements in patient care in Victoria.



Figure 1: Victorian Audit of Surgical Mortality (VASM) project governance structure



1.5. Data management and statistical analysis

All deaths occurring in Victorian hospitals while the patient is under the care of a surgeon and notified to VASM are audited. Cases admitted for terminal care and deaths incorrectly attributed to surgery are excluded from the full audit process. This 2009/10 annual report covers deaths reported to VASM since data collection commenced on 1 January 2008 to 30 June 2010. As the multiple rate-limiting steps in the audit process result in a mean time to completion of three months, information on some deaths that occurred during the reporting period are still under review and not available for inclusion.

Data is encrypted in the web database. This data is sent to, and stored in, a central Structured Query Language (SQL) 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 trail to be created for each case.

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

Data is downloaded from the secure database and then analysed using the statistical package STATA version 10.1, Microsoft Office Excel (2007) and ArcGIS version 9. Demographic data and summary statistics are presented. Continuous variables have been compared using Student's t-test or the nonparametric Ranksum test as appropriate. Categorical variables have been compared using Pearson's chi-square test. Kappa scores have been used as a measure of agreement. Funnel plots have been used to explore heterogeneity and are presented with upper and lower two and three standard deviation limits.

Numbers in the parentheses in the text (n) represent the number of cases actually analysed. As not all data fields have been completed by surgeons these numbers vary.



1.5.1 Interpretation of kappa scores

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

< 0 = no agreement

0.0 - 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

1.5.2 Interpretation of p-values

A p value < 0.05 is considered statistically significant.

1.5.3 Interpretation of funnel plots

Funnel plots are a visual tool to investigate bias in meta-analysis. They are scatter plots of the analysis effects estimated from individual studies (horizontal axis) against a measure of study size (vertical axis). The name funnel plot is based on the precision in the estimation of the underlying treatment effect increasing as the sample size of component studies increases.

1.5.4 Interpretation of geographic mapping

Geographic Information System provides a common analytical framework in which data can be geographically displayed.

1.5.5 Exclusion of identifiable data

Labels and data that might identify surgical groups, patients, hospitals and extreme values have been excluded from this report.



2. AUDIT RESULTS

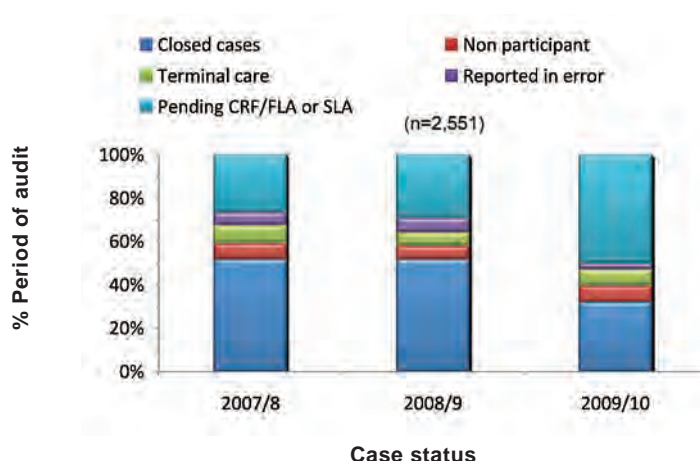
2.1. Audit numbers

From its commencement on 1 January 2008 to the end of the current audit period on 30 June 2010 the VASM received 2,551 notifications of death that have been associated with surgical care (see Figure 2).

It is beneficial to put these deaths in some perspective by reviewing the number of surgical procedures actually performed in Victoria over this period. For

this purpose we have interrogated the Victorian Admitted Episode Dataset (VAED). In one single year, financial year 2009/10, 352,677 patients underwent surgical procedures in the Victorian public sector. The number of deaths (2,551) attributed to surgery over a 2.5 year period is therefore a very small percentage of the number of patients who actually underwent surgery over the same period.

Figure 2: Synopsis of audit numbers over sequential audit periods



Note: Case record form (CRF), First-line assessment (FLA), Second-line assessment (SLA)

Regarding the audit status of the reported 2,551 deaths:

- By the census date (30/6/2010), 1,886 (73.9%) of the 2,551 case record forms sent to the treating surgeon had been completed and returned to VASM. This means there were 1,886 cases available for clinical review.
- 177 (6.9%) of these 2,551 cases were recorded as admissions for terminal care and therefore excluded from the review process.
- 129 (5.1%) cases had been wrongly attributed to a surgical unit and were therefore also excluded.
- 188 (7.4%) cases could not proceed in the audit process as the treating surgeon had elected not to participate.
- In 83 (4.1%) cases, the treating surgeon could not access the hospital case notes to complete the case record form as the notes were at that time at the coroner's court.
- Clinical information was therefore available on the remaining 1,327 (70.0%) of the 1,886 cases.
- By the census date only 1,113 (84.0%) of these 1,327 deaths had been fully audited. The outcomes from the actual peer-review process are restricted to these 1,113 deaths and will be the focus of this report. The outcomes of the remaining 214 cases still pending review will be available in the next audit report.

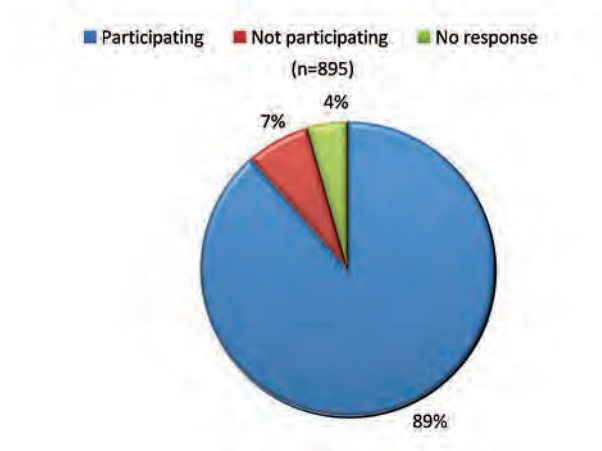


2.2. Audit participation rates

To comply with the audit process, surgeons must not only agree verbally to participate but also return completed case record forms and assessment forms in a timely manner. The hospitals in which they work must provide notifications of deaths on a regular basis, as these are the triggers for the audit process.

2.2.1 Participation by Fellows

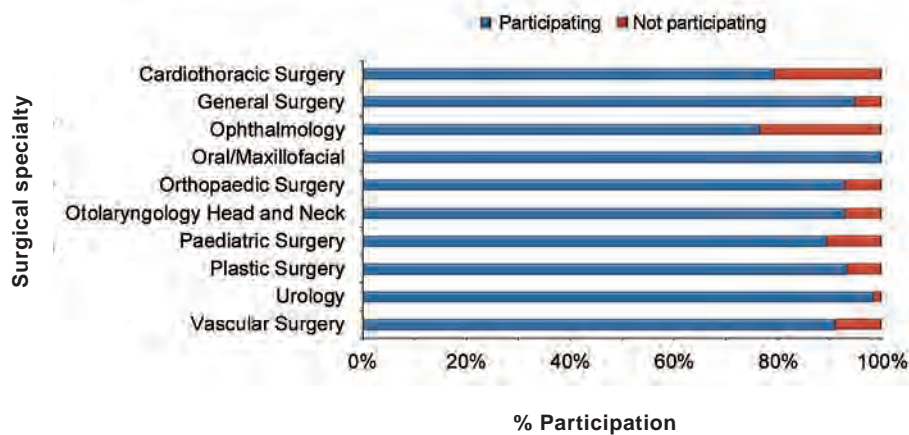
Figure 3: Surgeon agreement to participate as percentage of eligible College Fellows in Victoria



Comments:

- 174 (16.3%) of the 1,069 Victorian Fellows registered in the audit database have been excluded due to their retirement, transfer interstate or overseas. This leaves 895 surgeons eligible to participate, 89.0% of which have agreed to participate.
- The increase in participation rate from 71.0% last year to our current level of 89.0% is encouraging.
- 63 (7.0%) Fellows are still declining participation and a further 40 (4.0%) are yet to commit to the audit process.
- 456 (50.9%) of eligible 895 Fellows have also agreed to be first or second-line assessors.
- The College Council has delivered strong support to ANZASM by requiring surgeons to participate in their state's mortality audit as a compulsory component of the Continuing Professional Development (CPD) program.

Figure 4: Surgeon agreement to participate by surgical specialty

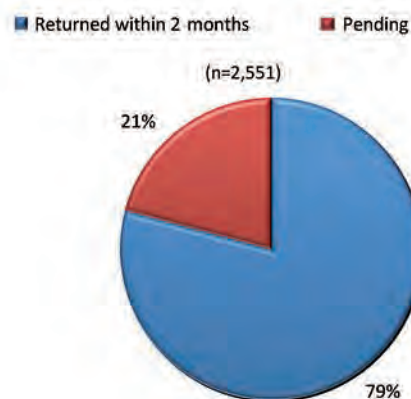


Note: Other specialties are Trauma, Transplant, Oncology, Otolaryngology and Gynaecology.

Comments:

- Participation rates are similar among specialties.

Figure 5: Case record form return rate

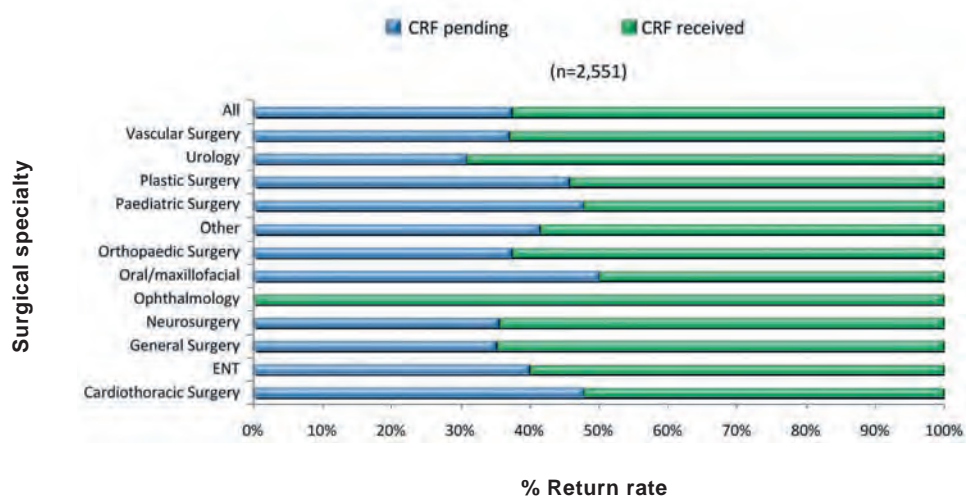


Comments:

- A case record form was sent to each surgeon nominated as the treating surgeon in all 2,551 instances of death reported to VASM.
- If we allow two months from notification of death to receipt of the case record form, the return rate is 1,809 (71.0%) cases. This is an increase of 6.0% from the previous year.
- The return rate in the Scottish Audit of Surgical Mortality (SASM) Annual Report 2010 is 78.0%. (2)
- The return rate across other states and territories varies between 70.0% and 95.0%. (3, 4, 5, 6)



Figure 6: Case record form return rate by surgical specialty

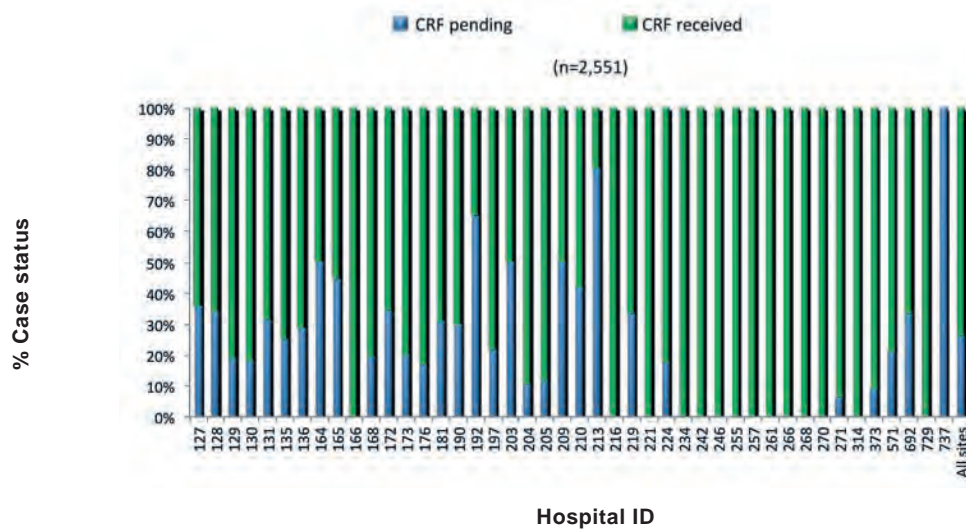


Note: Other specialties are Trauma, Transplant, Oncology, Otolaryngology, and Gynaecology

Comments:

- This suggests the case record form return rates were similar among specialties where case loads are higher.

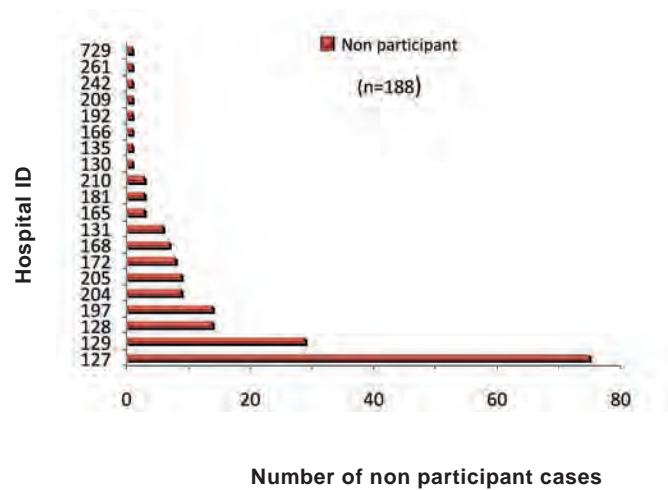
Figure 7: Case record form return rate by hospital



Comments:

- Compliance with the audit process as assessed by case record form return rates varies among hospitals.

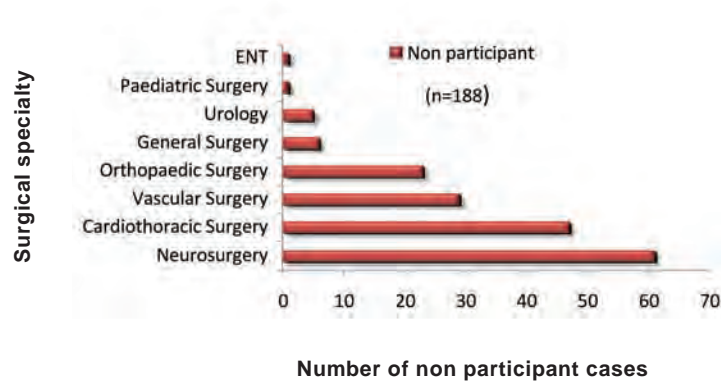
Figure 8: Hospital origin of cases that could not be reviewed due to non participation by treating surgeon



Comments:

- Surgeons electing not to participate seem to be focused in a few hospitals.
- In each instance above, the hospital has agreed to participate and notifies deaths to VASM but the surgeons responsible have not returned the case record forms. The audit process cannot proceed if the surgeon does not actively participate.
- Since January 2010 participation in ANZASM has been made a mandatory component of CPD. It is expected that this will encourage more surgeons to participate.

Figure 9: Specialty origin of cases that could not be reviewed due to non participation by treating surgeon

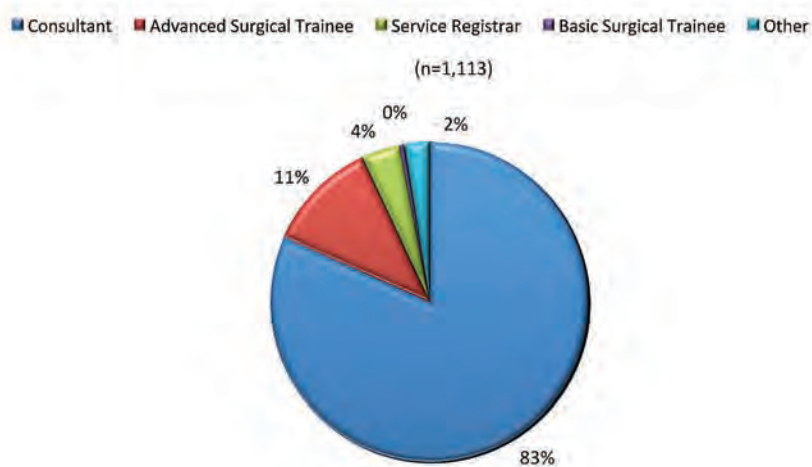


Comments:

- The specialties with the greatest degree of non-compliance are neurosurgery, cardiothoracic surgery and vascular surgery.



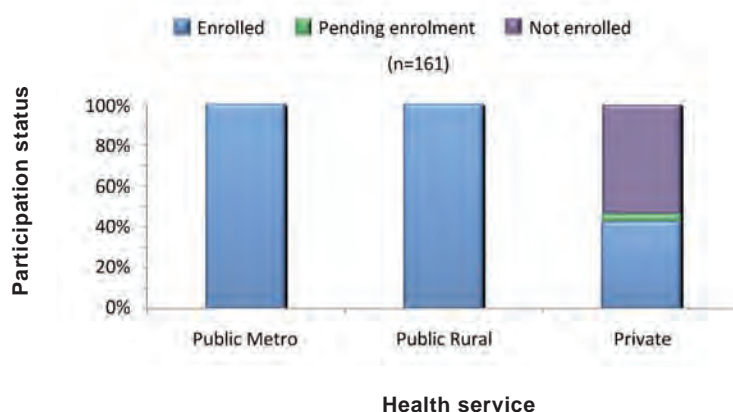
Figure 10: Seniority of surgeons completing the case record form



Comments:

- The high completion rate of the case record form by consultants in 926 (83.0%) of the 1,113 audited cases is commendable.
- The “Other” group of surgeons completing the case record form include International Medical Graduates (IMG).

Figure 11: Hospitals participating in the audit



Comments:

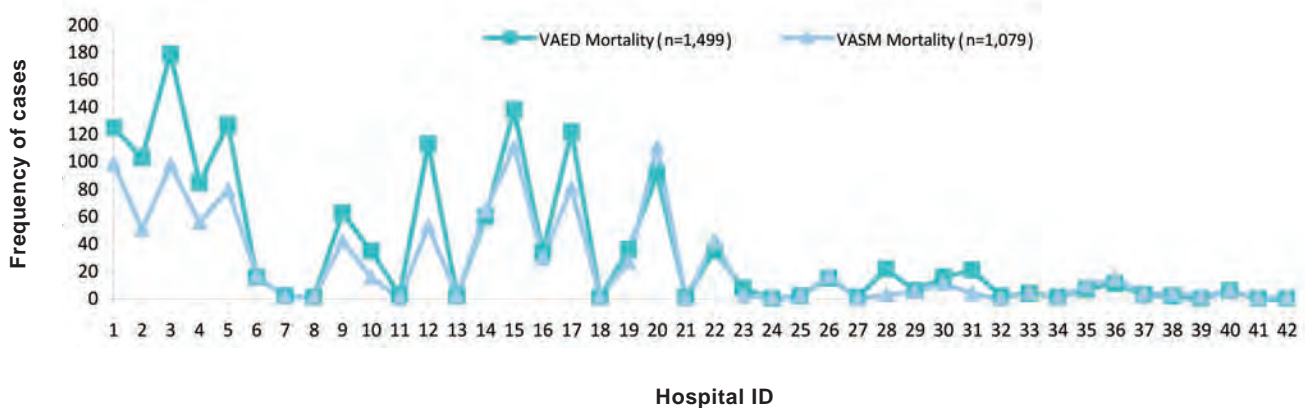
- Hospitals where no mortalities occurred or where deaths have not been reported have been excluded from further analysis.
- Certain hospitals that are part of a health service might have aggregate data shown in the report rather than individual representation. This is a result of the mortality reporting format used by the health services.
- All Victorian public hospitals providing relevant surgical services are now participating and providing notifications of death.
- Private sector enrolment commenced in August 2010. The initial response is encouraging as 24 (43.0%) of the 56 eligible private hospitals identified have enrolled in the audit program and a further two are currently pending enrolment.
- Hospitals that joined after 30 June 2010 and where no mortalities occurred or where deaths have not been reported have been excluded from analysis.

2.2.2 Verification of audit numbers

The audit process is dependent on receiving notifications of death from participating hospitals. This requires each hospital to prepare and submit a list of deaths that have occurred while under the care of a surgeon. This generally means the discharge unit has been recorded as surgical. In some instances, patients who have received surgical care may not be under the care of a surgeon at the time of discharge. It can therefore be seen that the attribution of care to surgery or another specialty is not exact. (7)

In parallel with our process, hospitals have to submit data to the Victorian Admitted Episode Dataset (VAED) which is maintained by the Victorian Department of Health. This is a robust database providing case-mix information required for hospital funding. The information allocates individual patient episodes to Disease Related Groups (DRGs). These DRGs are specialty specific and can therefore provide an alternative source of specialty notification. The Department of Health has provided us with a list of deaths that occurred in patients with surgical DRGs over the period 1 July 2009 to 30 June 2010.

Figure 12: Comparison of mortalities reported by VAED compared to hospitals



Comments:

- This is a comparison of data collected between 1 July 2009 and 30 June 2010.
- Hospital ID numbers have been de-identified in this analysis group as it might identify the hospital.
- Over this time period, VAED data suggests there were 1,499 deaths that might be attributable to surgery whereas hospital notifications to VASM suggested only 1,079 (72.0%). The gap between the two sources has narrowed over the last year. This is attributed to further recruitment of hospitals and increased familiarity with the audit process among hospitals.
- Some hospitals experienced difficulties in reporting mortalities in a timely manner due to upgrades in their electronic Health Information Systems.
- VAED also indicates that in a single year (2009/10) 352,677 patients received surgical care in the Victorian public hospital sector. An additional 504,737 patients were treated surgically in the Victorian private hospital sector.
- It should be noted that the two methods of assessing mortality (hospital and VAED) have different sources and might therefore be considered as complementary rather than parallel.



Key points

- There has been an increase in the number of eligible Victorian Fellows agreeing to participate in the audit (71.0% to 89.0%). Of these 244 (27.3%) have adopted the new electronic interface to transfer data to VASM.
- 456 (50.9%) of these 895 Fellows have also agreed to be first or second-line assessors.
- Case record form return rates have risen from 73.0% in 2009 to 79.0% in 2010.
- All Victorian public hospitals providing relevant surgical services are now participating and providing notifications of death.
- Recruitment of the private sector commenced in August 2010 and currently 24 (43.0%) of hospitals have enrolled in the audit program.

2.3. Demographic profile of audited cases

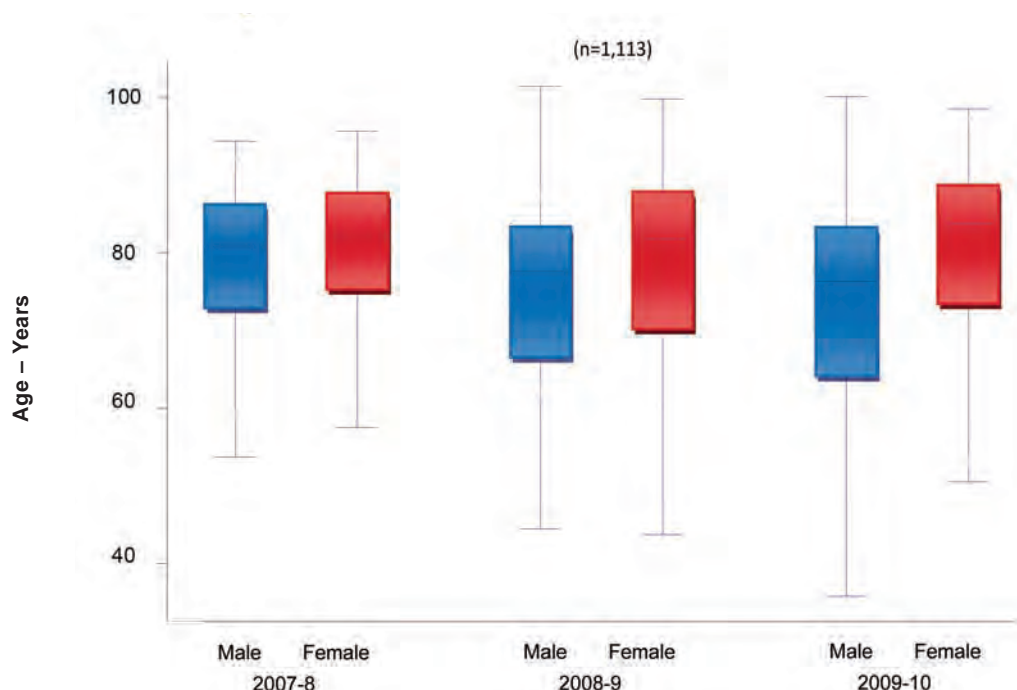
2.3.1 Age profile

Figures 13, 14, 15 and 16 are box and whisker plots in which:

- The central box represents the values from the lower to upper quartile (25-75 percentiles).
- The middle line represents the median value.
- The vertical line extends from the minimum value to the maximum value, excluding outliers and extreme values (i.e. values larger than the upper quartile and plus 1.5 or 3 times the inter-quartile range).

There were 1,113 audited cases with a mean (SD) age of 75 (17.4) years and a median age of 80 (69 to 86) years. The age range varied from one day old to 101 years old.

Figure 13: Gender and age distribution of deceased as notified

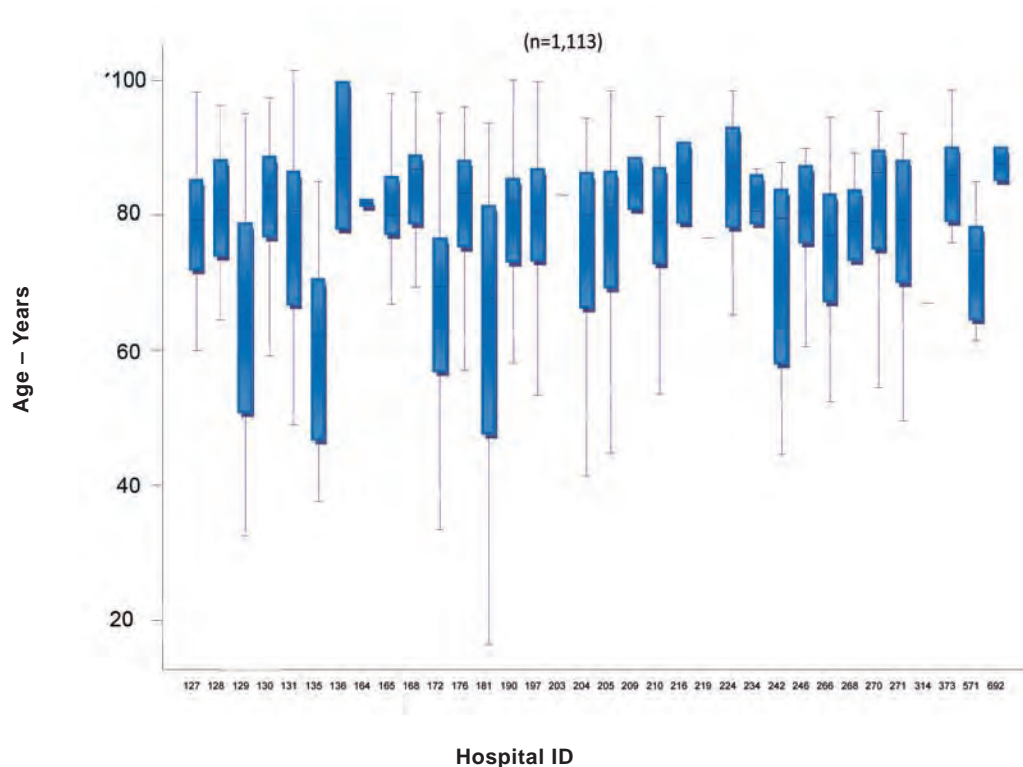


Note: Extreme values are excluded

Comments:

- The median age for 551 (49.5%) females was 77 years compared to 72 for the 562 (50.5%) males ($p < 0.001$). Extreme values are not displayed on the graph.
- This age profile is consistent with the ageing general population.
- From an Australian and New Zealand study, it was identified that patient factors often had a stronger association with mortality than the type of surgery. Strategies are needed to reduce complications and mortality in older surgical patients.⁽⁸⁾ Similarly, in the Australasian Society of Cardiac and Thoracic Surgeons annual report, increasing age can also influence a patient's survival.⁽⁹⁾
- The high mean age of these patients indicates surgical mortality is predominantly in the elderly.

Figure 14: Age distribution of deceased by hospital

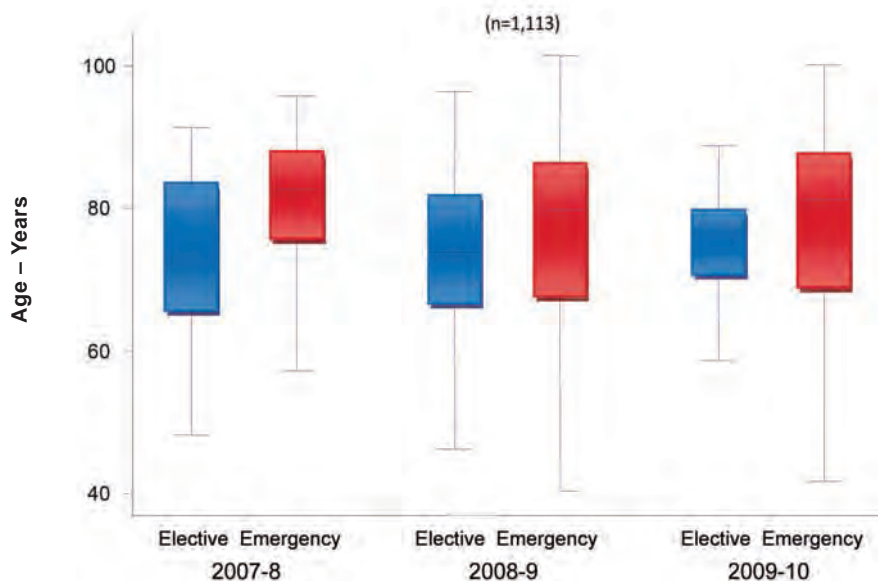


Comments:

- Extreme values have not been displayed on the graph.
- A thin horizontal bar indicates small patient numbers with a narrow age range.
- The mean age of all deceased patients in this audited series is 75.



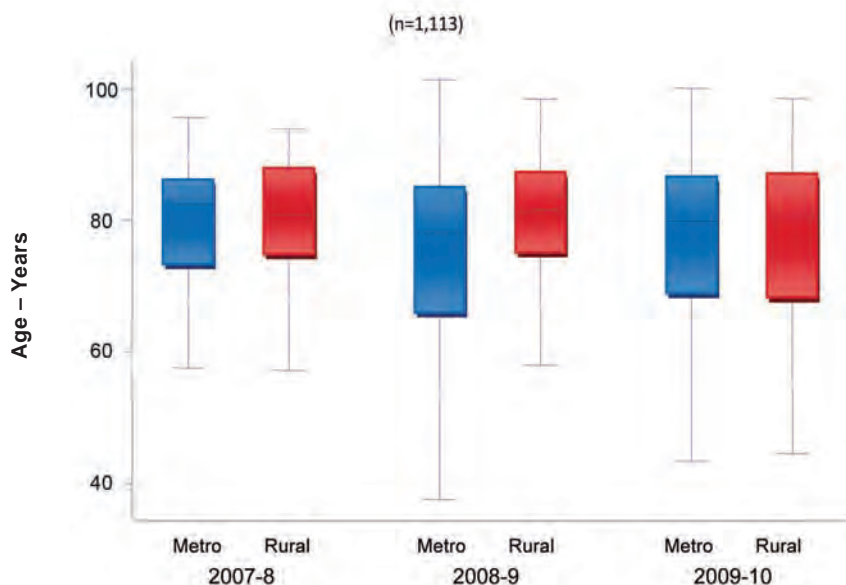
Figure 15: Age distribution of deceased by admission status



Comments:

- The age profile is unchanged with time.
- Extreme values are excluded.

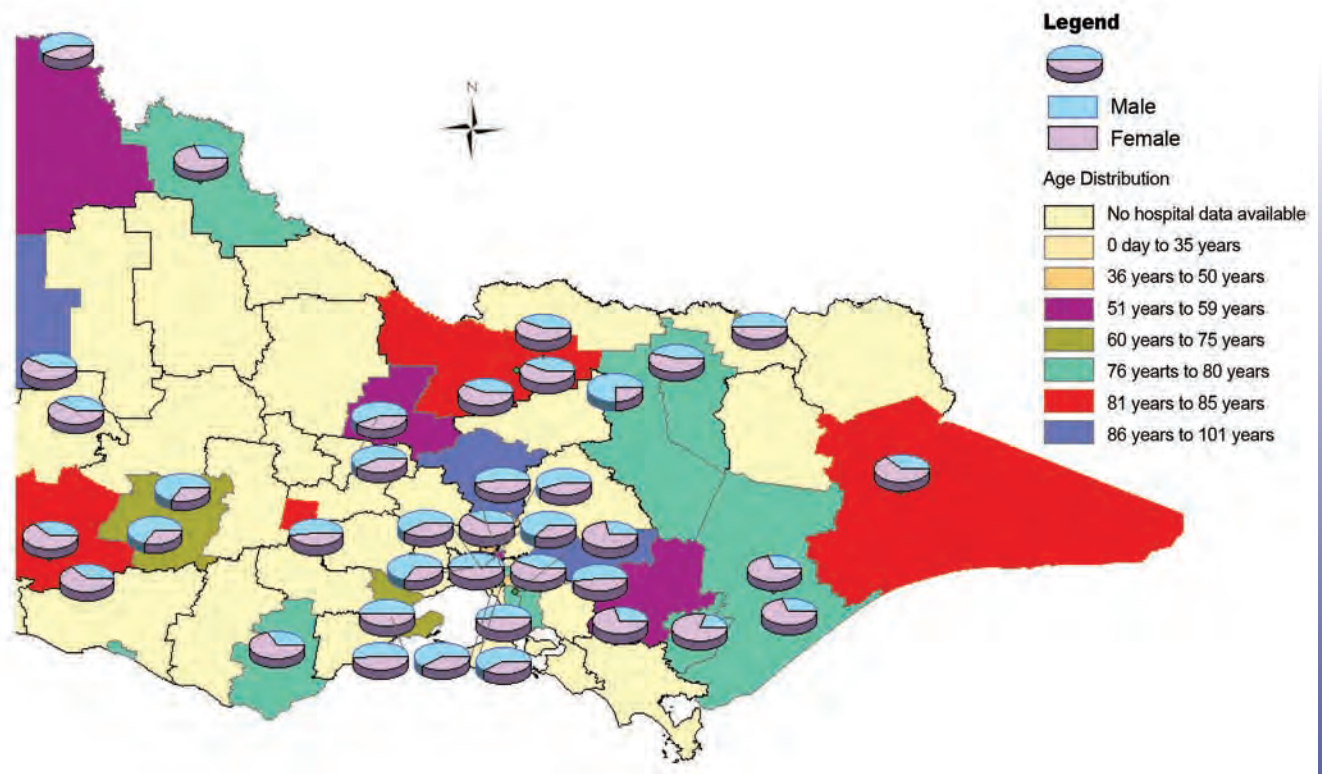
Figure 16: Age distribution of deceased by region



Comments:

- Extreme values are excluded.
- The median age variation across rural and metropolitan areas is 73 to 79 years of age respectively.
- The reason for this small difference in age is not known.

Figure 17: Age and gender of deceased by local government area



Comments:

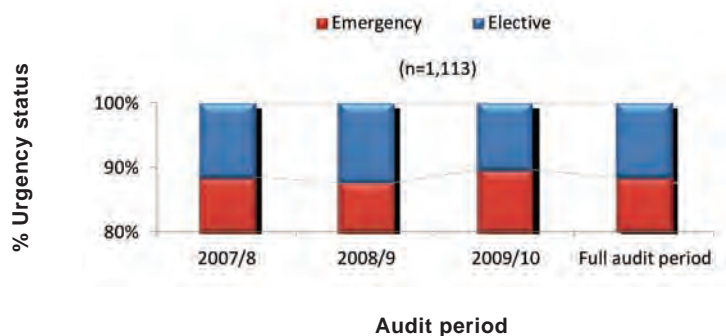
- Figure 17 is a pictorial view of the gender and mean age distribution of reported deaths by local government area (LGA). The points displayed have been sited in their relevant LGA.
- Individual points do not indicate where a death occurred, only the LGA in which death occurred.
- Only LGAs where a surgical death has occurred have data points or shading.



2.3.2 Urgency status of patients

The urgency status of a patient records whether that patient was admitted electively or as an emergency for an acute condition (see Figure 18).

Figure 18: Urgency status of deceased over sequential audit periods

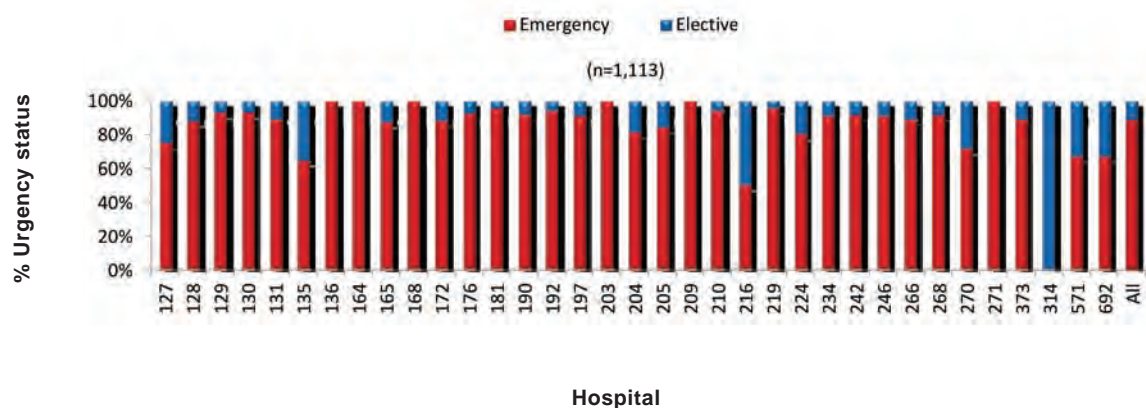


Note: Missing data n=3 (0.3%)

Comments:

- The high percentage of patients admitted as emergencies with acute conditions (88.1%, 981 patients) is constant over time.

Figure 19: Urgency status of deceased by hospital



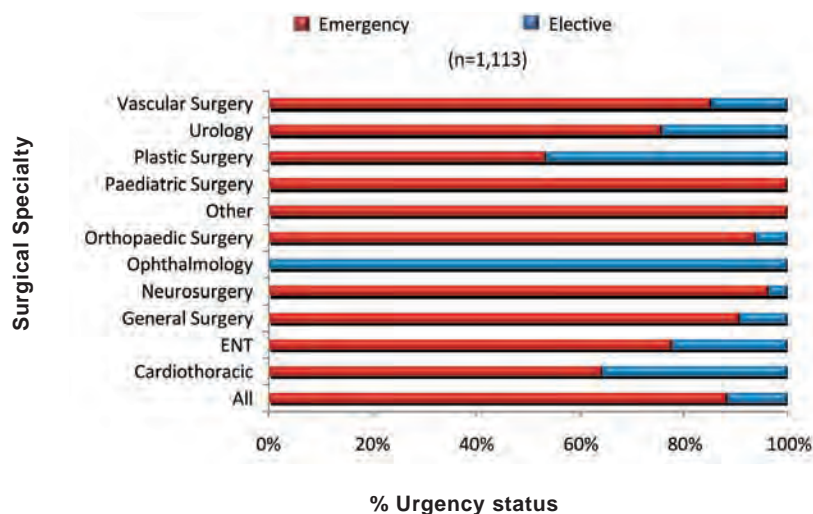
Note: Missing data n=3 (0.3%)

Comments:

- The proportion of audited cases admitted as emergencies varies among hospitals. Some hospitals do not have emergency departments and provide very limited emergency services.
- The majority of audited deaths (88.1%, 981 patients) occurred in patients admitted as an emergency for a condition. There was no difference in the mean ages of elective and emergency patients (data is not shown in this graph).
- The high rate of emergency admissions is similar among states.⁽¹⁰⁾



Figure 20: Urgency status of deceased by surgical specialty

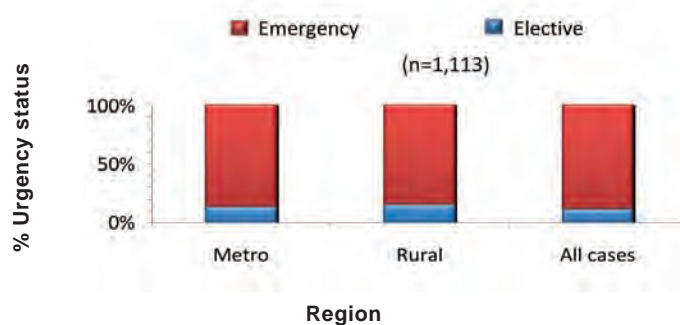


Note: Missing data n=3 (0.3%)

Comments:

- The proportion of audited cases admitted as emergencies varies among specialties. This is perhaps a reflection of the case-mix of the individual specialties.

Figure 21: Urgency status of deceased by region



Comments:

- The urgency profile is similar across rural and metropolitan hospitals.

Key points

- 981 (88.1%) of deaths in this audited series occurred in patients admitted as emergencies with acute conditions.
- The high mean age of these patients (75 years) indicates surgical mortality is predominantly in the elderly.



2.4 Risk profile and cause of death in audited cases

The following section reviews the risk profile of audited cases. This includes the American Society of Anaesthesiologists (ASA) status, reported comorbidities and a surgeon's perception of risk of death.

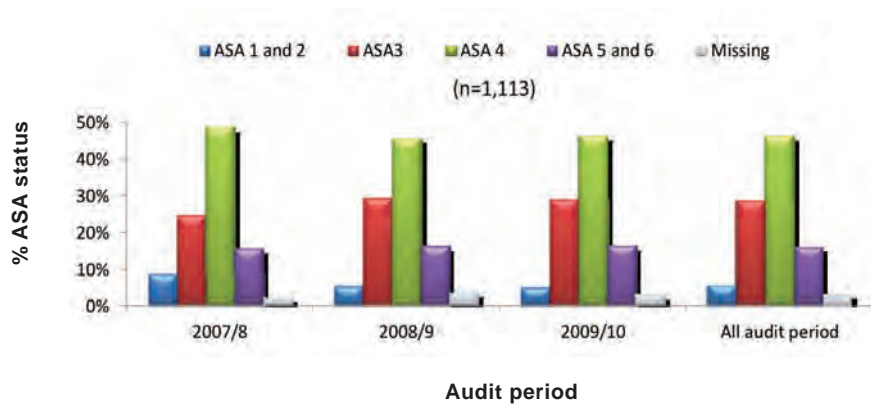
2.4.1 ASA status of patients

The ASA status is an international measure of patient risk used by anaesthetists.

ASA grade characteristics:

1. A normal healthy patient.
2. A patient with mild systemic disease and no functional limitation.
3. A patient with moderate systemic disease and definite functional limitation.
4. A patient with severe systemic disease that is a constant threat to life.
5. A moribund patient unlikely to survive 24 hours, with or without an operation.
6. A brain dead patient for organ donation.

Figure 22: ASA grades of deceased over sequential audit periods

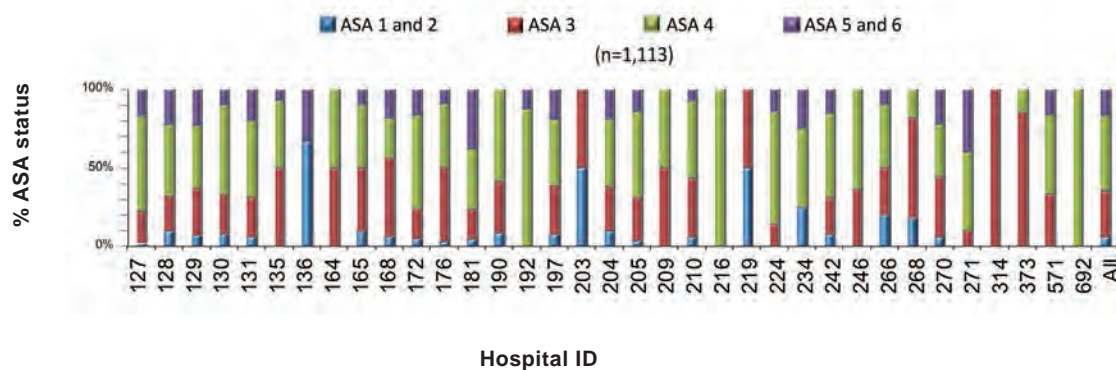


Comments:

- The preponderance of moderate and high (3-6) ASA grades is consistent with time.
- The preponderance of high ASA grades suggests most deaths have occurred in patients assessed as high risk by the anaesthetic team.



Figure 23: ASA grades of deceased by hospital

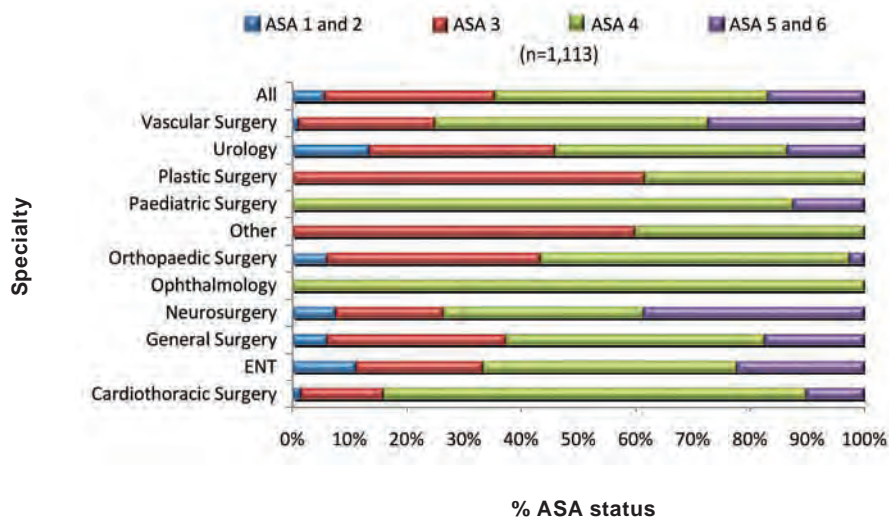


Note: Missing data n=44 (4.0%).

Comments:

- ASA status varies with the case-mix of hospitals.

Figure 24: ASA grades of deceased by surgical specialty



Note: Missing data n=44 (4.0%).

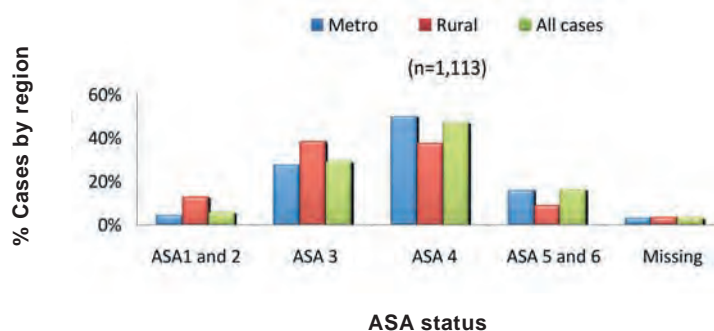
Other specialties are Trauma, Transplant, Oncology, Otolaryngology and Gynaecology

Comments:

- The variation in severity of ASA grades among specialties is a reflection of the risk profile inherent in their case-mix.



Figure 25: ASA grades of deceased by region

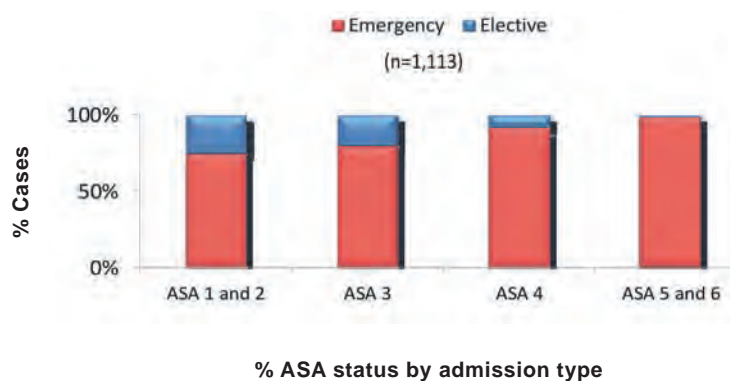


Note: Missing data n=44 (4.0%).

Comments:

- This figure demonstrates a high mean ASA grade in both rural and metropolitan regions. It again suggests the majority of deaths occurred in patients with significant comorbidity.
- In metropolitan hospitals there was a trend to a higher proportion of ASA 4, 5 and 6 grades, but this was not significant ($p=0.30$).

Figure 26: ASA grades of deceased by urgency status



Note: Missing data n=44 (4.0%).

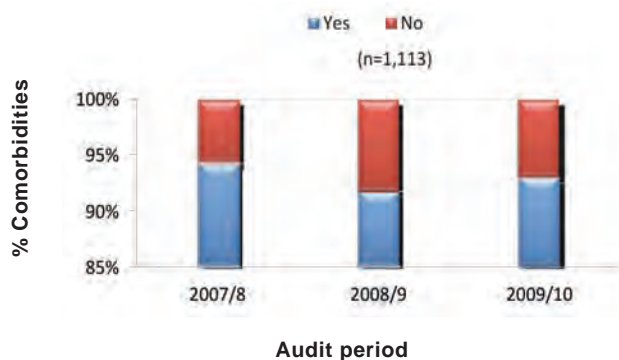
Comments:

- Patients with ASA grades 4, 5 or 6, had a higher proportion of admissions as emergencies than those with ASA grades 1, 2 or 3. This is expected as elective cases with ASA 4, 5 or 6 often do not proceed to surgery when risk versus benefit is considered.
- Cases with an ASA >4 were more likely ($p<0.001$) to be referred for case note review and second-line assessment (data is not shown in this figure).

2.4.2 Comorbidities

Comorbidity describes coexisting medical conditions or disease processes that are additional to the primary diagnosis.

Figure 27: Frequency of comorbidities reported over sequential audit periods

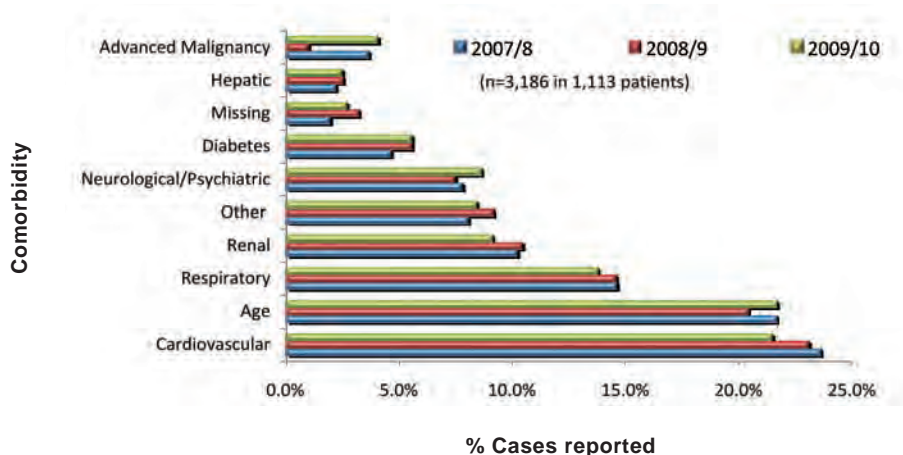


Note: Missing data n=7 (0.63%) cases

Comments:

- 1,023 (91.9%) of the 1,113 audited cases were reported to have comorbidities. This high rate is constant across the audit periods.
- The small variances shown are not statistically significant ($p=0.65$).

Figure 28: Prevalence of individual comorbidities over sequential audit periods.



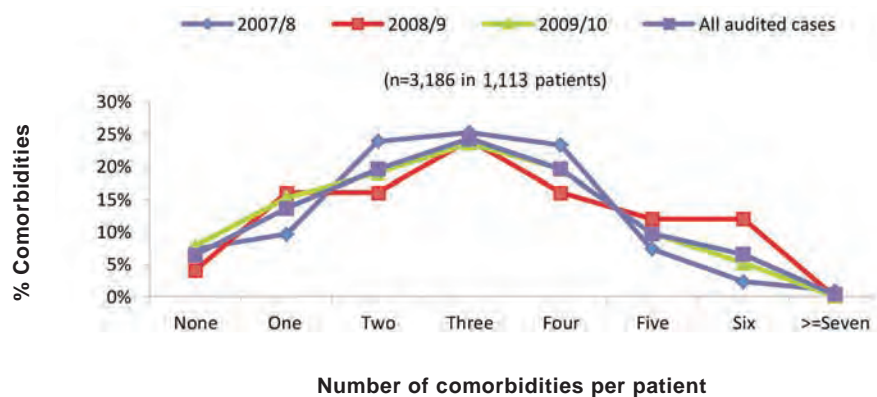
Note: Missing data n=74 (6.6%).

Comments:

- 3,186 comorbidities were reported in the 1,113 cases that had completed review.
- The 'other' comorbidity category includes factors such as alcohol abuse, dementia, anorexia, malnutrition, chronic lymphatic leukemia, chronic mesenteric ischaemia, coagulopathy, haemophilia, Crohn's disease, drug abuse, rheumatoid arthritis, epilepsy, extreme prematurity, Jehovah's witness refusing transfusion, leukaemia, myelofibrosis, osteoporosis, scleroderma, thyrotoxicosis and spina bifida.
- The comorbidity profile associated with audited deaths appears similar across metropolitan and rural regions (data is not shown in this graph).
- The most common risk factors notified in the 1,113 series of surgical deaths were cardiovascular 710 (22.3%), age 658 (20.1%), respiratory problems 449 (14.1%), renal 313 (10.0%) and neuro-psychiatric 247 (7.8%), and these are consistent with time.
- This profile is similar to that reported in the 2009 Australian and New Zealand Audit of Surgical Mortality.⁽¹⁰⁾



Figure 29: Frequency of multiple comorbidities in individual patients over sequential audit periods

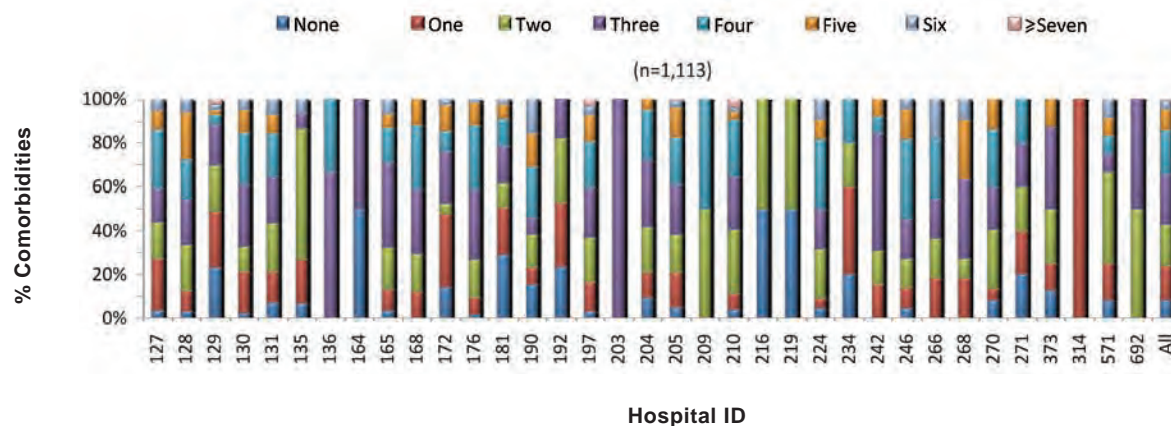


Note: Missing data n=7 (0.63%) cases

Comments:

- In this audited series, 1,023 (91.9%) of 1,113 cases were reported to have more than one comorbidity, with a mean of three comorbidities reported per patient.
- This reflects the fact that there is significant pre-existing illness in this group of audited deaths.

Figure 30: Frequency of comorbidities reported by hospitals



Comments:

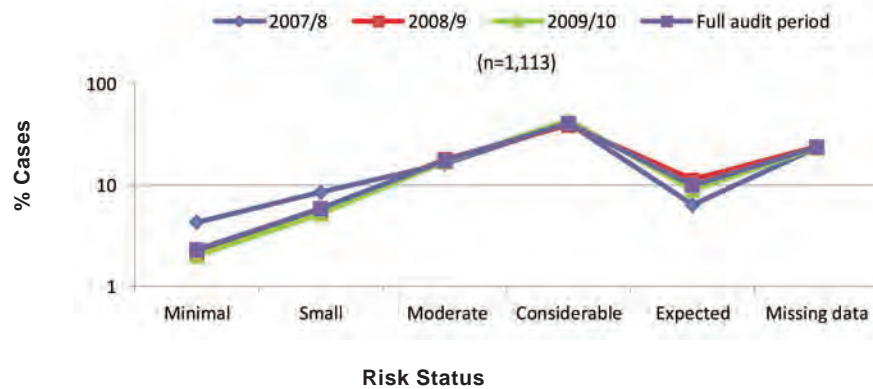
- This figure shows the comorbidity profile in surgical deaths reported by individual hospitals.
- The incidence of reported comorbidity varies among hospitals.
- Cardiovascular, age and respiratory problems remain the most common comorbidities reported.



2.4.3 Surgeon's perception of risk status

Treating surgeons are asked to record their perception of risk of death of their patient at the time of treatment.

Figure 3 I: Surgeon's perception of risk of death over sequential audit periods

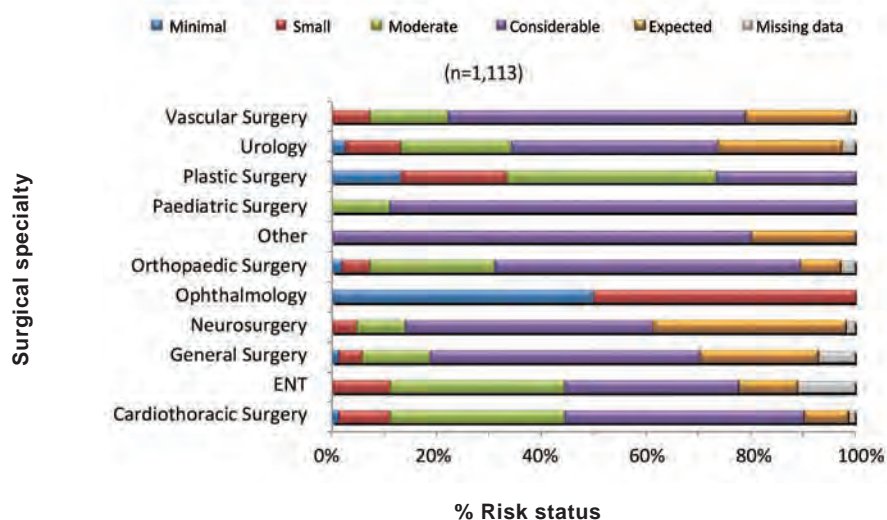


Comments:

- The treating surgeon assessed the risk of death as high in the majority of cases. This remained consistent over sequential audit periods.
- The overall perception of risk of death by hospital as identified by surgeons is similar to the aggregate findings and reflective of the risk profile associated with the case-mix of the individual hospital, data is not shown in this graph.
- This supports the high risk profile suggested by the mean age, ASA score and associated comorbidity.



Figure 32: Surgeon's perception of risk of death by surgical specialty

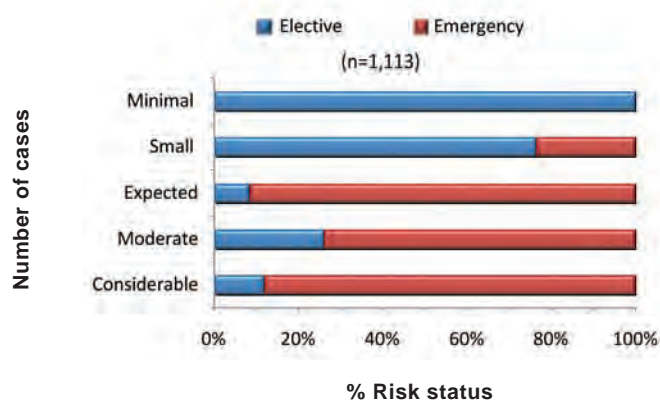


Note: Other specialties are Trauma, Transplant, Oncology, Otolaryngology and Gynaecology

Comments:

- The surgeon's perception of risk of death by specialty is similar to the aggregate findings and reflective of the risk profile associated with the case-mix of the individual hospital.

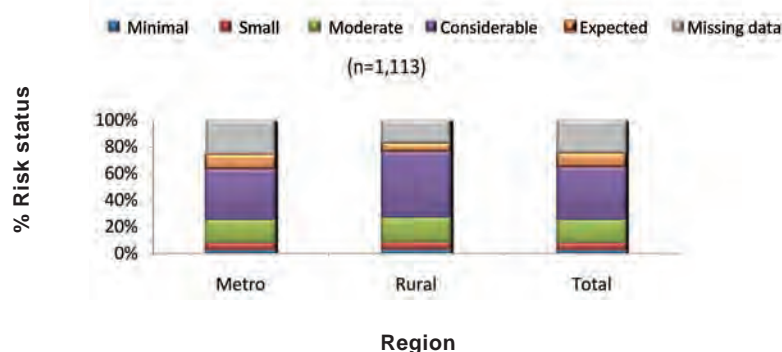
Figure 33: Surgeon's perception of risk of death by admission status



Comments:

- Patients admitted as an emergency have a higher risk status than elective admissions, the difference being statistically significant ($p < 0.001$).
- In cardiothoracic surgery, general surgery, orthopaedic surgery, neurosurgery, urology and areas of paediatric surgery, surgeons perceived a higher risk of death than in other specialties. For example, in cardiothoracic surgery, patients undergoing such surgery would have serious heart conditions and are generally in poor health and in greater risk of complications following surgery compared to people in good health.⁽⁹⁾
- In a 2010 report by End of Life (EoL), Palliative Care Australia, the need to reduce the number of patients accessing the public hospital system particularly emergency department for palliation was highlighted.⁽¹²⁾

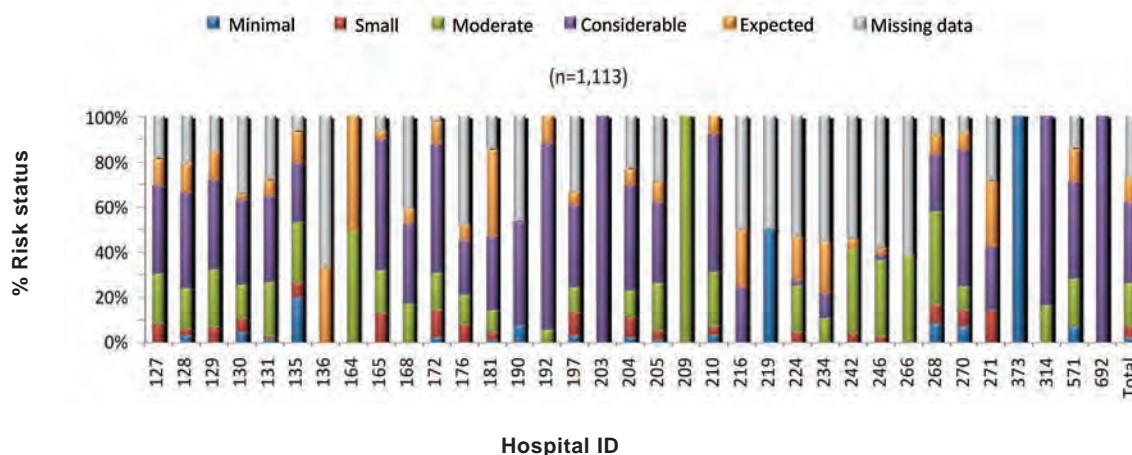
Figure 34: Surgeon's perception of risk of death by region



Comments:

- The treating surgeon's perception of risk is similar among metropolitan and rural hospitals ($p = 0.032$).

Figure 35: Surgeon's perception of risk of death by hospital



Comments:

- The overall perceived risk of death of patients in this series is high, with variances as expected between hospitals with differing case-mix.
- The surgeon's perception of risk of death by hospital is similar to the aggregate findings and is reflective of the risk profile associated with the case-mix of the individual hospital.

Key points

- The clinical risk profile of this audited series confirms that the majority of deaths have occurred in patients perceived to have a low risk of surviving their current illness.
- There were 1,023 (91.9%) patients with at least one pre-existing illness affecting their chance of recovery. The most frequent conditions cited were cardiovascular and respiratory.
- These findings are not surprising when we consider the high mean age of patients in the series.



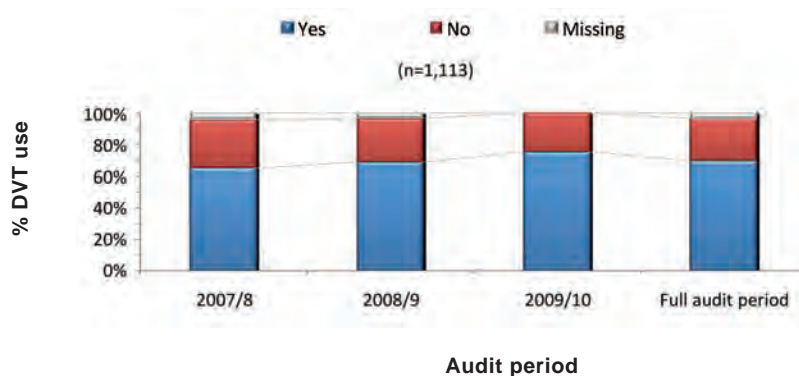
2.5 Risk management strategies

The following sections detail the risk minimisation strategies and appropriateness of provision of critical care support to audited cases.

2.5.1 Prophylaxis for Venous Thromboembolism

The treating surgeon has to record if venous thromboembolism (VTE) prophylaxis was given and what type of prophylaxis was actually used.

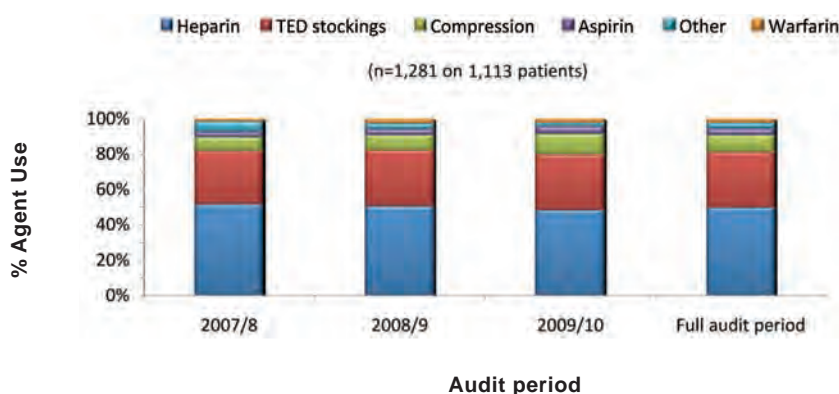
Figure 36: VTE prophylaxis use during the audit period



Comments:

- The use of VTE prophylaxis has slightly increased in 2010 to 72.7% from 64.5% in 2007/8 and 68.6% in 2008/9. This difference is not statistically significant.

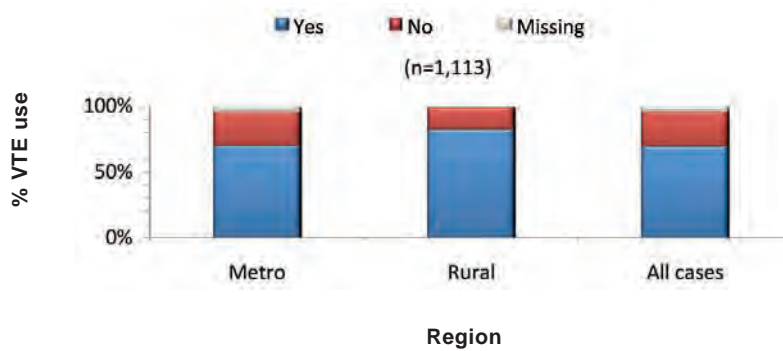
Figure 37: Type of VTE prophylaxis used



Comments:

- The spectrum of VTE prophylaxis used has not varied over the audit period.
- VTE prophylaxis recorded in the 'Other' category included calf stimulators, Clexane, Fragmin, clopidogrel, enoxaparin, epidural, full anticoagulation for Non-ST Segment Elevation Myocardial Infarction (NSTEMI), Inferior Vena Cava (IVC) filter.

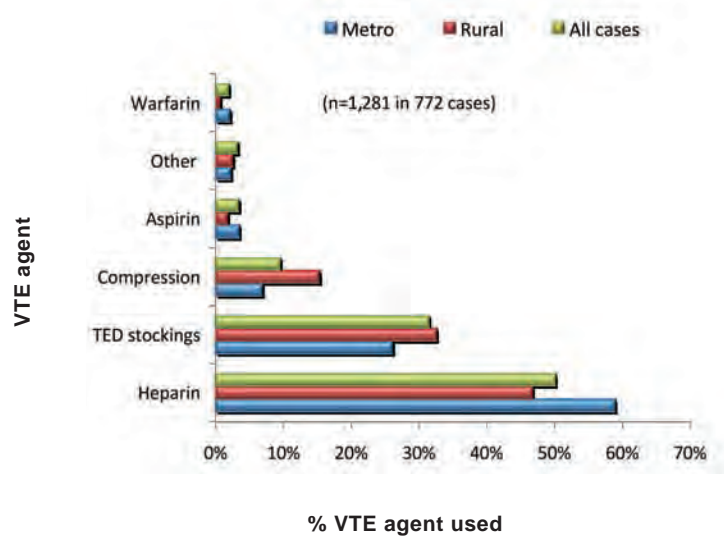
Figure 38: VTE prophylaxis use by region



Comments:

- The apparent higher use of VTE prophylaxis in rural area is not statistically significant ($p = 0.94$).

Figure 39: Type of VTE prophylaxis used by region

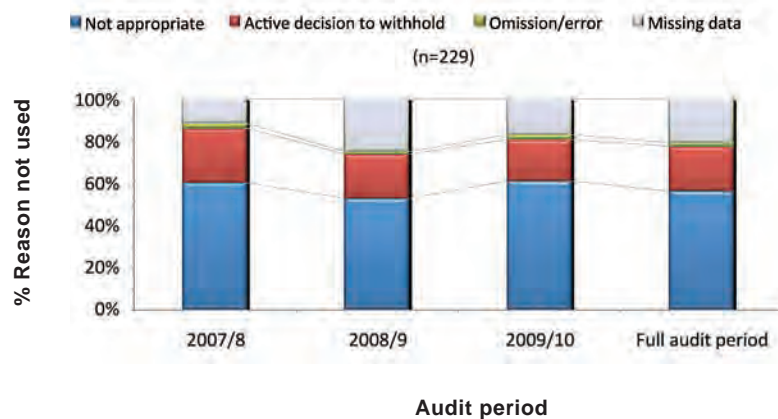


Comments:

- Some form of VTE prophylaxis was recorded as being provided in 772 (69.4%) of 1,113 cases. The variation in prophylaxis used is not significant ($p = 0.77$).
- Heparin was given in 616 (79.8%) of these 772 cases. The case record form does not record the type of heparin product used. Thrombo Embolic Deterrent (TED) stockings were used in 387 (50.1%) of the audited cases where VTE prophylaxis was provided.
- VTE prophylaxis recorded in the 'Other' category included calf stimulators, Clexane, clopidogrel, enoxaparin, epidural, Fragmin, full anticoagulation for NSTEMI, IVC filter.



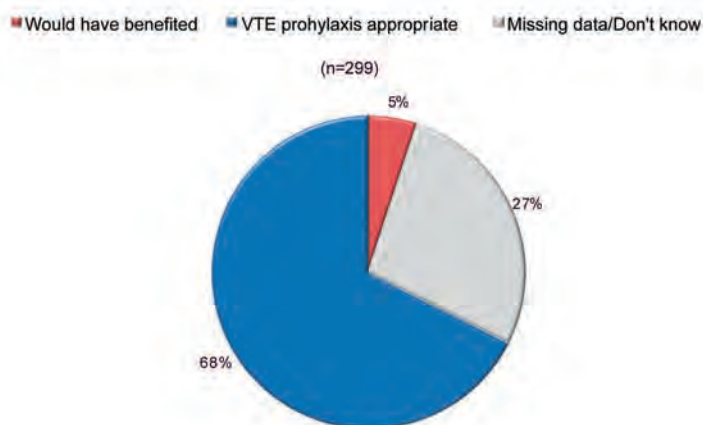
Figure 40: Reasons given by treating surgeon for not providing VTE prophylaxis



Comments:

- 299 (26.9%) patients of the 1,113 received no prophylaxis. In the majority of these cases it was a conscious decision by the treating team. The inadvertent omission rate was low n=5 (1.7%) in 299 cases.
- The high rate of missing data (27.0%) is disappointing and indicates many surgeons are still not completing this part of the case record form attentively.

Figure 41: Assessor perception of appropriateness of decision to withhold VTE prophylaxis



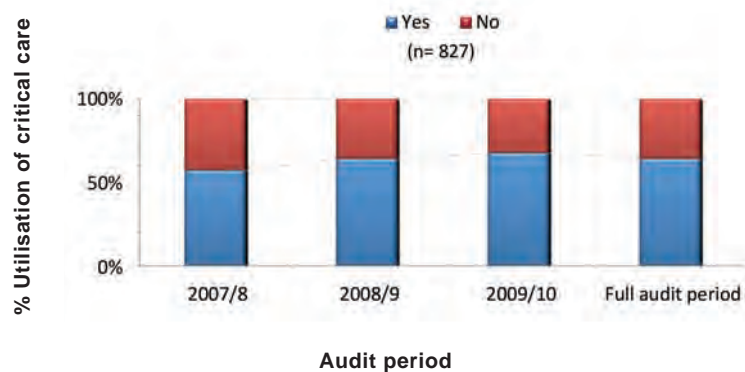
Comments:

- Assessors are asked to comment on the appropriateness of withholding prophylaxis.
- Again the volume of missing data is disappointing but assessors felt the decision to withhold on clinical grounds was appropriate in the majority (68.0%) of cases.
- In 15 (5.0%) cases the assessors felt that the patient would have benefited from receiving DVT prophylaxis.
- In the 195 cases that underwent both first-line and second-line assessment, and VTE data was available, the agreement between first and second-line assessors on appropriateness of VTE prophylaxis given was 65.7%.

2.5.2 Adequacy of provision of critical care support to patients

The treating surgeon is asked to record if their patient received critical care support before or after surgery. The first and second-line assessors review the appropriateness of the use of critical care facilities for patients.

Figure 42: Provision of critical care support during the audit period

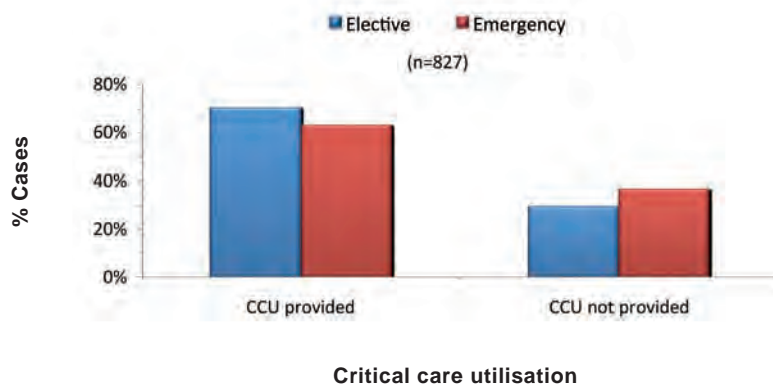


Note: Missing data 286 (25.7%)

Comments:

- Volume of missing data is disappointing 286 (25.7%). The question was reframed in 2010 to make it more informative and user friendly.
- 532 of the 1,113 cases (47.8%) received critical care support during their admission.
- Critical care utilisation has slightly increased over time yet did not reach statistical significance ($p = 0.87$).

Figure 43: Provision of critical care support by admission type



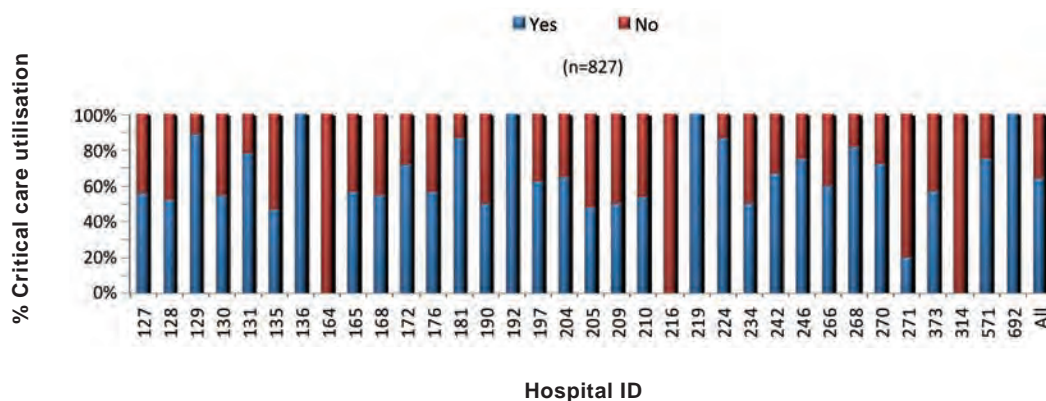
Note: Missing data 286 (25.7%)

Comments:

- Use of critical care support is similar among elective and emergency cases.



Figure 44: Provision of critical care support by hospital

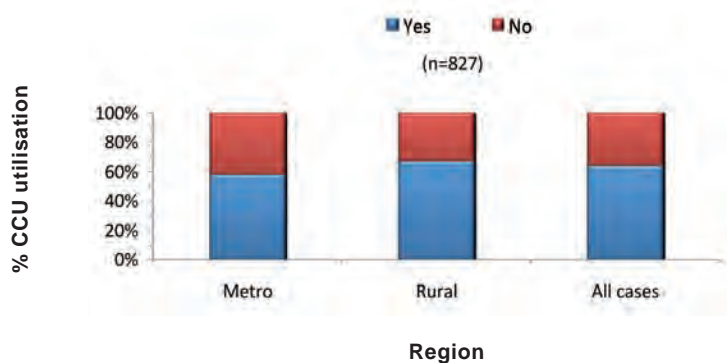


Note: Missing data 286 (25.7%)

Comments:

- It should be acknowledged that not all hospitals have critical care services and triage patients accordingly.

Figure 45: Provision of critical care support by region

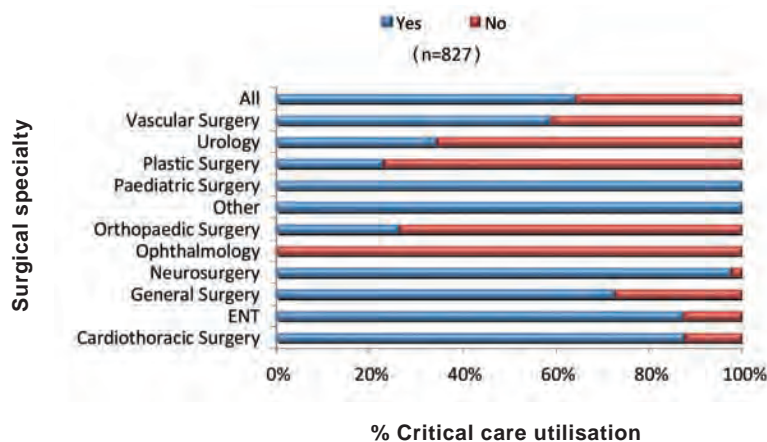


Note: Missing data 286 (25.7%)

Comments:

- The above graph shows minor, insignificant ($p=0.55$) difference in the provision of critical care support between metropolitan and rural regions.

Figure 46: Provision of critical care support to patients by specialty



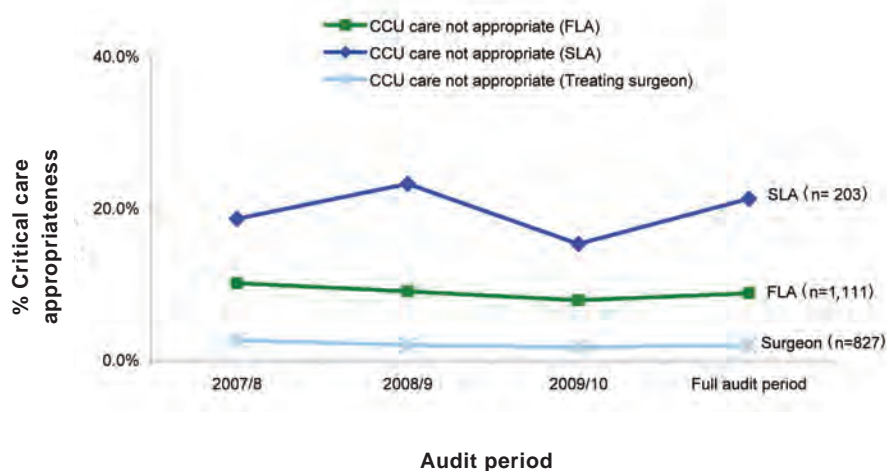
Note: Missing data 286 (25.7%)

Other specialties are Trauma, Transplant, Oncology, Otolaryngology and Gynaecology

Comments:

- Similar to previous years orthopaedic patients have low referral rates for critical care support. This is postulated to be due to the high number of elderly patients with fractured necks of femur from high level care institutions.⁽¹⁴⁾

Figure 47: Surgeon and assessor perception of appropriateness where critical care support provided



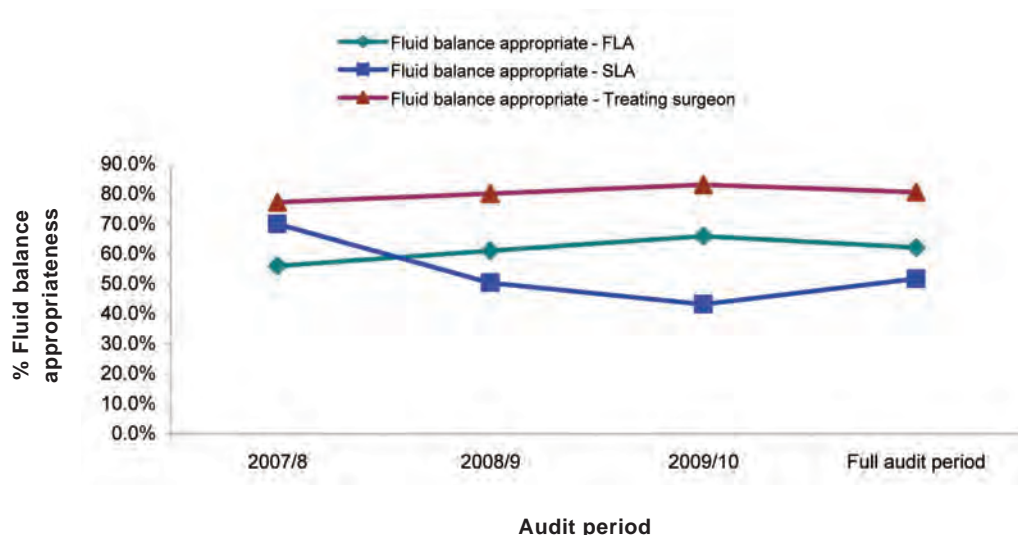
Comments:

- The treating surgeon felt lack of provision of critical care support was an issue in only a small percentage of cases.
- The peer-review process (first and second-line assessment) concluded that more of the patients who did not receive critical care support would have benefited from critical care support.
- The percentage rose with the depth of assessment performed. Second-line assessors felt that a greater percentage would have benefited than first-line assessors. It should be acknowledged that second-line assessors had full access to the patient medical records while first-line assessors were relying on the surgical case record form completed by the surgeon only.
- From a Melbourne-based Australian study, the use of critical care is higher in older patients with comorbidities and postoperative complications. This places considerable demands on critical care services. Such patient factors are often stronger predictors of mortality than the type of surgery.⁽⁸⁾



2.5.3 Issues with fluid balance

Figure 48: Perception of fluid balance appropriateness



Note: Missing data 286 (25.7%)

Comments:

- The treating surgeon and all assessors are asked to comment on appropriateness of fluid balance during the episode of care.
- In 81.0% of cases the treating surgeon felt that fluid balance had been managed appropriately.
- Of the 1,113 cases that have available data and completed the peer-review process, the first-line assessors found 62.1% of the cases had no issues of fluid balance management, and in the secondline assessment pool of 195 cases a total of 51.7% reported no issues of fluid balance management.
- The fluid balance appropriateness comparison agreement between first and second-line assessor was moderate (43.7% with a kappa score 0.14).
- Fluid balance was assessed as inappropriate by the first and second-line assessors in a very small number of cases (29, 2.6%).

Key points

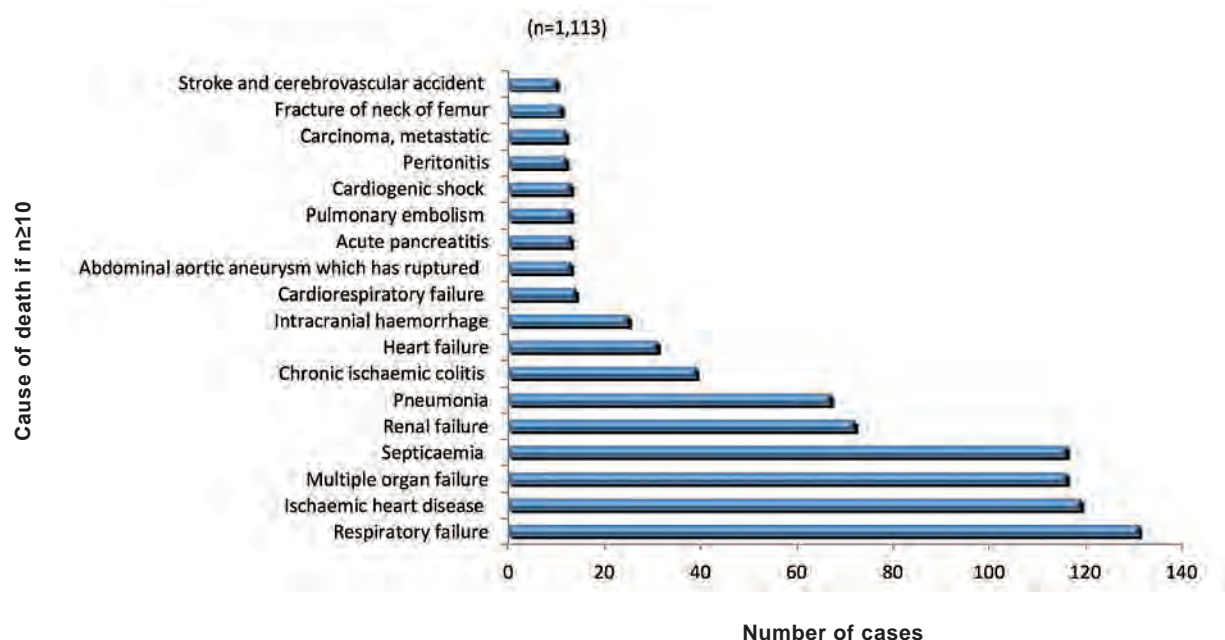
- It is important that surgical patients receive VTE prophylaxis where appropriate. The provision of VTE prophylaxis has improved with some form of VTE prophylaxis being provided in 69.4% cases. Inadvertent omission of prophylaxis was rare, only occurring in 3.0% of cases.
- In the majority of cases where VTE prophylaxis was withheld, the assessor agreed with the decision.
- In total 47.8% of patients in this audited series received critical care support during the clinical course of their illness. In the majority of instances those perceived to benefit from critical care support received it.
- There was a perception by second-line assessors that 19.0% of the cases that did not receive critical care support might have benefited from such support. The first line assessors perceived this to be the case in a smaller percentage.



2.6 Causes of death reported in audited cases

The treating surgeon records the probable cause of death as evidenced by the clinical features leading up to death.

Figure 49: Frequency of reported causes of death



Comments:

- There were 1,524 conditions perceived to be responsible for death recorded in 1,113 cases.
- Cardiac factors (heart failure, cerebrovascular incident, ischaemic heart disease, cardiorespiratory failure and cardiogenic shock) 180 (16.2%), respiratory failure 131 (11.7%), multiple organ failure 116 (10.4%), and septicaemia 116 (10.4%) were most frequently cited. These conditions accounted for 543 (48.8%) of deaths in this 1,113 audit series.
- A further 697 (62.6%) other conditions felt to be responsible for death were reported. As the individual frequencies of each are less than five they have not been listed.

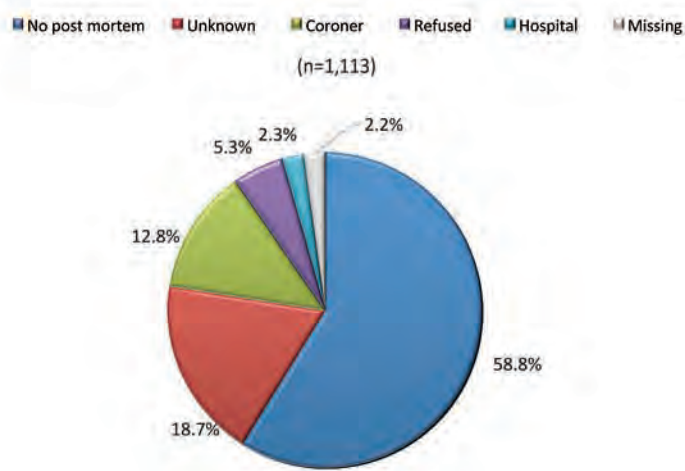


2.7 Establishing the cause of death

The cause of death recorded by the treating surgeon is based on the clinical course of the patient and any relevant supporting evidence from investigations. Where doubt exists around the circumstances leading to death, the case will be referred to the Coroner. In other instances, where the cause of death is not clear, a postmortem examination may be requested. This latter method of confirming cause of death is requested with decreasing frequency.

2.7.1 Postmortem rate

Figure 50: Postmortem utilisation by urgency status



Comments:

- The number of postmortems performed, including coronial ones, is very low at 168 (15.0%) instances in 1,113 cases. This figure may be of concern to some as postmortems are deemed to provide educational information and valuable insights.
- The pattern of referral to the Coroner or request for postmortem is similar for elective and emergency admissions (data not shown in this graph).
- There is no difference in hospital or region in referral pattern by admission type.
- The majority of postmortems were coronial and occurred in deaths associated with emergency admissions.

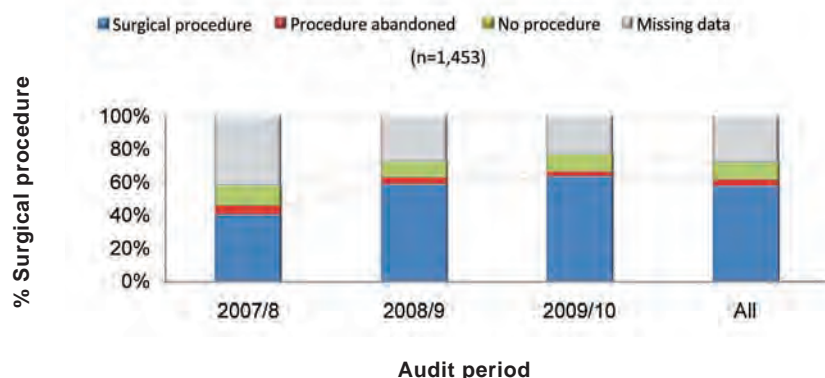
Key points

- Cardiac failure and respiratory failure are cited as the most frequent causes of death. This is congruent with the risk profile described for this series of patients.
- These reasons for death are based on the clinical course to death.
- The low rate of postmortems does not allow confirmation of these diagnoses.

2.8 Profile of operative procedures

This examines the frequency and timing of surgical procedures, the seniority of the surgeon performing them and the need for reoperation.

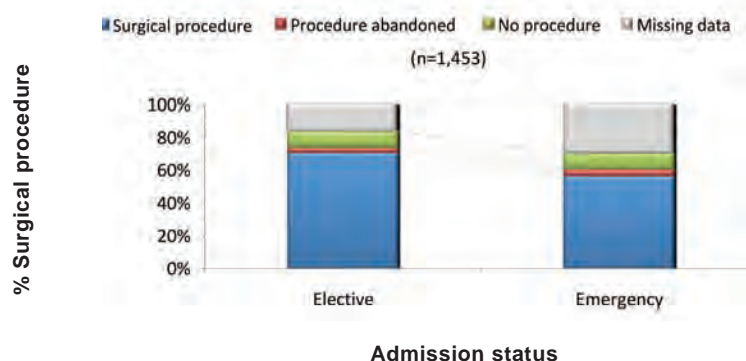
Figure 51: Operative procedures performed



Comments:

- There is no significant change in the rate of operative intervention over the audit period ($p = 0.72$).

Figure 52: Operative intervention by urgency type

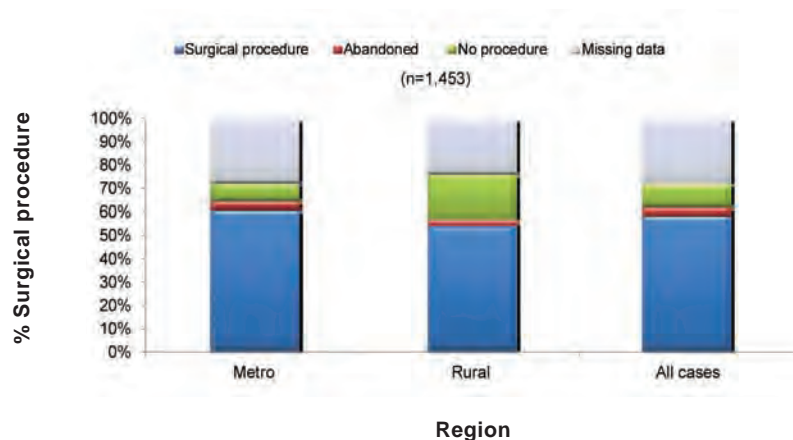


Comments:

- Patients admitted as elective admissions and who subsequently died had a higher rate of operative intervention than those admitted as emergencies ($p < 0.0001$). This is not unexpected as most elective admissions to a surgical unit are for an operative procedure.
- Sometimes during surgery it is deemed inappropriate to continue with the procedure as there is no prospect of even short-term survival of the patient due to the extent of the disease process. This was necessary in a very low percentage of audited cases (60 cases, 4.1%).
- Deaths where no operative intervention occurred were mainly associated with emergency admissions. In such cases there was usually an 'active' decision not to operate.
- From a Queensland-based Australian study, it was identified that many patients are still being subjected to unnecessary investigations and interventions in the last days of life and concluded that the reluctance on the part of many doctors and patients to accept palliative care reflects a natural desire to avoid death.⁽¹¹⁾
- In a 2010 report by EoL, Palliative Care Australia, the need to reduce the number of patients accessing the public hospital system, particularly the emergency department, for palliation was identified.⁽¹²⁾



Figure 53: Operative intervention by region

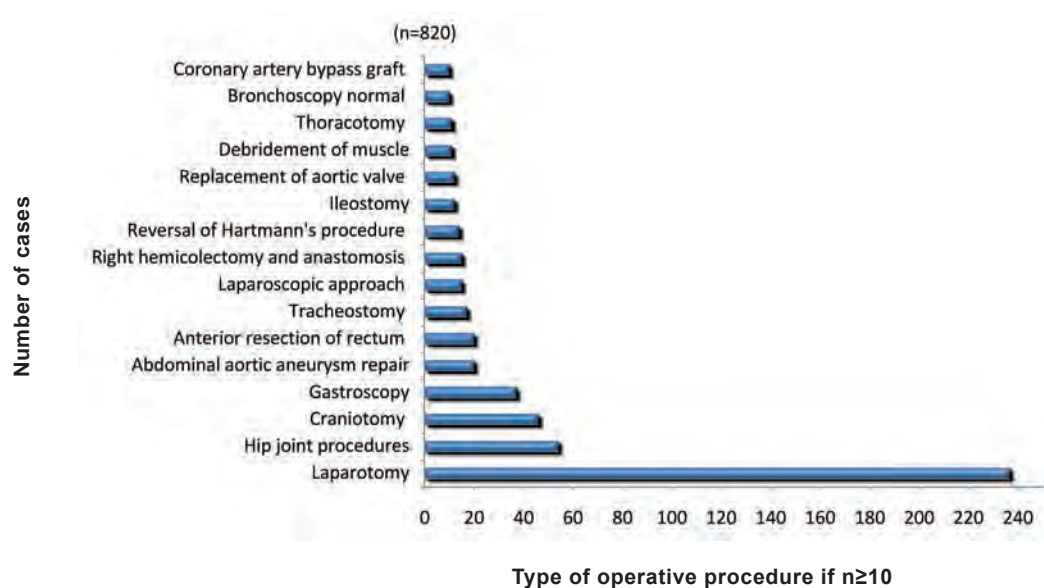


Note: missing data n=409 (28.1%)

Comments:

- There are no major differences between rural and metropolitan areas.

Figure 54: Frequency of individual surgical procedures reported (if n ≥ 10)



Comments:

- During 1,453 separate episodes of surgery in 1,113 patients there were 1,752 procedures. A patient can undergo multiple procedures during the same admission and at the same surgical session.
- Only procedures with a frequency >10 are recorded here. There were also 293 'Other' procedures recorded.
- The most frequent procedures reported are usually associated with emergency admission for trauma or acute abdominal pathology.
- The term 'Hip joint procedures' includes fractures of the neck of the femur.

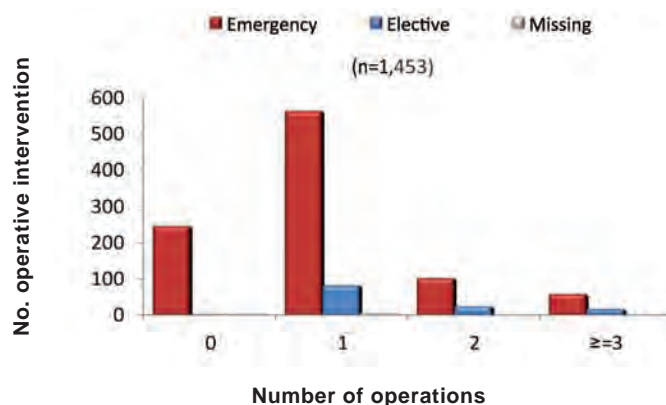
Figure 55: Frequency of operative intervention by hospital



Comments:

- These figures reflect the general distribution of operative interventions by hospital in the aggregate data. A number of the hospitals represented here do not perform emergency surgery.
- Not all patients underwent surgery.

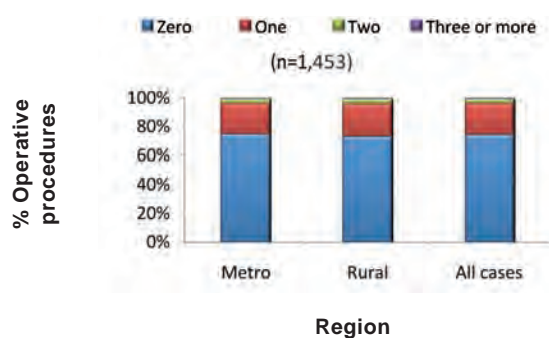
Figure 56: Operative procedures by urgency type



Comments:

- The frequency of multiple interventions is slightly higher in patients admitted electively, although the high proportion of emergency cases may skew the data. We are unsure of why elective patients have more multiple interventions; it might reflect reintervention or 'staged' procedures.

Figure 57: Frequency of multiple operative procedures by region

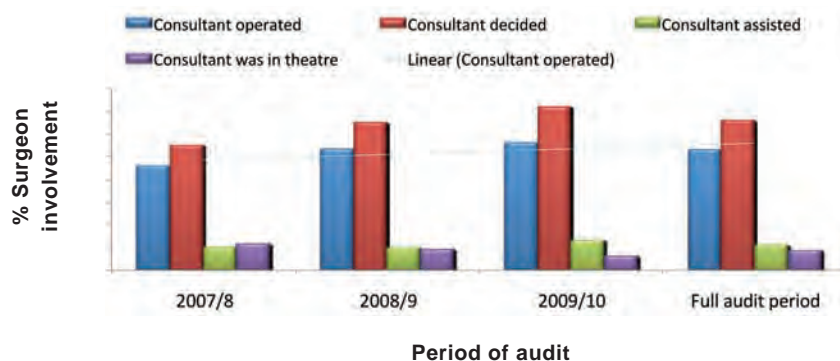


Comments:

- The frequency of multiple interventions was similar in metropolitan and rural regions.



Figure 58: Seniority of surgeons deciding on and performing surgery

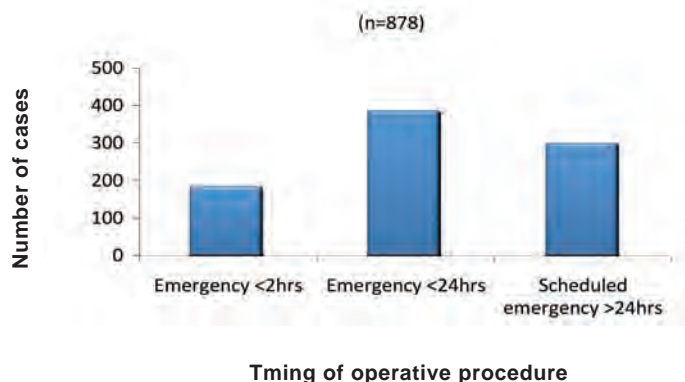


Comments:

- A consultant surgeon performed the surgery in 54.0% of cases and took the decision to proceed to surgery in more than 60.0% of instances. This bias towards consultants is appropriate when the risk profile of the audited cases is considered. The increase in active participation by consultants over time has not reached statistical significance ($p=0.82$).⁽¹³⁾
- A consultant anaesthetist was present in 795 (71.4%) of the 1,113 cases (data is not shown).

2.8.1 Timing of emergency procedures

Figure 59: Timing of operative procedures in emergency admissions



Comments:

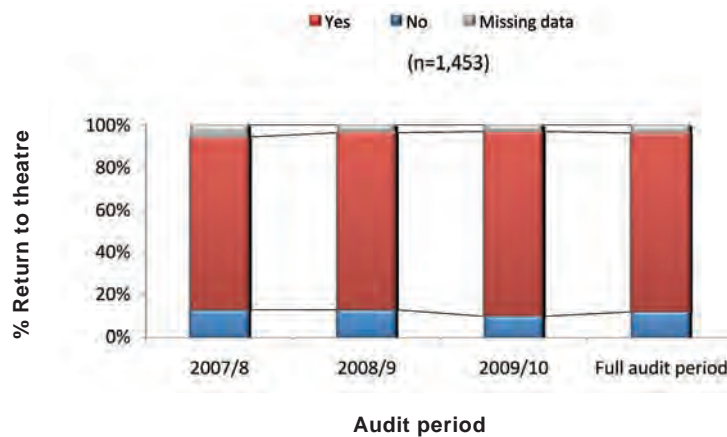
- The time criticality of a patient's condition predicts the timing of emergency surgery. Of 878 emergency admissions, 187 (21.3%) had surgery within 2 hours of admission, 389 (44.3%) had surgery within 24 hours and 302 (34.4%) after 24 hours.
- This means 576 (65.6%) of the 878 emergency admissions to a surgical unit required surgery within 24 hours of admission. The scheduling problems associated with managing these urgent cases and the elective workload remains an issue for hospitals.
- The Victorian Department of Health has published an excellent literature review entitled 'Good practice in management of emergency surgery' (http://www.health.vic.gov.au/surgery/good_practice.pdf).⁽¹⁾ According to a 2010 report on the status of Australian public hospitals, emergency surgery occurs in the most urgent or critical cases and generally needs to be performed within 24 hours. In 2008-09, over 262,000 emergency surgeries were performed with the majority carried out in public hospitals.⁽¹⁴⁾ This has led to the development of 'acute surgical units' in some areas. Such units have preferential access to the operating suits to expedite treatment. Strategies to manage this issue have been proposed and the College has contributed to the topic with a position paper on the issue.⁽¹⁵⁾



2.8.2 Unplanned return to the operating room

An unplanned return to the operating room is usually necessitated by the development of a complication requiring further return operative intervention.

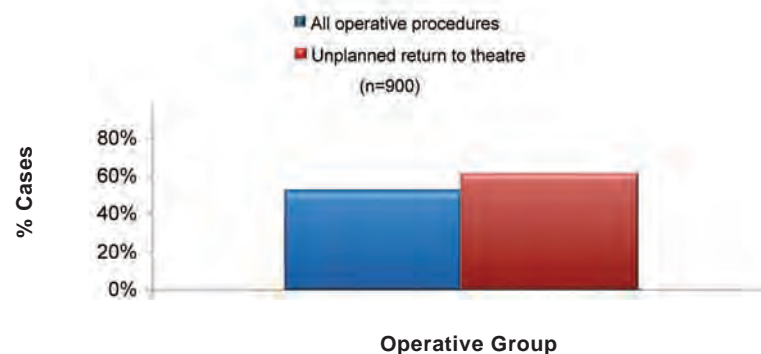
Figure 60: Unplanned return to operating room



Comments:

- An unplanned return to the operating room was reported in 132 (14.7%) of 900 cases where patients underwent a surgical procedure of the 1,113 cases reported to VASM. This percentage appears constant over time.

Figure 61: Seniority of surgeons performing surgery at unplanned return to operating room

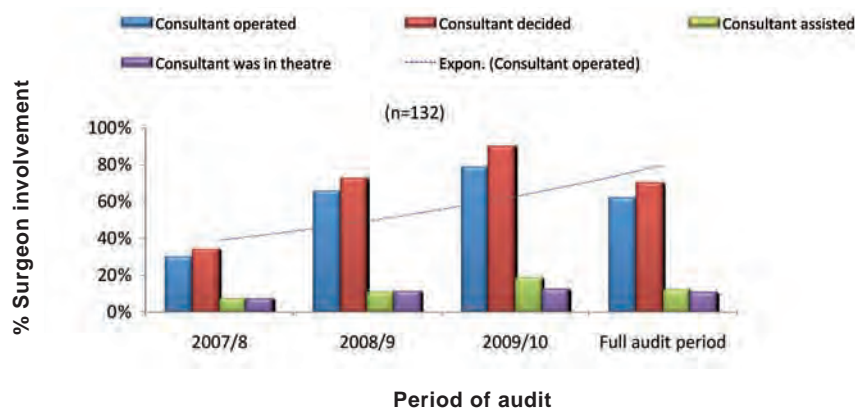


Comments:

- Active consultant participation is higher in cases with unplanned return to the operating room. Active consultant participation in unplanned returns to the operating room has increased significantly with time ($p < 0.001$).
- This is appropriate as such cases are more challenging and the risks are greater.



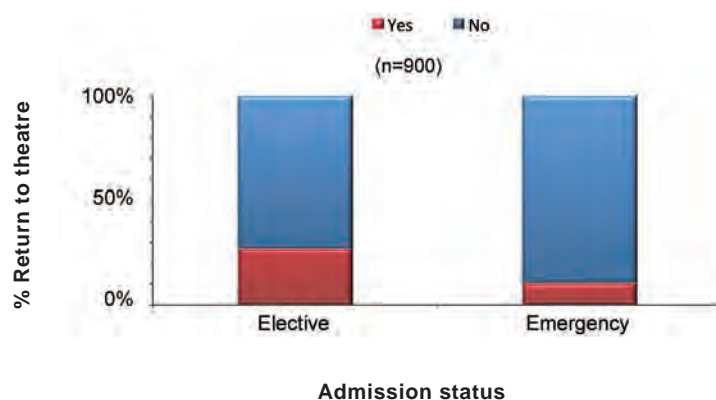
Figure 62: Seniority of surgeons performing unplanned procedures



Comments:

- Active consultant participation in unplanned returns to the operating room has increased significantly with time ($p < 0.001$). This may also be an indication of the increase in surgeon participation in the VASM audit since inception.
- A relative lack of consultant input at such unplanned procedures was an early finding of the Scottish Audit of Surgical Mortality (SASM).⁽²⁾ Subsequent reports demonstrated a marked improvement in consultant involvement.⁽¹⁰⁾

Figure 63: Unplanned return to the operating room by urgency status

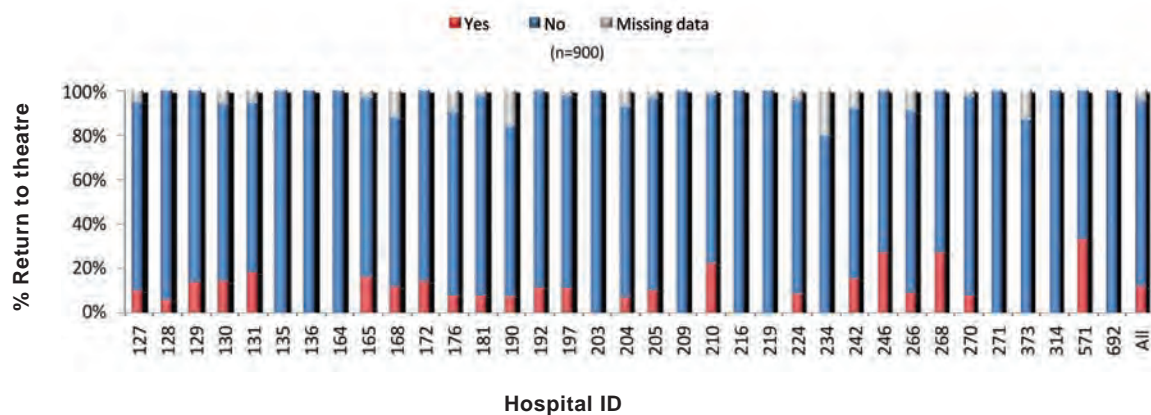


Comments:

- The unplanned return to the operating room in the elective group is higher than in the emergency group ($p = < 0.001$).
- In 65.0% of elective cases a consultant surgeon performed the initial surgery versus 51.0% in emergency cases. The higher rate of unplanned return to the operating room for elective cases is unanticipated, especially with the higher rate of consultant involvement at the initial procedure. This trend will be monitored.
- In this audited series the majority of deaths occurred in emergency admissions (88.4% versus 11.6%).



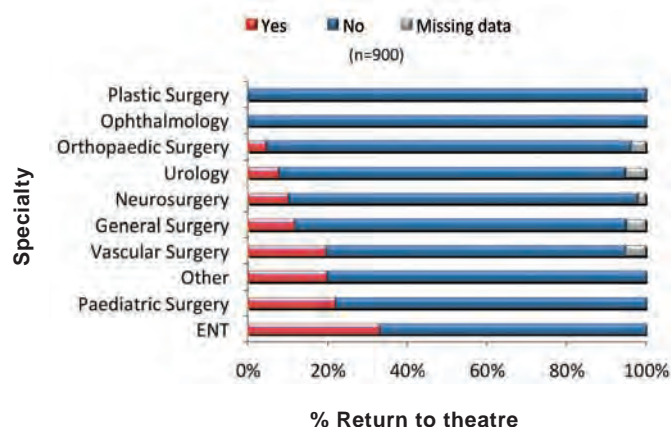
Figure 64: Unplanned return to the operating room by hospital



Comments:

- An unplanned return to the operating room was reported in 132 (14.7%) of these audited cases. The incidence varies among hospitals. The variance is most likely explained by the case-mix of patient and specialty services available.

Figure 65: Unplanned return to the operating room by surgical specialty

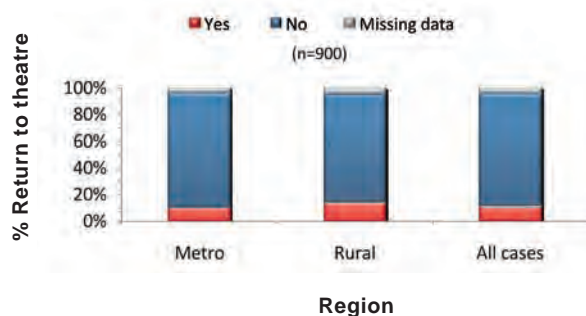


Note: Other specialties are Trauma, Transplant, Oncology, Otolaryngology and Gynaecology

Comments:

- Unplanned return to the operating room varies among specialties.

Figure 66: Unplanned return to the operating room by region

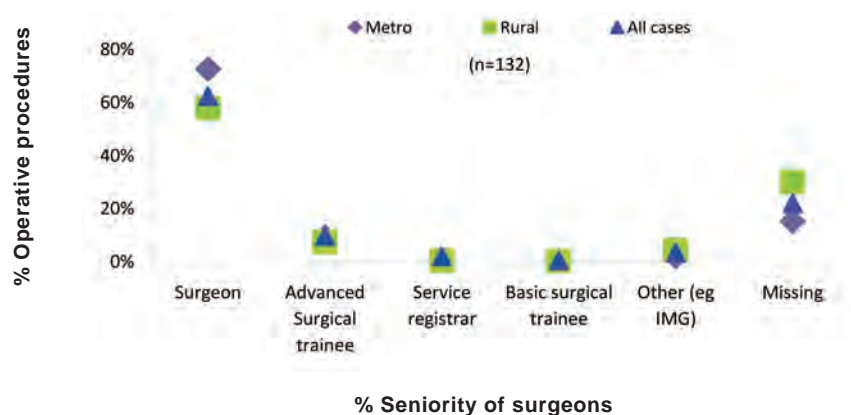


Comments:

- The frequency of unplanned procedures was similar between metropolitan and rural regions.



Figure 67: Seniority of surgeons performing unplanned procedures by area



Comments:

- There were no major differences in unplanned return to the operating theatre between rural and metropolitan regions ($p=0.68$).

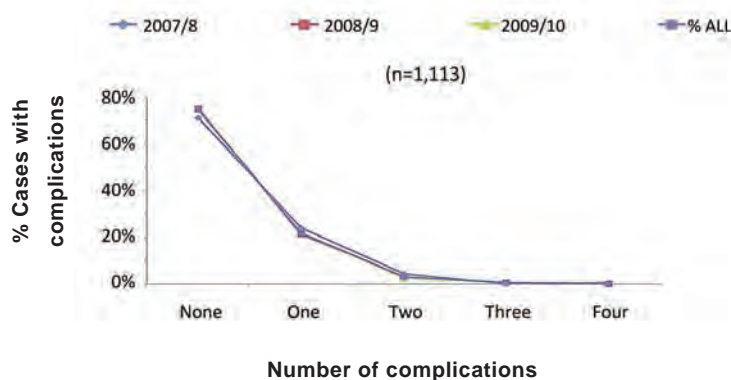
Key points

- A patient can undergo a number of procedures during the one admission and at the same surgical session. During 1,453 separate episodes of surgery in 900 of the 1,113 audited cases, 1,752 operative procedures were recorded.
- The most frequent procedures reported are associated with emergency admission for trauma or acute abdominal pathology.
- A consultant surgeon performed the initial surgery in 54.0% of cases and took the decision to proceed to surgery in more than 60.0% of instances.
- Similar to previous reports, 576 (65.6%) of the 878 emergency admissions to a surgical unit required surgery within 24 hours of admission. The scheduling problems associated with managing these urgent cases and the elective workload remains an issue for hospitals.
- An unplanned return to the operating room, usually necessitated by the development of a complication, was reported in 132 (14.7%) of 900 patients of the 1,113 audited cases. This percentage appears constant over time.
- Active consultant participation is higher in cases with unplanned return to the operating room and has increased significantly over the audit period ($p < 0.001$).



2.9 Postoperative complications

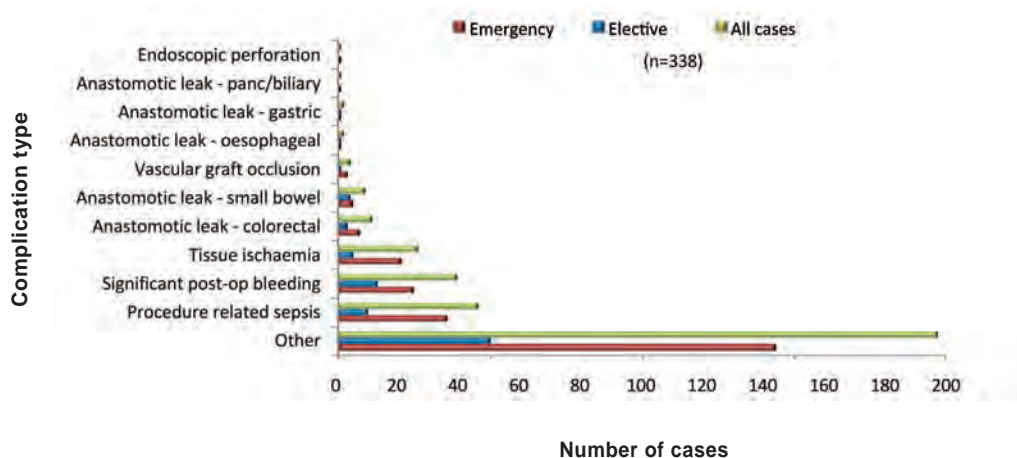
Figure 68: Postoperative complications recorded by treating surgeon



Comments:

- The treating surgeon is asked to record any postoperative complications.
- The low rate of postoperative complications reported by treating surgeons remains constant throughout the audit period. No complications were recorded in 828 (74.4%) and one complication in 242 (21.7%) of the 1,113 cases audited.

Figure 69: Frequency of specific postoperative complications by urgency status

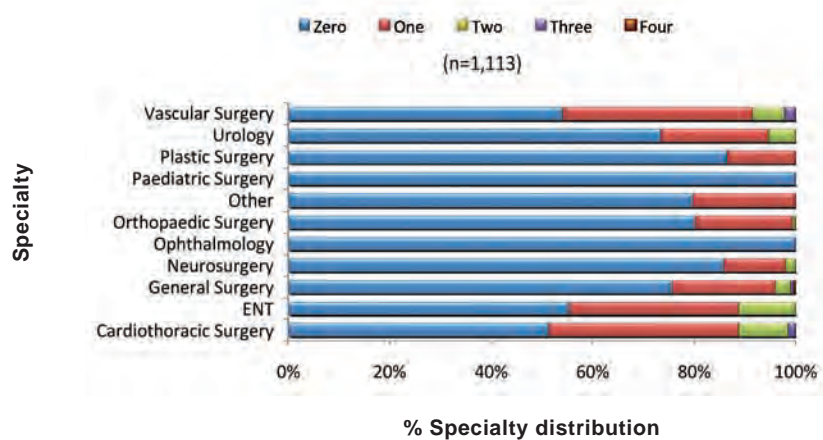


Comments:

- 197 other complications were identified, including myocardial failure, intrapulmonary haemorrhage, intracerebral bleed, hypoxia post operation, acute or chronic renal failure, paraplegia, liver failure, pneumonia, perforated viscus, pulmonary embolism, pyelonephritis, renal failure, respiratory failure, seizures, sepsis, stroke and wound haematoma.⁽⁸⁾
- Sepsis accounted for 46 (13.6%) of the 338 complications, postoperative bleeding accounted for 39 (11.5%), tissue ischaemia for 26 (7.7%) and all forms of anastomotic leak for 25 (7.4%) cases.



Figure 70: Postoperative complications by specialty

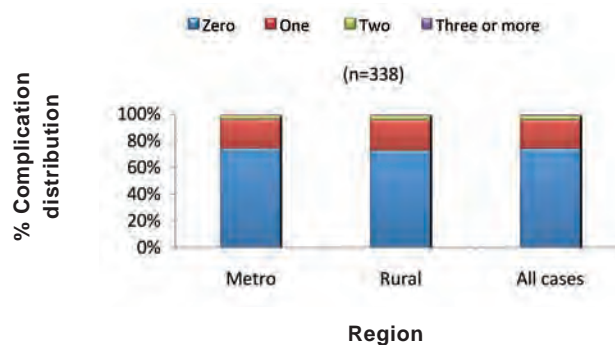


Note: Other specialties are Trauma, Transplant, Oncology, Otolaryngology and Gynaecology

Comments:

- There were no major differences in the rate of postoperative complications by specialty, when the number of patients in each category is factored in.

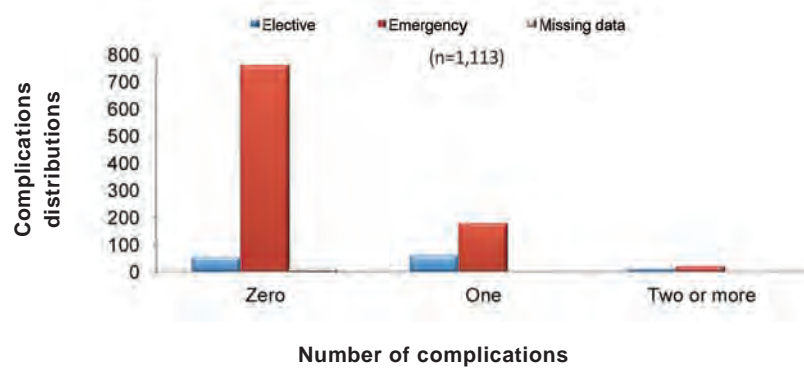
Figure 71: Postoperative complications by region



Comments:

- There were no major differences between the rate of postoperative complications in rural and metropolitan regions.

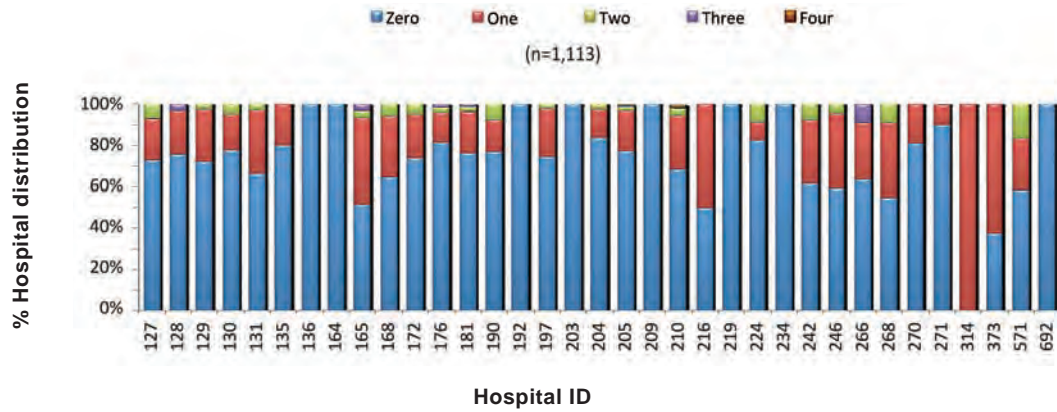
Figure 72: Postoperative complications by urgency status



Comments:

- In the majority of cases no postoperative complications were reported.

Figure 73: Postoperative complications by hospital



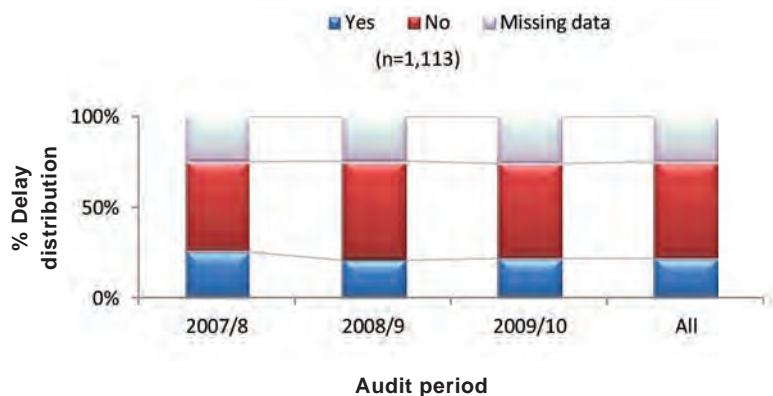
Comments:

- The reported rate of postoperative complications varies slightly between specialties, hospitals and regions.



2.10 Anaesthetic problems

Figure 74: Anaesthetic delays



Comments:

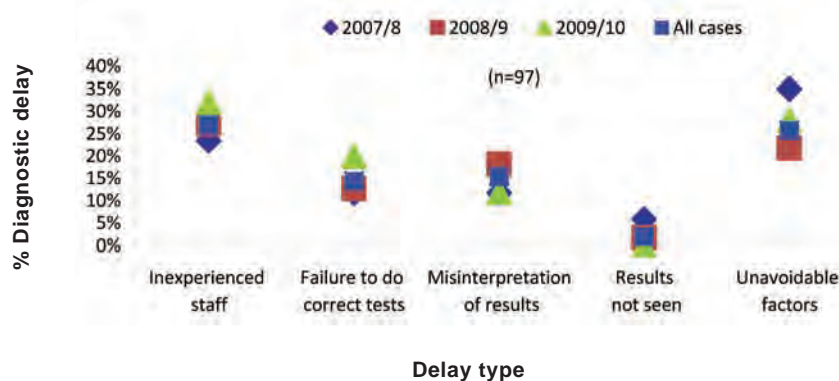
- The number of delays identified during the audit series was 242 (21.7%) and the trend was similar during the full audit period. The reasons for such delays are not stated.

Key points

- The low rate of postoperative complications reported by treating surgeons remains constant throughout the audit period. No complications were recorded in 828 (74.4%) and one complication in 242 (21.7%) of the 1,113 cases audited.

2.1.1 Delay in diagnosis

Figure 75: Perceived delays in establishing a diagnosis



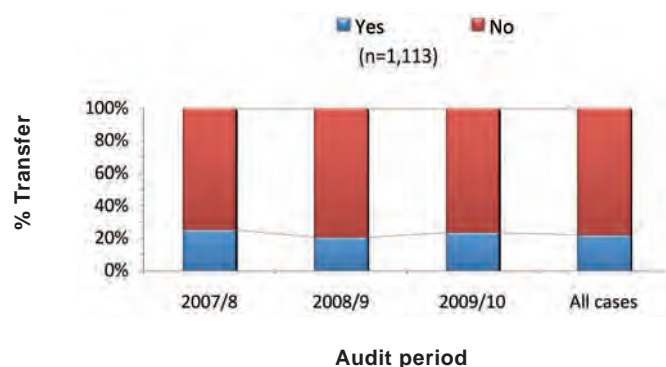
Comments:

- Treating surgeons are asked to record any perceived delays in establishing a diagnosis and proceeding to definitive treatment.
- The treating surgeons identified delays in establishing the diagnosis in 97 (8.7%) of the 1,113 audited cases. This rate has remained constant with time.
- When cases were submitted to the peer-review process the incidence of delay in establishing a diagnosis rose to 21.3%.
- Such delays in establishing the true diagnosis necessary for directing definitive treatment are a concern.
- It is important to note that these delays in establishing the diagnosis are not always attributable to the surgical team.

2.1.1.1 Patient transfer issues

The treating surgeon is asked to provide information on patients who required inter-hospital transfer as part of their care. This includes timeliness and appropriateness of transfer.

Figure 76: Patients requiring transfer to another hospital

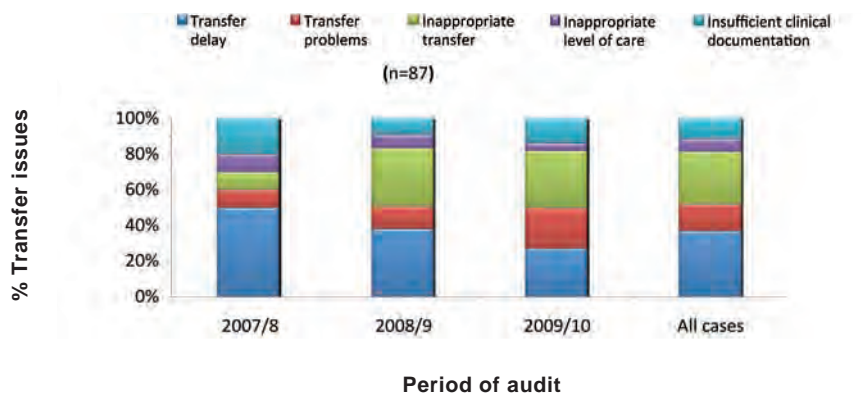


Comments:

- There were 242 (22.0%) instances in the audited series of 1,113 cases where patients needed transfer to another hospital. The reasons for transfer are not required and therefore often are not recorded.
- The need for patient transfer has remained constant throughout the audit period.



Figure 77: Care of patient during transfer to another hospital



Comments:

- Issues of care related to patient transfers were identified in 87 (36.0%) of 242 patients requiring transfer. This rate is constant over time. This graph demonstrates the spectrum of issues identified by surgeons.
- The level of care provided during transfer was deemed appropriate in 61 (70.0%) of the 87 cases.
- It was felt that adequate clinical information had been provided to the receiving hospital in 77 (88.5%) of the 87 cases.
- In a further 26 (29.9%) it was felt that the transfer had occurred inappropriately late in the course of the illness.
- The Victorian Major Trauma Transfer Study (2009) suggests that there is a 'considerable variability in request for transfer and transfer times, transfer escorts and mortality risks exist'.⁽¹⁶⁾

Key points

- Inappropriate delay in transfer to a surgical unit was the major issue associated with transfer of a patient.
- The peer-review process suggests the incidence of delay in establishing a diagnosis necessary for confirming definitive treatment is 21.3%. Such delays are a concern. It is important to note these delays are not always attributable to the surgical team.



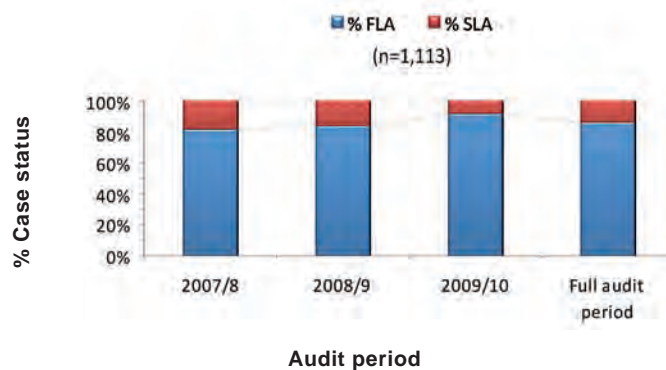
3. Peer-review outcomes

The VASM peer-review process is a retrospective examination of the clinical management of patients who died while under the care of a surgeon. All assessors (first and second-line) must decide if the death was a direct result of the disease process alone, or if aspects of the management of the patient may have contributed to the outcome. First-line assessments were completed in 1,113 cases. Each first-line assessor had to decide if the treating surgeon had provided adequate information to allow a conclusion to be reached. If the information is deemed inadequate then a second-line assessment or case note review is requested. Other triggers for requesting second-line assessment are:

- More detailed review of the case, which could better clarify events leading up to death and any lessons emanating from the case under review.
- Unexpected death, for example in a young, fit patient with benign disease or a day surgery case. The number of second-line assessments required because of a lack of information provided in the case record form is an indirect measure of surgeon compliance in the audit process. Second-line assessments required for the other triggers are more likely to represent suspected issues of clinical management.

3.1 Second-line assessments

Figure 78: Referral for second-line assessment

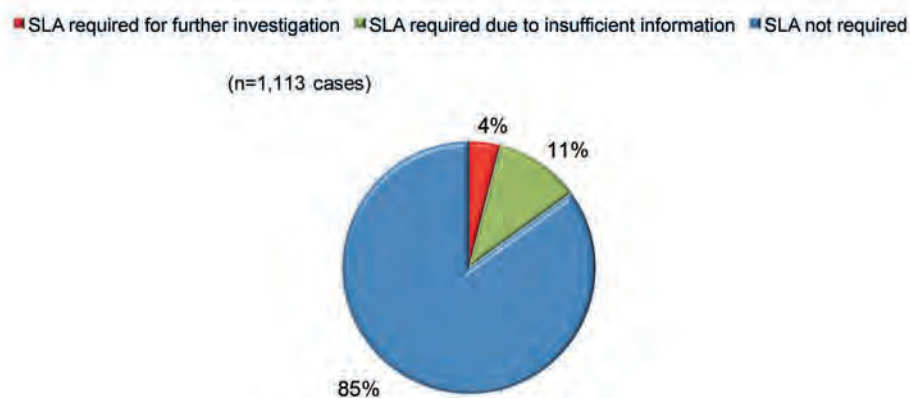


Comments:

- Second-line assessment was only requested in 195 (17.5%) of 1,113 cases. This is similar to other states. (3, 4, 5, 6)
- The requirement for second-line assessment has decreased over time. The percentage of cases referred for second-line assessment dropped from 18.0% in 2007/8 to 8.6% in 2009/10.
- Cases with an ASA>4 were more likely to be referred for second-line assessment; this is statistically significant with a $p < 0.001$.



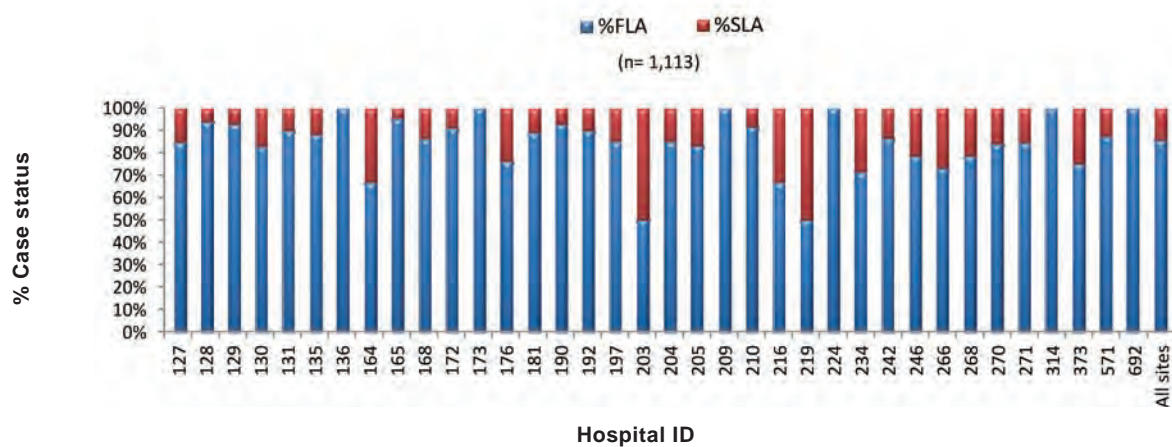
Figure 79: Reason for referral for second-line assessment



Comments:

- Insufficient clinical information provided by the treating surgeon was the most common trigger for second-line assessments (11.0%). The remaining 4.0% required more detailed review for perceived issues of management.
- This issue with the quality of the data provided by some treating surgeons is ongoing and unfortunate. Greater attention to detail in completing the case record form can help reduce the workload of colleagues who have agreed to act as first and second-line assessors.

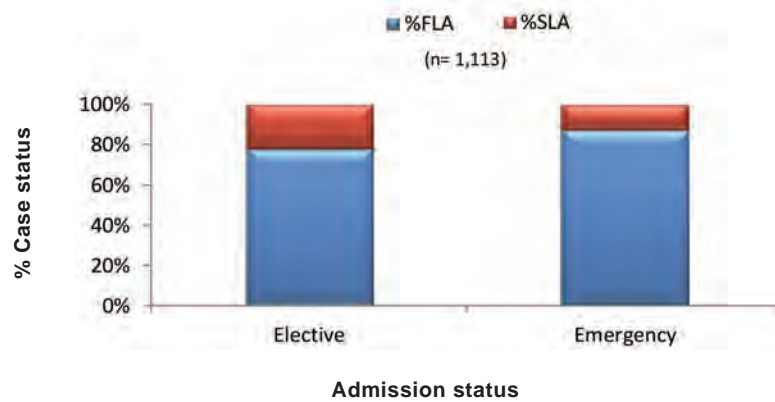
Figure 80: Frequency of need for second-line assessment in individual hospitals



Comments:

- The frequency of case referral for second-line assessment varies slightly between hospitals.

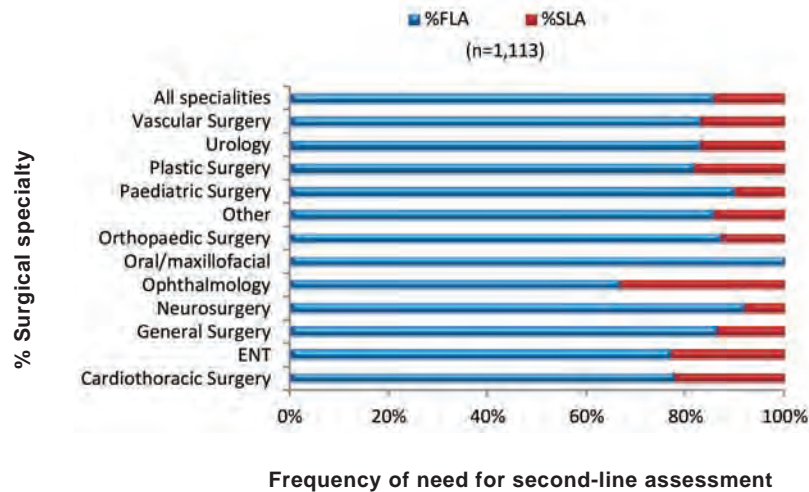
Figure 81: Frequency of need for second-line assessment by admission type



Comments:

- There is no significant difference in frequency of request for second-line assessments in elective or emergency cases.

Figure 82: Frequency of need for second-line assessment in surgical specialties



Comments:

- The need for second-line assessment is similar between specialties. No inferences are made.
- The need for referral for second-line assessment is similar in metropolitan and rural regions data is not shown in this graph.

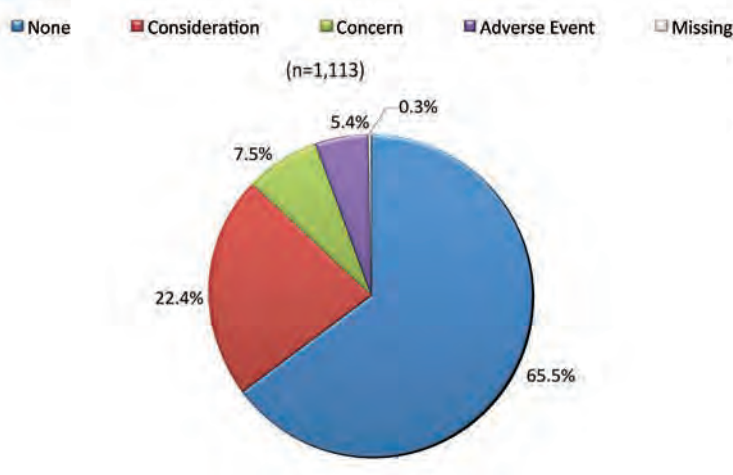


3.2 Clinical management issues

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

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

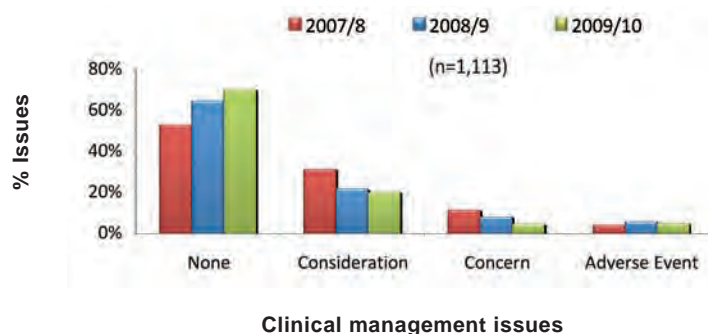
Figure 83: Clinical management issues as perceived by assessors



Comments:

- In 718 (64.5%) of the 1,113 cases that completed the audit process, no or only minor issues of patient management were perceived to have occurred.
- In 60 (5.4%) of the 1,113 cases, assessors felt the clinical issues were serious enough to be called adverse events.
- In 7.5% of cases areas of concern were identified.
- The prevalence of issues perceived by assessors was similar in both rural and metropolitan regions (data is not shown in this graph).
- The prevalence of areas of concern and adverse event perceived by assessors is similar across rural and metropolitan regions.

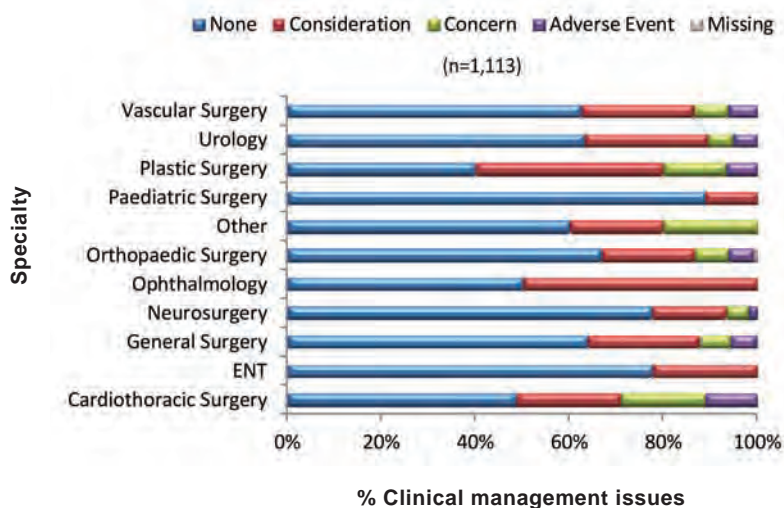
Figure 84: Spectrum of clinical management issues during the audit period



Comments:

- There is an apparent reduction in the rate of clinical issues identified in 2009/10 that has reached statistical and clinical significance ($p=0.013$).
- In 2007/8, no clinical management issues were identified for 52.5% of patients. In 2008/9 this figure rose to 64.3% and in 2009/10 a total of 69.8% of cases had no clinical management issues raised.

Figure 85: Spectrum of clinical management issues by specialty



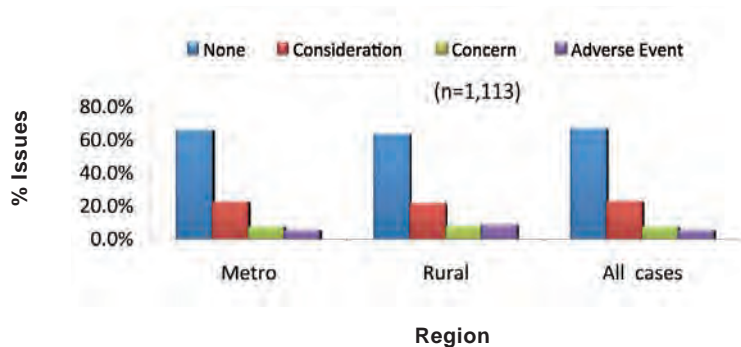
Note: Other specialties are Trauma, Transplant, Oncology, Otolaryngology and Gynaecology

Comments:

- The prevalence of areas of concern and adverse events identified by assessors is similar among the specialties.



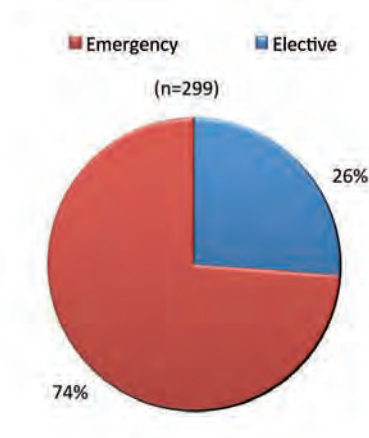
Figure 86: Spectrum of clinical management issues by region



Comments:

- The prevalence of areas of concern and adverse events perceived by assessors is similar among the regions.

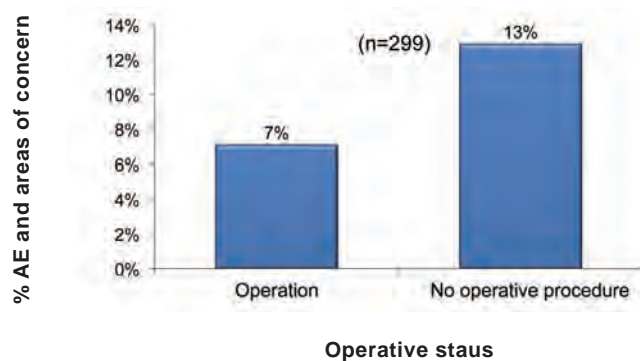
Figure 87: Frequency of clinical management issues by urgency type for areas of concern and adverse event group



Comments:

- 74.0% of significant issues of clinical management were associated with emergency admissions and 26.0% with elective cases.
- It should be remembered that 88.0% of cases were emergency admissions.

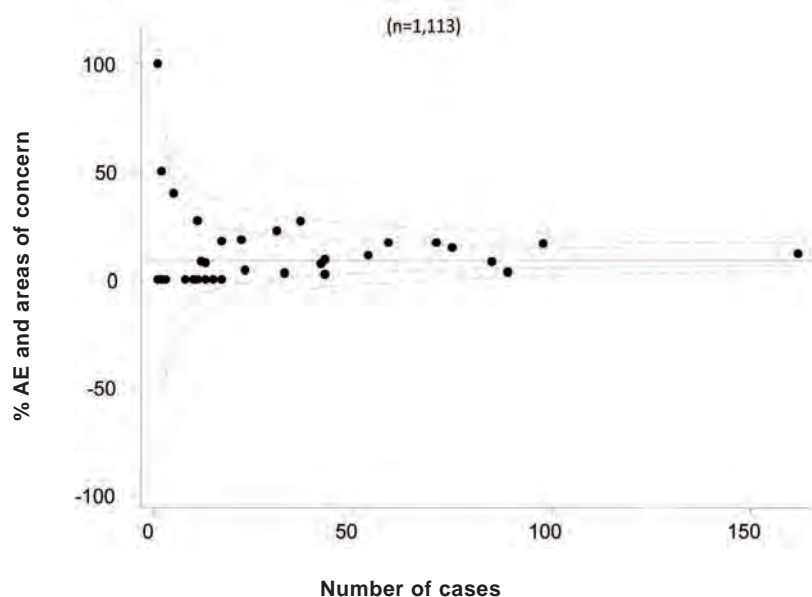
Figure 88: Adverse events (AE) and areas of concern by operative status



Comments:

- Cases where no operative procedure occurred had a higher rate of areas of concern and adverse events identified (13.0%) than cases where an operative procedure occurred (7.0%). These differences are statistically significant ($p < 0.01$).
- Cases where the consultant surgeon had no involvement in the surgery, for example, not operating, deciding, assisting or being present in theatre, had a higher rate of areas of concern and adverse events (23.0%) than those where a consultant was involved in the operative procedure (13.0%), but this difference did not reach significance ($p = 0.11$).

Figure 89: Adverse events (AE) and areas of concern by hospital during the audit period

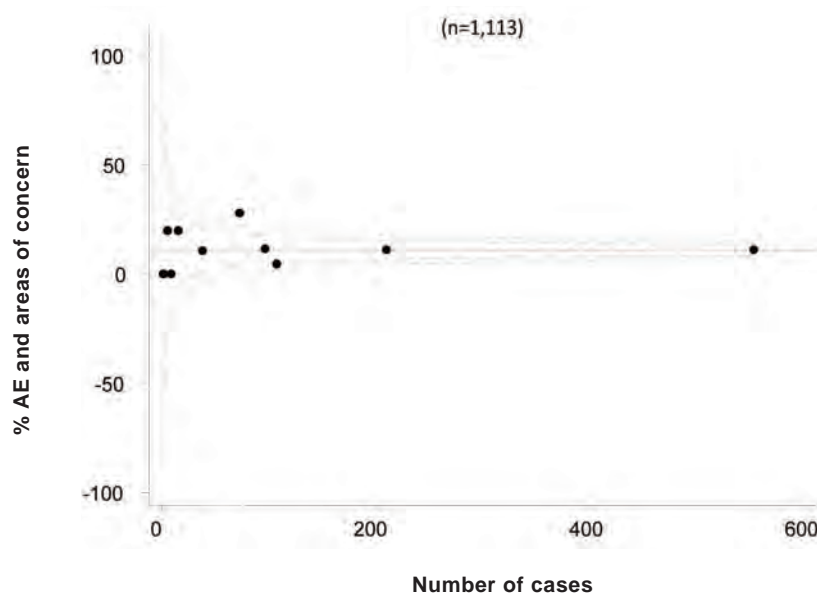


Comments:

- Where cases have undergone both first and second-line assessment, only the second-line assessment was included in the analysis above (Figure 89).
- None of the hospitals is outside the 3 Standard Deviation (SD) limit.
- If an assessor flags an area of concern or adverse event this implies significant criticism. In this funnel plot we have combined these to look at the prevalence of this degree of criticism among hospitals.



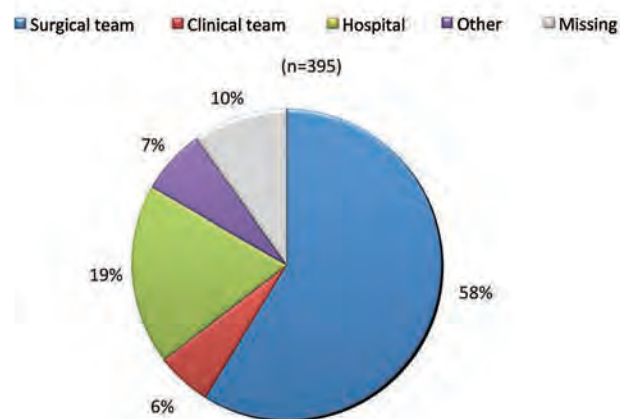
Figure 90: Adverse events (AE) and areas of concern by surgical specialty



Comments:

- Where cases have undergone both first and second-line assessment only the second-line assessment was included in this analysis.
- If an assessor flags an area of concern or adverse event, this implies significant criticism. In this funnel plot we have combined these to look at the prevalence of this degree of criticism among surgical specialties.
- One specialty is outside the 3 SD limit; however the number of cases is too small in this specialty group to make any inferences.

Figure 91: Attribution of responsibility for clinical management issues



Comments:

- Patients may require input from clinical teams other than surgery during their course of treatment. Management issues raised may therefore be attributable to any of these teams.
- 232 (58.7%) of the issues identified were attributed to the surgical team. Another 124 (31.3%) were attributed to other clinical teams, for example, medical and emergency department, hospital issues or patient-related factors.
- The hospital and other categories are not well-defined and overlap. They include issues such as staffing levels, patient transfer issues, the availability and quality of critical care support, and anaesthetic care.

Figure 92: Frequency of specific clinical issues of management



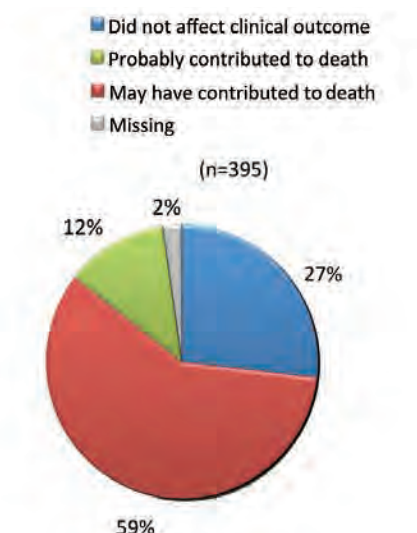
Comments:

- In addition to simply identifying if a management issue occurred, assessors have to indicate at which phase of patient management these occurred.
- When all forms of delay are combined, including delay in transfer and delay in starting treatment, omit this is the greatest issue raised, with 180 (36.2%) of the 496 specific issues identified being delays.
- The most common issues reported were: delay in transfer to a surgical unit (106 issues 21.3%), inappropriateness of decision to operate (112 issues 22.5%), unsatisfactory pre or postoperative assessment of patients (77 issues 15.5%) and delay in diagnosis (50 issues 10.1%). It should be acknowledged that a number of these were 'areas of consideration' and therefore relatively minor criticisms. It is also important to note that disagreements on the decision to operate are most frequently associated with patients who have little chance of survival with or without treatment.
- In the 2010 WAASM report, patient delay was due to a number of issues such as incorrect initial diagnosis and difficulty in accessing an operating room or Intensive Care Unit.⁽⁶⁾ Similarly, in the 2010 SAAPM report, delays in treatment included factors such as delays in diagnosis, access to radiology and timing of surgery.⁽⁵⁾



Figure 93: Clinical incidents outcomes

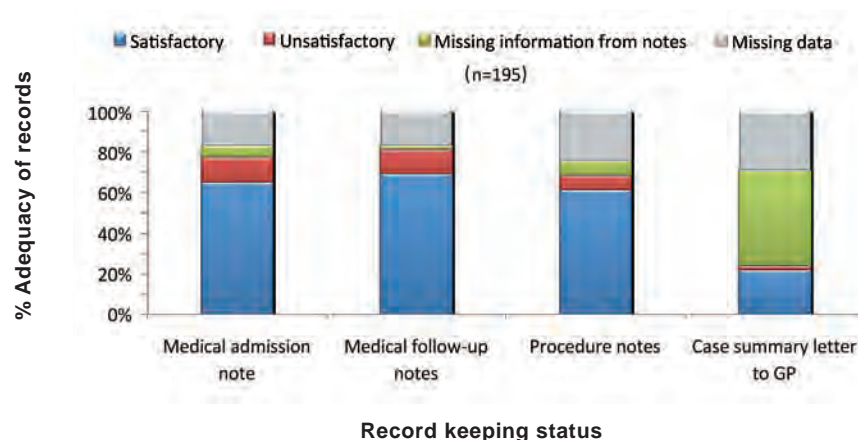
Assessors have to gauge the likely impact of these clinical incidents on the clinical outcome as part of the peer-review process.



Comments:

- Assessors perceived clinical management issues had occurred in 395 of the 1,113 cases in this audited series.
- Assessors felt these clinical management issues had probably contributed to the death of the patient in 4.3% of 1,113 audited cases. In the remaining cases where management issues were perceived, the relationship of the clinical management to the adverse outcome was uncertain.

Figure 94: Adequacy of information provided by hospital case record



Comments:

- Second-line assessors are asked to comment on the adequacy of information contained in the hospital case record.
- In 24 (12.3%) of 195 second-line assessments, at least one aspect of the medical notes was deemed unsatisfactory. These included poor follow-up records and unsatisfactory description of surgical procedure.
- The hospital case notes are an important record of what occurred during a patient's treatment. The difficulty in managing patients in a complex environment where there is an increasing lack of continuity in the care provided over the hours and days of a patient's stay in hospital is exacerbated by poor and inaccurate clinical notes.



Key points

- A case note review (second-line assessment) was deemed necessary to clarify events leading to the clinical outcome in 195 (17.5%) of 1,113 audited cases. In 24 (2.2%) of the audited cases, the inadequacy of information provided by the treating surgeon was the trigger for further review.
- The need for second-line assessment was similar across hospitals, surgical specialties and metropolitan and rural regions.
- In 718 (64.5%) of audited cases, no issues pertaining to the clinical management of patients were identified.
- The review process perceived that faults in the clinical management, serious enough to be called adverse events, had occurred in 60 (5.4%) of the audited cases. These were felt to be preventable in 1 (1.6%) of the 60 cases and have contributed to the likelihood of death in 14 (23.3%) of the 60 cases. Of the 60 adverse events, 19 (31.6%) were attributed to the individual treating surgical units. A further 19 (31.6%) instances were attributed to the clinical team and 4 (6.6%) were attributed to hospital-wide issues. In all cases detailed feedback has been provided directly to the relevant treating surgeons.
- An adverse event and an area of concern are at the higher end of the spectrum of criticism applied by the peer-review process. We have combined these in funnel plots to look for outlier performance among individual hospitals and surgical specialties.



Table 1: Assigning severity to clinical incidents

	Less severe	←————→		Most severe
Areas of clinical incidents	N/A	Consideration	Concern	Adverse event
Outcome of incidents	N/A	Did not affect clinical outcome	May have contributed to death	Probably contributes to death
Preventable incidents	Definitely not	Probably not	Probably	Definitely
Association of incidents	Other	Hospital	Clinical team	Surgical team

Table 2: Clinical incidents (n=1,113 cases)

Clinical incidents	Total occurrences (n)	Patients affected by clinical management (n)
Number of clinical management issues perceived	0	718
Degree of criticism expressed	Clinical management issues (n)	Number of patients with management issues (n)
Area of consideration	494	249
Area of concern	189	83
Area of adverse event	81	60
Missing data	15	3
Perceived impact on outcome	Clinical management issues (n)	Number of patients with management issues (n)
Did not affect clinical outcome	202	106
May have contributed to death	481	232
Probably contributed to death	62	48
Missing data	34	9
Preventability of incidents	Clinical management issues (n)	Number of patients with management issues (n)
Definitely preventable	72	57
Probably preventable	302	138
Probably not preventable	288	162
Definitely not preventable	35	20
Missing data	82	18
Attribution to clinical specialty	Clinical management issues (n)	Number of patients with management issues (n)
Surgical team	399	232
Other clinical team	215	76
Hospital issue	64	21
Other	81	27
Missing data	20	20

Comments:

- Audited cases can have more than one clinical management issue identified for each patient.



4. DATA MANAGEMENT AND DATA QUALITY

Data quality is an essential component of all audits. Inaccurate and incomplete clinical information will impact on the audit outcomes. Missing data prevents the identification of trends and hinders other analyses.⁽¹⁷⁾

Figure 95: Limitations of the audit due to missing data



Comments:

- This graph demonstrates the frequency (in decreasing order) of missing data for individual questions in the case record form.
- The volume of missing data is most prevalent in the DVT, utilisation of critical care facilities and fluid balance sections. These questions are important if we are to identify and address adverse trends.
- Where data integrity issues are identified it is important to review the format of the questions that will generate the data. ANZASM felt it appropriate to revise the critical care and VTE questions in 2010. It is hoped this will lead to improved data integrity in the future.
- ANZASM wishes to emphasise the importance of accuracy and completeness as data quality is more critical than quantity. The Clinical Excellence Commission indicated that “datasets will need to be refined over time in terms of number and value, rather than trying to get a perfect set first time”.⁽¹⁸⁾

4.1 First and second-line assessment validation studies

These have been conducted among a random sample of cases that have completed the audit process. The findings emphasise that in a process with some degree of subjectivity and lacking a ‘gold standard’ as reference, there will be intra-assessor variation. It is felt that the primary objective of the audit program (education of surgeons) is achieved by the current process. The reports can be downloaded from <http://www.surgeons.org/vasm>.



5. ESTABLISHMENT OF EXTERNAL EVALUATION

In 2011, VASM will conduct an external evaluation of the entire audit process. The aim is to ascertain to what extent VASM is achieving its objectives.

The scope of the evaluation includes:

- Effectiveness of processes used to collect, analyse, maintain and report the VASM data.
- A qualitative analysis of the effectiveness of communication between VASM and health services/clinicians with recommendations arising from the audit process.
- A qualitative analysis of the effectiveness of the relationship and governance arrangements.

The outcomes from this external review will suggest opportunities for improving the audit. This will enhance our ability to achieving our goal of improving safety and quality in surgery in Victoria.⁽¹⁸⁾



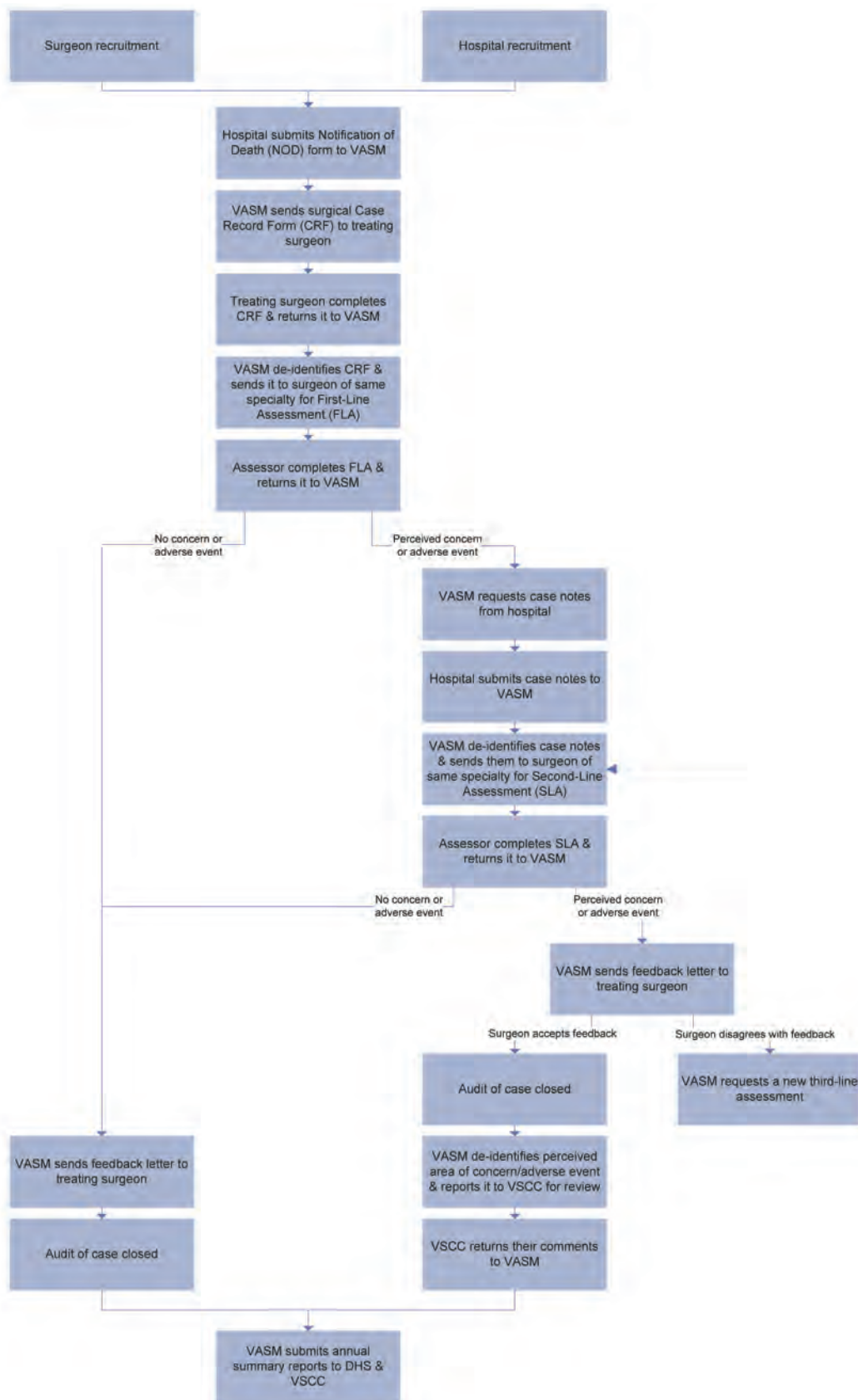
6. VASM PERFORMANCE REVIEW

Table 3: Project schedule and delivery status

Schedule of key deliverables	Status
• Establishment of governance model	✓ Completed 27 November 2007
• Establishment of mortality audit at four pilot sites	✓ Completed 27 November 2007
• Establishment of mortality audit at a further four sites	✓ Completed 23 May 2008
• Establishment of mortality audit at all Victorian public hospitals	✓ Completed 23 November 2008
<ul style="list-style-type: none"> Provision of confidential, specific reports to the department, the Minister for Health and VSCC, and: <ol style="list-style-type: none"> A report on the four pilot hospitals after their commencement, including data analysis and qualitative issues and lessons. Reports to involved surgeons after their commencement in the audit. Reports to involved hospitals. 	✓ Completed 30 June 2009
• Individual case forms provided to the VSCC, in instances where areas of consideration, concern or adverse event were identified by the second-line assessor	✓ Completed 30 June 2009
• Provision of annual public report based in lay format	✓ Completed 30 October 2009
<ul style="list-style-type: none"> Agreement reached regarding the process to address individual surgeons, surgical outcomes that have been identified as outside of acceptable parameters, in line with the following principles: <ul style="list-style-type: none"> The definition of normal parameters to be agreed by RACS, VSCC and DHS. Recommendations are to be made by VSCC to address deficiencies in surgical outcomes. Identified surgeons to be informed of audit findings and VSCC recommendations by the chair of the VSCC. Continued monitoring of surgeon performance to be ongoing following implementation of VSCC recommendations. Surgeons identified as having surgical outcomes outside of normal parameters following the implementation of VSCC recommendations to undergo further remediation. 	✓ Completed 30 October 2009
• Provision of an outlier report to the DHS and the VSCC	The audit provides limited opportunities for identifying Fellows who might be considered to be 'outliers'. The aim of the program has been improving clinical standards through education. However if outlier criteria can be developed through consensus these might be applied to identify surgeons who would benefit from support from colleagues.
• VASM Contract renewal	✓ Completed 30 July 2010
• Establishment of the Fellows electronic interface	✓ Completed 1 August 2010
• Establishment of mortality audit at all Victorian private hospitals	Commenced 1 August 2010
• Establishment of external evaluation of the VASM audit processes	Commenced 16 December 2010



Figure 96: Victorian Audit of Surgical Mortality (VASM) audit process





REFERENCES

1. Good practice in management of emergency surgery: a literature review October 2010. Available from: http://www.health.vic.gov.au/surgery/good_practice.pdf.
2. Scottish Audit of Surgical Mortality. Scottish Audit of Surgical Mortality: Annual Report 2010 reporting on 2009 data. National Services Scotland. 2010 [cited 2010 November 1]:[about 26 pages]. Available from: <http://www.sasm.org.uk/>.
3. Queensland Audit of Surgical Mortality. QASM: Annual Report 2009. Royal Australasian College of Surgeons. 2009 [cited 2010 November 30]:[about 36 pages]. Available from: <http://www.surgeons.org/qasm>
4. South Australian Audit of Perioperative Mortality. South Australian Audit of Perioperative Mortality: SAAPM Annual Report 2009. Royal Australasian College of Surgeons. 2009 [cited 2010 November 30]:[about 24 pages]. Available from: <http://www.surgeons.org/saapm>
5. South Australian Audit of Perioperative Mortality. South Australian Audit of Perioperative Mortality: SAAPM Annual Report 2010. Royal Australasian College of Surgeons. 2010.
6. Western Australian Audit of Surgical Mortality. Annual Report 2010. Royal Australasian College of Surgeons. 2010 [cited 2010 November 30]:[about 60 pages]. Available from: <http://www.surgeons.org/waasm>
7. Board N, Watson DE. Using what we gather: harnessing information for improved care. MJA. 2010;193(8):S93-94.
8. Story DA, Leslie K, Myles PS, Fink M, Poustie SJ, Forbes A, Yap S, Beavis V, Kerridge R. Complications and mortality in older surgical patients in Australia and New Zealand (the REASON study): a multicentre, prospective, observational study. Journal of the Association of Anaesthetists of Great Britain and Ireland. 2010;65:1022-30.
9. Dinh D, Billah B, Shardey G, Reid CM, ASCTS Database Project Steering Committee. Australasian Society of Cardiac and Thoracic Surgeons (ASCTS) Victorian Cardiac Surgery Database Project: Annual Report 2006-2007. Australasian Society of Cardiac and Thoracic Surgeons (ASCTS). 2007 [cited 2010 November 30]:[about 36 pages]. Available from: <http://www.health.vic.gov.au/surgicalperformance/downloads/cardiac-surgery-report09.pdf>.
10. Australian and New Zealand Audit of Surgical Mortality. National Report 2009. Royal Australasian College of Surgeons. 2009. Available from: <http://www.surgeons.org>
11. Hardy J, Maresco-Pennisi D, Gilshenan K, Yates P. Barriers to the best care of the dying in Queensland, Australia. J Pall Med. 2008;11(10):1325-29.
12. Palliative Care Australia. EoL: Towards quality care at the end of life. Australia. [Internet]. 2010 [cited 2010 November 28]; 2(1):[about 22 pages]. Available from: <http://www.palliativecare.org.au/>.
13. Maddern GJ, Bruening MH. Rural surgery: the Australian experience. Surg Clin N Am. 2009; 89: 1325- 33.
14. Australian Government Department of Health and Aging. The state of our public hospitals: June 2010 report. 2010:1-124. Available from: <http://www.health.gov.au/internet/main/publishing.nsf/Content/sooph10>.
15. Surgeons.org [Internet]. Melbourne: Royal Australasian College of Surgeons; c2008-11 [updated 2008 February; cited 2010 December 12]. Available from: http://www.surgeons.org/media/7985/FES_FES_2269_P_Position_Statement_Emergency_Surgery.pdf.



16. Zalstein S, Danne P, Taylor D, Cameron P, McLellan S, Fitzgerald M, Kossmann T, Patrick I, Walker T, Crameri J, Bailey M, Magilton G. The Victorian Major Trauma Transfer Study. 2009 Elsevier. Available from:

www.elsevier.com/locate/injury.

17. Johnston EW. Recycling the surgical audit. Clinical Audit 2010; 2: 89-91.

18. Leathley C M, Gilbert R, Kennedy P J, Hughes C F. Measuring hospital performance - 2008 forum summary. MJA 2010; 193-8.



ACKNOWLEDGMENTS

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:

- Participating Victorian hospitals
- Participating Victorian Fellows and International Medical Graduates
- Assessors, in particular the dedicated and specialty-specific first-line assessors
- Surgeons who have acted as assessors, for the time and effort providing detailed and valuable casenote reviews
- Hospital medical records departments
- Victorian Surgical Consultative Council (VSCC)
- Western Australian Audit of Surgical Mortality (WAASM)
- Tasmanian Audit of Surgical Mortality (TASM)
- The National Coroners Information System (NCIS)
- South Australian Audit of Perioperative Mortality (SAAPM)
- Queensland Audit of Surgical Mortality (QASM)
- The Collaborating Hospitals' Audit of Surgical Mortality (CHASM)
- Royal Australasian College of Medical Administrators
- Victorian Department of Health, for funding the project
- Department of Epidemiology and Preventive Medicine, School of Public Health and Preventive Medicine Monash University
- Jodie Cooper for providing the image on the front cover 'Autumn Flight', Studio I9, www.studioI9gallery.com
- Royal Australasian College of Surgeons for their infrastructure and oversight of this project



VASM MANAGEMENT COMMITTEE

Colin Russell	Chair, Victorian Audit of Surgical Mortality
Peter Field	Chair, Victorian Surgical Consultative Council
Andrew Clarke	VASM Contract Manager, Quality, Safety & Patient Experience Branch, Department of Health
Anne-Maree Szauer	Manager, Clinical Councils Unit, Quality, Safety & Patient Experience Branch, Department of Health
Ian Faragher	Chair, Victorian State Committee & Colorectal Surgical Society of Australia and New Zealand
Andrew Cochrane	Australasian Society of Cardiac and Thoracic Surgeons
Bernie Lyons	Australian Society of Otolaryngology, Head and Neck Surgery
Keith Stokes	Australasian Association of Paediatric Surgery
Lee Gruner	Censor in Chief, Royal Australasian College of Medical Administrators
Christos Kondogiannis	Australian Orthopaedic Association
Jocelyn Shand	Dental Practice Board of Victoria
Alex Babarczy	Australian and New Zealand College of Anaesthetists
Patrick Lo	Neurosurgical Society of Australasia
Douglas Druitt	Urological Society of Australia and New Zealand
Heather Cleland	The Australian Society of Plastic Surgeons
Gary Fell	Board in Vascular Surgery
Heather Cleland	Australian Society of Plastic Surgeons
Ivan Kayne	Medal of Order of Australia, Consumer representative

VASM STAFF

Colin Russell	Clinical Director
Claudia Retegan	Project Manager
Jessele Vinluan	Senior Project Officer
Karen Crowley	Project Officer
Mary Jane Sterry	Project Officer
Rajneet Arora	Administrative Research Officer
Jamaine Ansell	RMIT Placement student
Andrew Chen	RMIT Placement student

VASM BIOSTATISTICAL CONSULTANTS

Nick Andrianopoulos	Senior Research Fellow, Department of Epidemiology and Preventive Medicine, School of Public Health and Preventive Medicine Monash University
Christopher Reid	Associate Director of the Monash Centre of Cardiovascular Research and Education in Therapeutics, School of Public Health and Preventive Medicine Monash University





Victorian Audit of Surgical Mortality
GPO Box 2821
Melbourne VIC 3001