

South Australian Audit of Perioperative Mortality



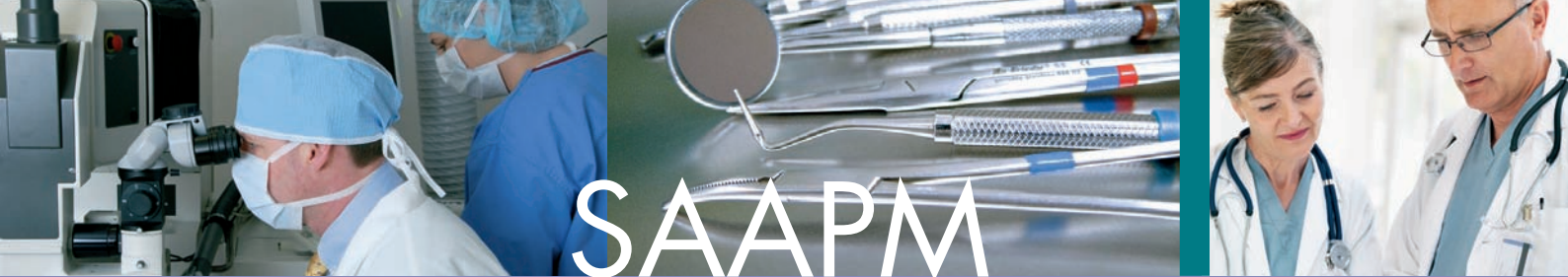
SAAPM ANNUAL REPORT 2007



Government
of South Australia

SA Health



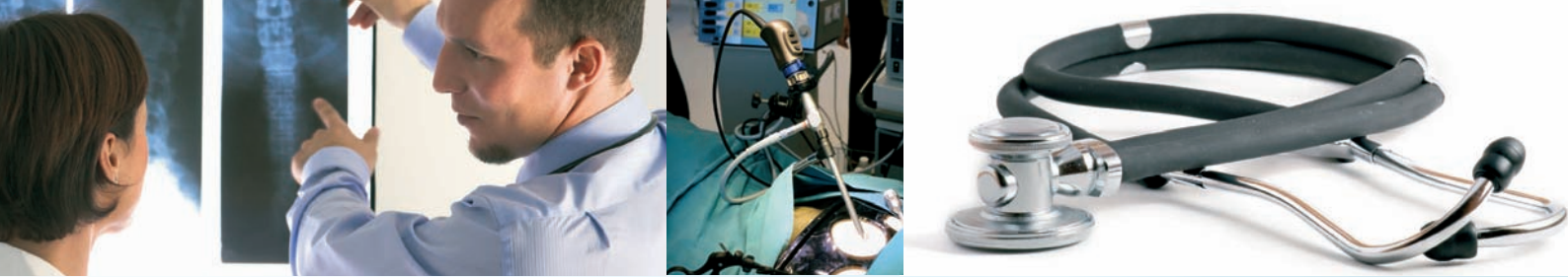


SAAPM

South Australian Audit of Perioperative Mortality Annual Report

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Chairman's Report

I am pleased to present the second Annual Report of the South Australian Audit of Perioperative Mortality, which covers data up to the end of June 2007. During this period the audit has expanded steadily, with recruitment of a further five public hospitals in both the metropolitan and rural sectors. The audit now covers all the major public hospital sites in South Australia.

As a result of this expansion, case numbers have increased by 12% compared to our first report, with a corresponding rise in the number of assessments carried out by our peer reviewers. Surgeon participation remains very high, with a 96% participation rate amongst those who have had cases recorded in the audit. A proforma completion rate of 81% also indicates the commitment of surgeons to submitting their results for review. The information gathered is building on the foundation data in our first report, with a clearer picture emerging of the types of cases where deaths occur, and the circumstances in which clinical care may be improved.

The overall picture is of a high quality healthcare system with a low rate of avoidable adverse events. The reality of everyday practice is that increasing numbers of patients with multiple comorbidities, often elderly, are routinely being referred for surgical treatment. Surgeons are often involved as members of multidisciplinary teams, particularly in the emergency setting, and the complexity of modern healthcare brings with it an inherent risk of human error and system failure. By review of results such as mortality data, we should be able to identify patterns of illness or clinical responses which lead to poor outcomes.

The current report shows a very small number of potentially avoidable adverse events due specifically to surgeons. However we should not be complacent. There are recurring themes in the data which are relevant to all clinicians. Delays in diagnosis and decision making, communication issues between staff, and delays in access to investigations, theatres and ICU/HDU are all issues which medical staff and hospital administration must address. Similarly, fluid balance management and DVT prophylaxis are common areas where consultant supervision of junior staff could help prevent avoidable problems.

Ultimately the purpose of this audit is to make surgical care safer for our patients. This can only be achieved with continuing attention to detail, and the ongoing collection of appropriate data, followed by feedback to all involved. As we move into the third year of the project, we plan to increase data collection from the private hospital sector to provide a more accurate state-wide review of mortality in surgical patients. I wish to thank all those surgeons who have contributed their patients' data to the audit, and I hope all surgeons will read this report and act on any areas which may impact on their own clinical practice.

Dr Paul Dolan
Clinical Director
SAAPM



Abbreviations

AAA	Abdominal aortic aneurysm
ANZASM SC	Australian and New Zealand Audit of Surgical Mortality Steering Committee
ANZCA	Australian & New Zealand College of Anaesthetists
AST	Advanced Surgical Trainee
BST	Basic Surgical Trainee
DVT	Deep vein thrombosis
ED	Emergency department
ENT	Ear Nose and Throat
FRACS	Fellow of the Royal Australasian College of Surgeons
HDU	High Dependency Unit
HITS	Heparin-induced thrombocytopenia syndrome
ICH	Intra-cranial haemorrhage
ICU	Intensive Care Unit
INR	International Normalised Ratio
LMWH	Low molecular weight heparin
NFR	Not for resuscitation
NG	Nasogastric
PE	Pulmonary embolus
PM	Post mortem
RACDS	Royal Australasian College of Dental Surgeons
RACP	Royal Australasian College of Physicians
RACS	Royal Australasian College of Surgeons
RANZCOG	Royal Australian & New Zealand College of Obstetricians & Gynaecologists
SA	South Australia
SAAPM	South Australian Audit of Perioperative Mortality
SA Health	South Australian Department of Health
SAH	Subarachnoid haemorrhage
SAPOMC	South Australian Perioperative Mortality Committee
SASM	Scottish Audit of Surgical Mortality
SDH	Subdural haematoma
TASM	Tasmanian Audit of Surgical Mortality
The College	The Royal Australasian College of Surgeons
WAASM	Western Australian Audit of Surgical Mortality



Executive Summary

This Annual Report reflects the second year of data collection for the South Australian Audit of Perioperative Mortality (SAAPM). Established in 2005, with data initiation on 1 July of that year, the audit reviewed 933 surgically related deaths to 30 June 2007.

SAAPM continues to function under the administration of The Royal Australasian College of Surgeons (the College) through funding from the South Australian Department of Health (SA Health), and in association with the Australian and New Zealand College of Anaesthetists (ANZCA).

Death notifications

The number of deaths reported to SAAPM has increased by 12% in the July 06 – June 07 reporting period due to increased hospital participation. Data obtained from SA Health indicates deaths occurring during surgical admission account for approximately 14% of all deaths in South Australian public hospitals.

Hospital participation

Hospital participation has increased during the past year, with SAAPM collecting data from five additional public hospitals comprising one metropolitan hospital and four from large regional centres.

Two large metropolitan private hospitals have also joined SAAPM during this audit period; data collection will not commence until after the close of this audit cycle and will be reported on in the 2008 report.

Surgeon participation

Participation in SAAPM is voluntary. In the current reporting period, 493 cases met the inclusion criteria. These deaths were associated with 129 surgeons, of which 124(96%) agreed to participate.

Proforma completion

During the period 1 July 2006 to 30 June 2007, 493 proformas were sent to surgeons. Of these, 399 (81%) were completed and returned. Twelve cases were admitted for terminal care and are excluded from further analysis. This return rate represents an increase of 6% from the last reporting period and is comparable to the Scottish Audit of Surgical Mortality, which after some 11 years reports a proforma completion rate of 89%.

The highest number of proformas was sent to the General Surgical specialty (47%) followed by Orthopaedics (16%), which is comparable to the previous audit period.

Assessments

During the audit period, 329/387 (85%) of the included proformas underwent first line assessment. In the view of the first line assessor, clarification through a second line review of case notes was required in 26/329 (8%) of cases. The percentage of cases being referred to second line assessment has fallen in the second audit year. This is consistent with a decreasing referral to second line assessment reported by the Western Australian Audit of Surgical Mortality over five years of reporting.

Patient demographics

Of the death notifications received, 89% of all patients were aged over 50 years. Patients between the ages of 81-90 years were the most frequently occurring age group and patients in the 71-90 year age group accounted for 59% of all deaths audited. Advanced age was second to cardiovascular disease in reported co-morbidities for this audit period. The most serious cases are generally transferred to a larger metropolitan teaching hospital for specialist care. Of the 387 deaths assessed, surgeons reported 115 patients had been transferred to the hospital in which they died. The average distance for transfer was 196km with the range being between 1km and 2300km.



Operative and non-operative data

The most frequently occurring surgical diagnosis was fractured neck of femur (hip fracture). There were 11 common surgical diagnoses which accounted for 59% of all cases.

The proportion of cases which underwent an operation was 56% and the proportion of non-operative cases was 44%.

Grade of surgeon operating

Patients returning to theatre are generally in a poorer condition and present a higher surgical risk. SAAPM examined the grade of surgeon undertaking the first and any subsequent surgical procedures during the patient's final admission. Data from the current reporting period reveals that consultants were the primary surgeon in 43% of first procedures. The proportion of consultants operating, where a subsequent procedure was necessary, increased to 50% for the second procedure and 58% for the third procedure. This result mirrors the trend observed in other mortality audits.

Use of HDU and ICU

Surgeons reported the use of either HDU or ICU pre/post-operatively in 85% of assessed cases. In 6% of cases assessors considered that HDU or ICU should have been utilised in a patient's pre or post operative management.

Clinical incidents

Of the 329 cases which have completed assessment, 81% of deaths were related to the disease process, and there were no areas which raised comments from the assessors.

Assessors reported an area of consideration, an area of concern or an adverse event in 64 cases (19%). This incidence rate is similar to the data reported by SAAPM in 05/06 (20%).

DVT prophylaxis

Of the 387 returned proformas, surgeons reported they had used a form of DVT prophylaxis in 219 (57%) of cases.

In 32% (124/387) of cases, surgeons reported they did not use DVT prophylaxis for reasons including the patient was being conservatively treated, was coagulopathic, presented with a haemorrhage or had a rapid death due to the underlying disease process. The use of DVT prophylaxis was considered inappropriate in 1% of the cases which had undergone assessment.

Fluid balance

In 27/300 (9%) of cases, surgeons indicated that management of fluid balance was an issue in the case.

Fluid balance was raised as an issue in 12 cases by first line assessors and in 2 cases by second line assessments. In only 5 of these 14 cases, the surgeon indicated that fluid balance was an issue.

Post mortem

In the 2006/07 audit period 40 cases (10%) were reported by the surgeon as having undergone a post mortem (PM). This is a reduction on the previous period. Four surgeons advised that they had read the Coroner's report prior to completing the surgical case form.

In five cases the PM was refused and in two cases, surgeons indicated they would have preferred a PM although none was performed. At the time the audit period closed, 12 cases were outstanding and known to be awaiting coronial investigation.



Recommendations

Notifications

- Procedures for death notifications from public hospitals should be standardised through SA Health.

Hospital participation

- Private hospitals should be encouraged to participate and report eligible deaths by both the College and SA Health.

Surgeon Participation

- A significant percentage of proformas remain incomplete. SAAPM encourages surgeons to provide more detail on case forms to facilitate first line assessment.
- Hospitals must develop procedures to ensure case notes are available when requested for case note reviews.

Assessment processes

- Legal and professional barriers need to be overcome by SA Health and the College to allow independent assessment of smaller specialty cases through the establishment of interstate assessment networks.
- More local assessors from all specialties are required

Clinical management

- Surgeons are urged to be actively involved in surgical procedures on elderly high risk patients, particularly in the event of second and subsequent operations.
- Delays (diagnosis, transfer, investigation, treatment, theatre access) are regularly identified by assessors as contributing factors in the clinical incidents.
- Clinical staff and hospital management need to address barriers to timely treatment.

- DVT prophylaxis needs to be emphasised to both medical and nursing staff.
- Identifying clinical issues and resolving barriers to communication between junior and senior staff are two areas requiring improvement.
- Fluid balance issues were identified in 9% of the current audit cases, indicating this area needs to be addressed in training programs including intern orientation sessions in hospitals.

ICU/HDU

- With an aging population there is a need for increased availability of ICU/HDU facilities over time. This should be addressed by health planning groups

Post Mortem

- The rate of post mortem examination remains low. Addressing this issue requires a community education approach, by both SA Health and the College.
- A significant increase in post mortem rate must be met by an equivalent increase in facilities and trained pathologists.



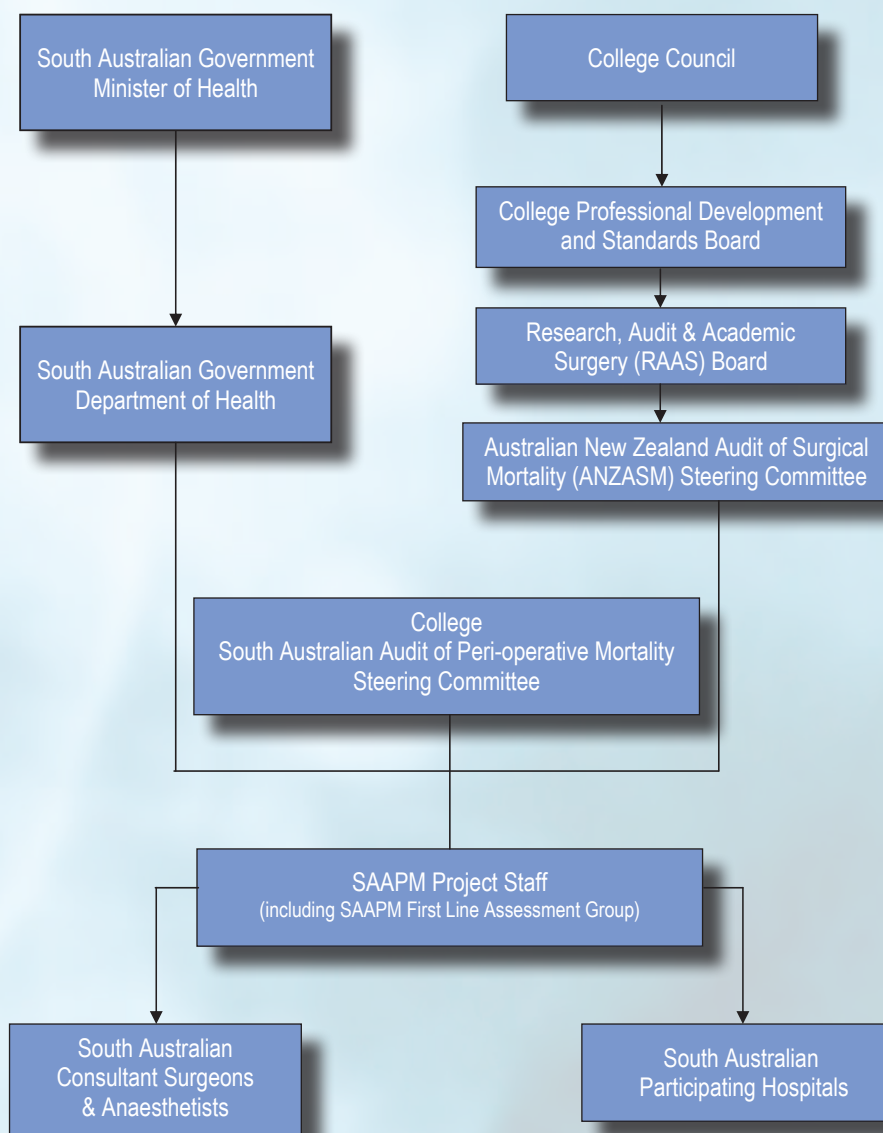
1 Introduction

Background

The South Australian Audit of Peri-operative Mortality (SAAPM) is a peer review audit of surgically-related deaths in South Australia. The project is funded by the South Australian Department of Health (SA Health) and is administered by the Royal Australasian College of Surgeons (the College).

SAAPM commenced data collection on 1 July 2005 and falls under the governance of the Australian and New Zealand Audit of Surgical Mortality Steering Committee (ANZASM SC). The committee is an overarching body which ensures that mortality audits in Australia and New Zealand use standardised assessment protocols and collect a common data set across regions to allow bi-national reporting of surgically-related deaths. The project governance structure is illustrated in Figure 1.1.

Figure 1.1 Project governance structure





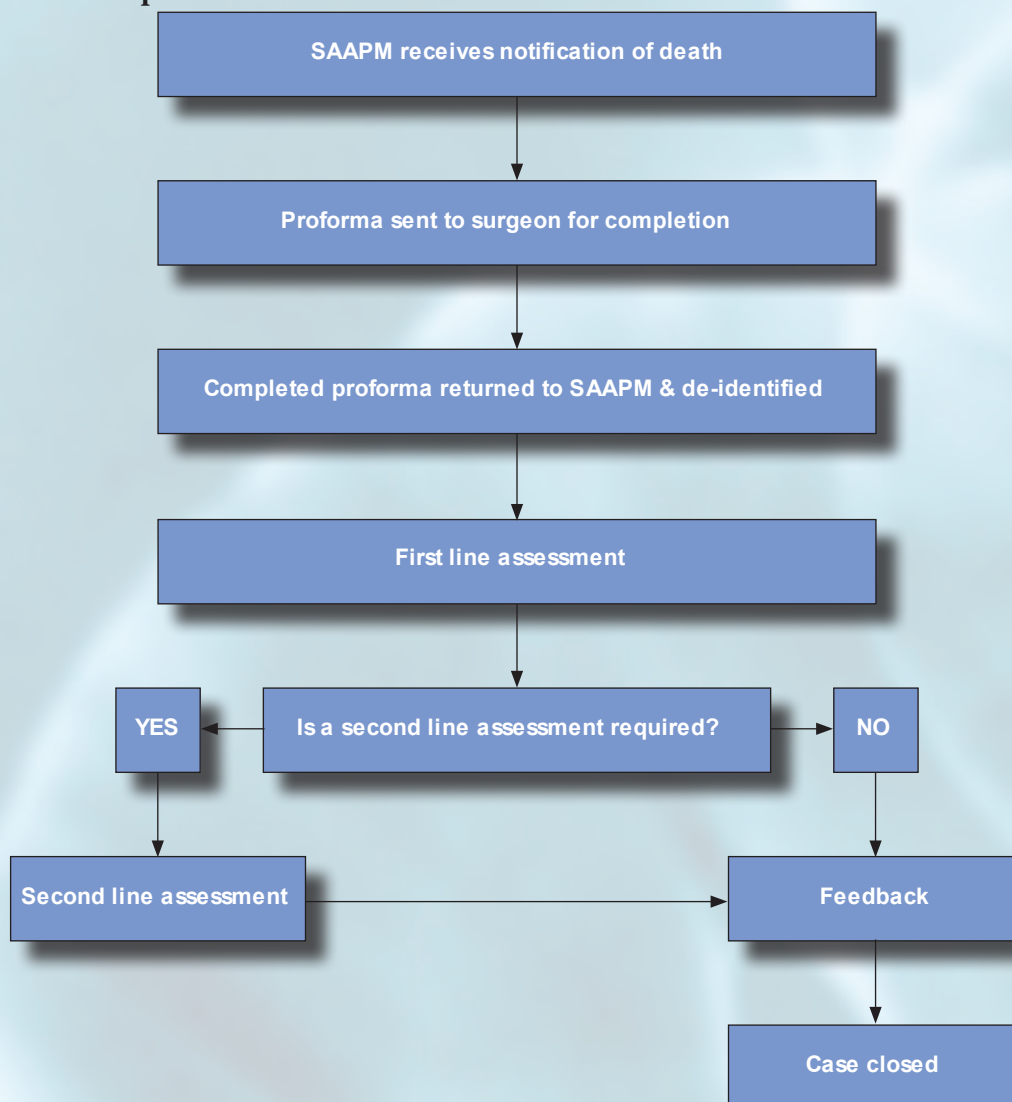
Confidentiality

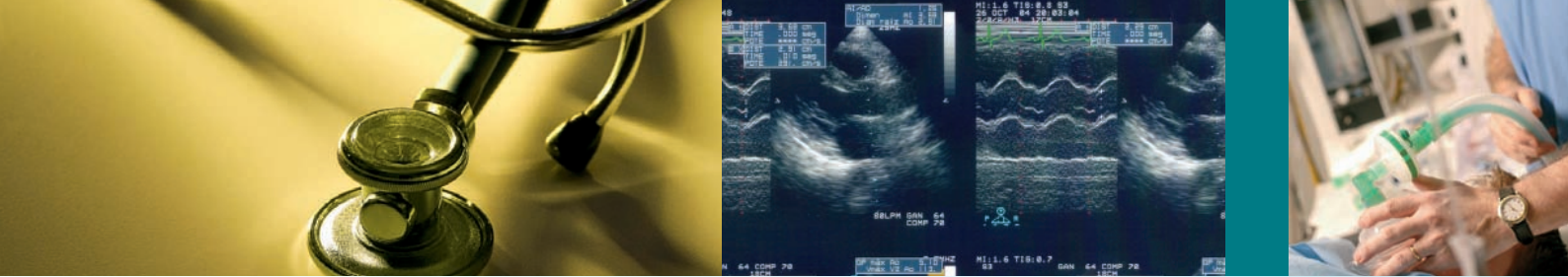
SAAPM is a confidential project with legislative protection at a state level under section 64D of the South Australian Health Commission Act 1976. From 1 July 2008, this protection will be conferred under Section 64, part 7 & 8 of the SA Health Act (2008). Additionally, Federal coverage under ANZASM through the Commonwealth Qualified Privilege Scheme is provided under Part VC of the Health Insurance Act 1973 (gazetted 6 November 2006). This protection covers SAAPM staff as well as surgeons acting in the capacity of first and second line assessors.

1.1 The audit process & methodology

The audit process begins when the SAAPM Office is notified of a surgically-related death by the medical record department or safety and quality unit of a hospital. A data collection form (surgical proforma) is sent to the consultant surgeon under whom the patient was admitted. Figure 1.2 indicates the various pathways a case may take through the assessment processes.

Figure 1.2 SAAPM audit process





First line Assessment

When the surgeon's completed proforma is received by the SAAPM Office, all identifiers are removed and the proforma is sent to a member of the SAAPM First Line Assessment Group. Proformas are assigned to First Line Assessor Group members according to the specialty of the surgeon who completed the proforma. The first line assessor completes a surgical assessor's form, providing comments on the case management and level of care provided to the patient. If the first line assessor considers that there is insufficient information on the proforma to come to any conclusion about the case, or if there appear to be factors that warrant further investigation, a second line assessment is requested.

Second line Assessment

A second line assessment involves a detailed review of a patient's case notes. The SAAPM Office will request case notes from the relevant hospital and these are forwarded with the proforma to a second line assessor. Second line assessors will assess cases relevant to their own specialty which have occurred in a hospital in which they do not practise. The case assessor provides a summary on the case management and the level of care provided to the patient.

Feedback

A primary objective of SAAPM is education through feedback. Feedback is provided in a number of ways upon completion of a first or second line assessment, as well as publication of a selection of de-identified case note reviews for surgeons. In the broader sense, regular newsletters and this state-wide annual report containing analyses of the data and commentaries covering all of the specialties provide an overview of the project to the surgical and broader community.

1.2 Categories of deaths investigated

Deaths currently included in SAAPM are classified into three categories as follows:

- Category 1: Operative deaths
A death that occurs when a patient is admitted under a surgeon, and has an operation/procedure during their last admission regardless of their length of stay in the hospital or medical facility.
- Category 2: Non-operative deaths
A death that occurs when a patient is admitted under a surgeon, does not have an operation/procedure and dies during their last admission regardless of their length of stay in the hospital or medical facility.

Deaths which are identified as terminal care on the surgical case form by the responsible surgeon are excluded from further assessment in the audit. Similarly, cases which fall under the care of specialists from the following Colleges are also excluded from further assessment:

- The Royal Australasian College of Dental Surgeons (FRACDS)
- The Royal Australian and New Zealand College of Obstetricians & Gynaecologists (RANZCOG)
- The Royal Australasian College of Physicians (RANZCP)

Terminal care cases are recorded but do not undergo the complete audit process. Terminal care is nominated by the surgeon on the surgical case form, and cannot be identified from the notification of death information.



1.3 Categorising clinical incidents

First and second line assessors are responsible for categorising patient death into one of two categories:

- **Cases related to disease process:** In these cases patient death occurred due to the disease process despite appropriate care, and assessors found no issues with patient management.
- **Cases with clinical incidents:** In these cases clinical incidents were identified that may have impacted on patient management. These events are divided into one of three categories:
 - **Area of consideration:** This is an area of care that an assessor believes could have been different or improved but recognises that it may be an area for debate.
 - **Area of concern:** This is an area of care that the assessor believes should have been better managed.
 - **Adverse event:** An unintended injury caused by medical management rather than by disease, which is sufficiently serious to lead to prolonged hospitalisation or to temporary or permanent impairment or disability of the patient at the time of discharge, or which contributes to or causes death.

Assessors also evaluate the impact and preventability of the clinical incident as well as determining which associated clinical team may have been responsible. Overall the assessors must decide if the impact of the clinical incident either:

- made no difference to the patient's outcome
- may have contributed to the patient's death
- caused the death of a patient who would otherwise have been expected to survive

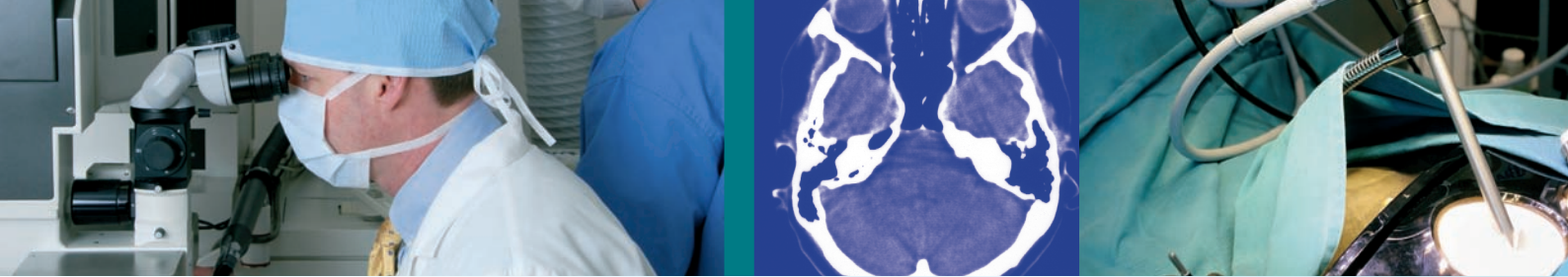
Assessors must also give their opinion as to whether the clinical incident was either:

- definitely preventable
- probably preventable
- probably not preventable
- definitely not preventable

Assessors must also indicate who was primarily associated with the clinical incident:

- the audited surgical team
- another clinical team
- the hospital
- other

It is important to note that the analyses contained in this report are based on the opinions subscribed to cases by either first or second line assessors.



2 Audit participation

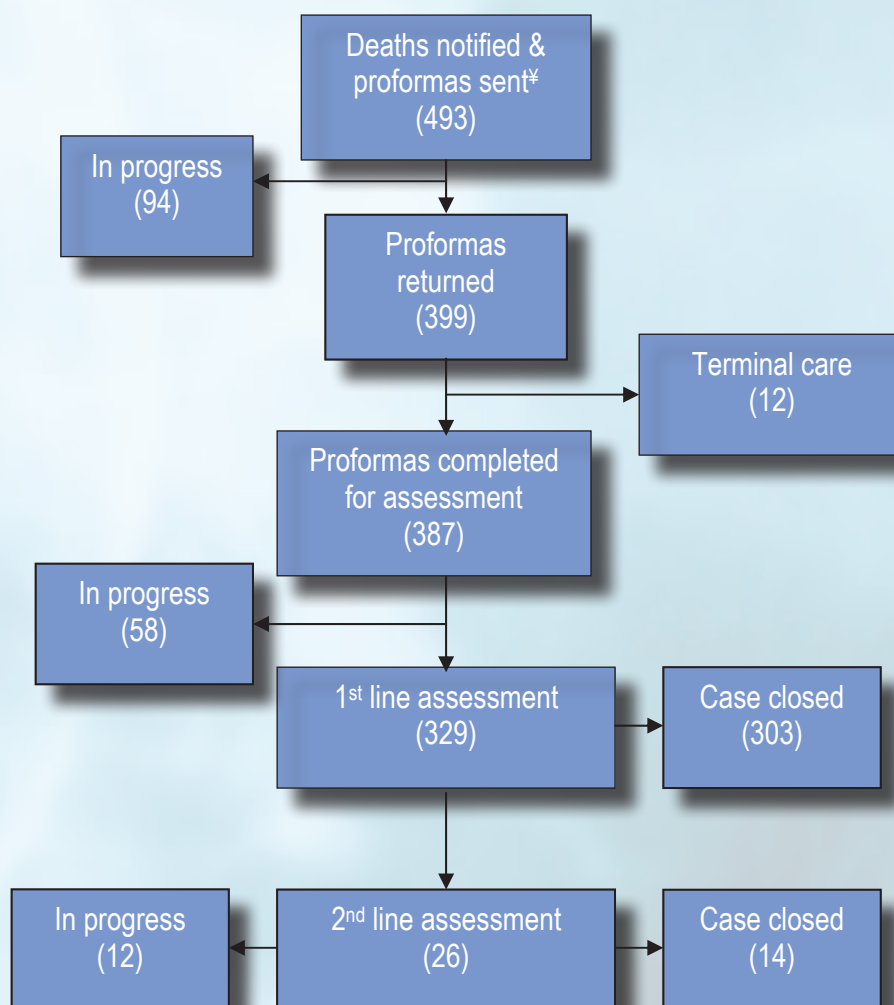
2.1 Overview of participation

Participation in SAAPM is directed at Fellows of the Royal Australasian College of Surgeons and is undertaken on a voluntary basis. Surgeons register to participate by signing a participation agreement form the SAAPM project office sends to them. On notification from a hospital that a death has occurred, a case form is forwarded to the responsible surgeon unless the SAAPM project office has had specific notification of a surgeon's refusal to participate.

During the second reporting year, the audit has recruited public hospitals from the SA country region and more recently, some private metropolitan hospitals. Each of these hospitals participates by providing timely notification of deaths and where required, making available the case notes.

Figure 2.1 describes the number of deaths and the proforma return and assessment rate, indicating the number of cases which have completed the audit cycle

Figure 2.1 Deaths reported to SAAPM between 1 July 2006 and 30 June 2007



*5 Proformas were not sent as the surgeons had previously advised SAAPM they did not wish to participate



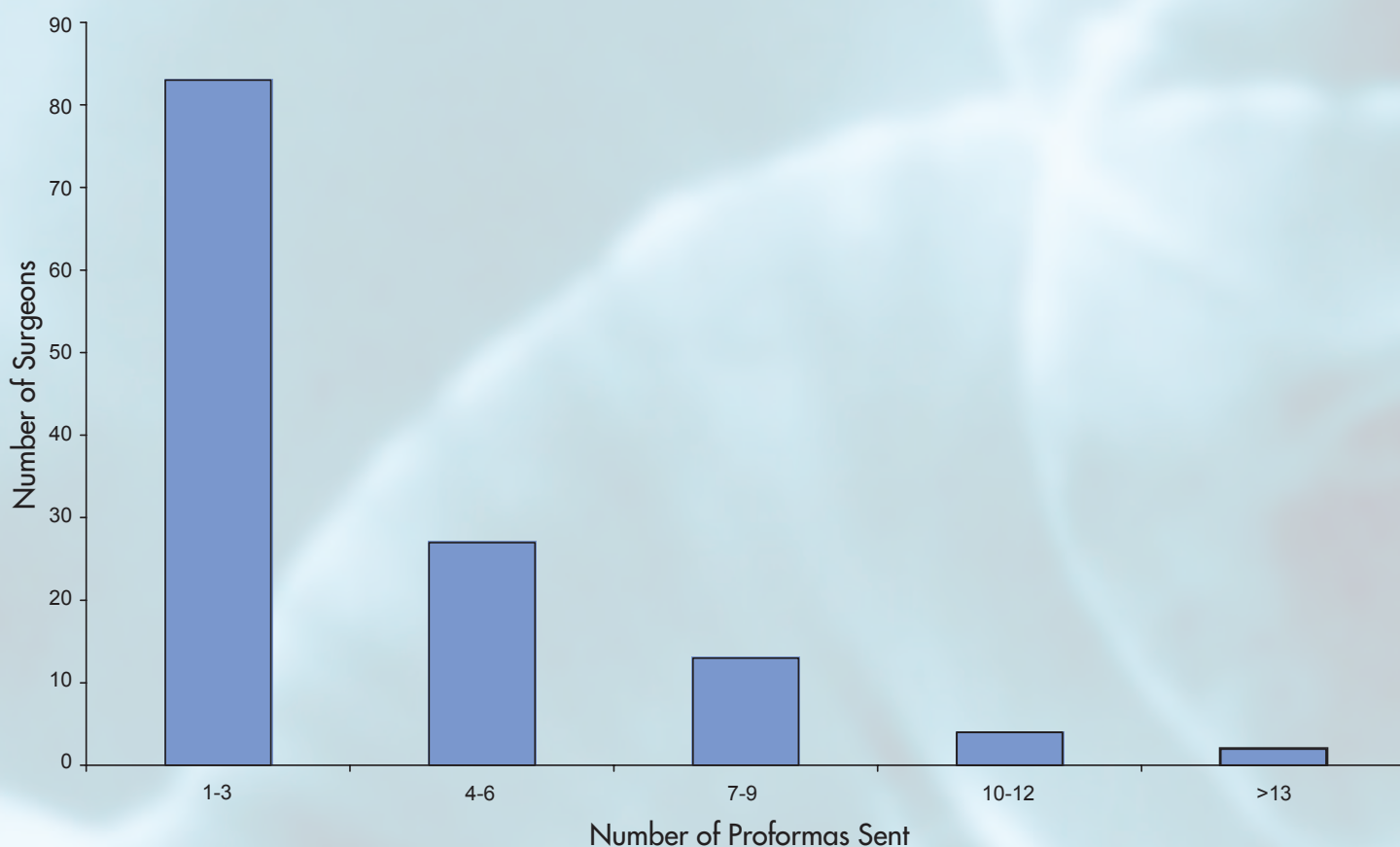
2.2 Surgeon participation

Participation in SAAPM is voluntary. Surgeons are defined as participating by either actively agreeing to participate through a signed consent form or having had a notifiable death for which they have completed and returned a proforma.

Mortality rates across specialties may vary due to the nature of patients treated; some specialties treat patients with complex medical conditions and multiple co-morbidities increasing the risk of death, while other specialties may involve patients at lower risk.

Over the two-year period, 250 surgeons have been associated with 896 deaths. In the 06/07 audit period, there were 493 deaths reported associated with 129 surgeons. Of these, 124 surgeons agreed to participate (96%). The 06/07 results are summarised in Figure 2.2.

Figure 2.2 Number of proformas completed





2.3 Hospital participation

SAAPM has broadened the scope of the audit through increased hospital participation in the 06/07 reporting period. During this period, one metropolitan public hospital and four regional public hospitals were recruited to participate in the audit. Table 2.1 reflects the location and hospital status of each of the participating hospitals. Negotiations are currently underway with a number of private hospitals with the aim of including them in the audit.

Seven of the twelve participating hospitals reported surgically-related deaths. Figure 2.3 illustrates the distribution of proformas amongst participating hospitals and the status of cases. The most serious cases are generally transferred to a larger metropolitan teaching hospital for specialist care. Five participating hospitals did not report any deaths during this audit period.

Of the 387 proformas completed for assessment, surgeons reported 115 patients had been transferred to the hospital in which they died. The average distance for transfer was 196km, with the range being between 1km and 2300kms.

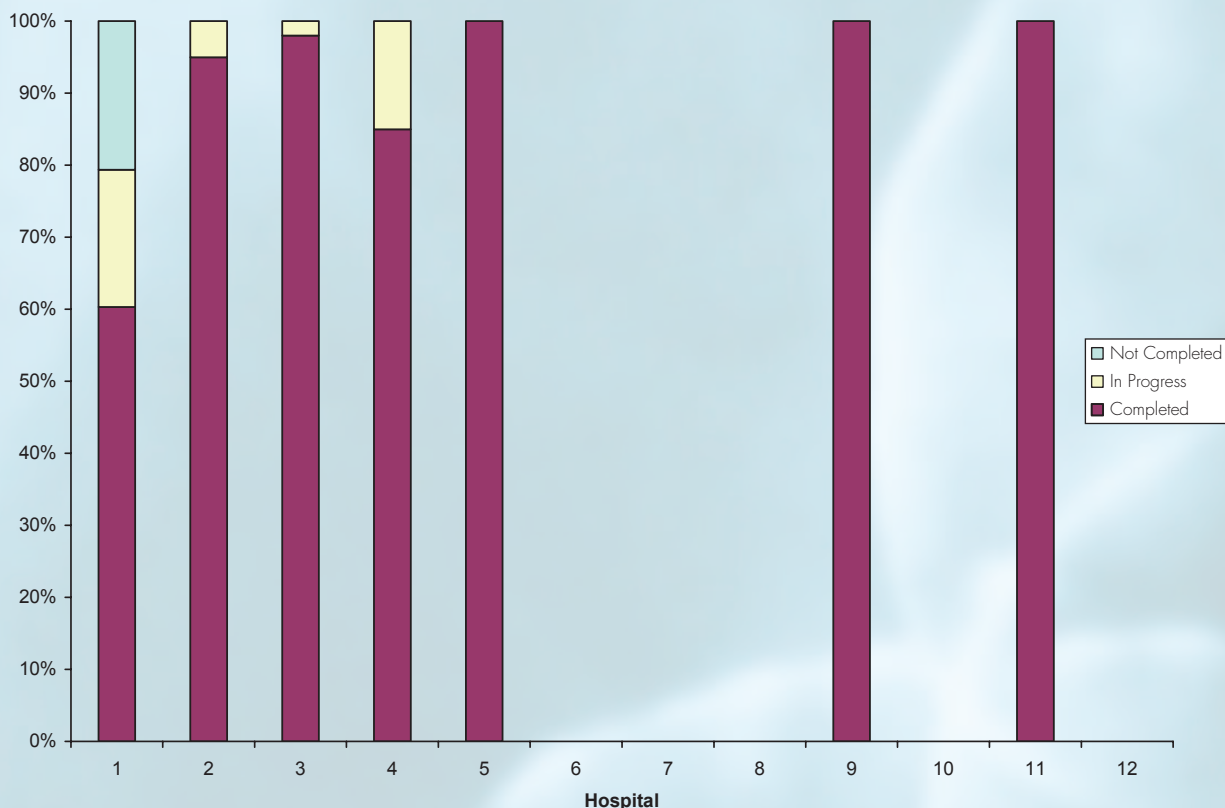
Obtaining denominator data in relation to the total number of surgically-related deaths in South Australia has been difficult. Not all hospitals are currently participating in the audit, and anomalies in clinical reporting systems do not always capture patients who have moved through surgical and general medical teams during their admission. Within these limitations, data obtained from the South Australian Department of Health indicates that surgically-related deaths account for approximately 14% (498/3585) of deaths in South Australian public hospitals.

Table 2.1 Hospital status and data collection initiation dates

Hospital Number	Hospital Status					Data Collection Initiated
	Public	Private	Tertiary	Metro	Regional	
1	X		X	X		04 Jul 05
2	X			X		11 Jul 05
3	X		X	X		15 Jul 05
4	X		X	X		01 Sep 05
5		X		X		08 Feb 06
6	X				X	10 Apr 06
7	X				X	19 Apr 06
8	X				X	17 Jul 06
9	X			X		28 Aug 06
10	X				X	27 Nov 06
11	X				X	27 Nov 06
12	X				X	15 Jan 07



Figure 2.3 Proportion of proformas completed by hospital



Not all hospitals reported eligible deaths in the 2006/2007 audit year

2.4 Proforma completion

During the period 1 July 2006 to 30 June 2007, 493 proformas were sent to surgeons. Of these, 399 (81%) were completed and returned. This proforma return rate after only two years is comparable to the Scottish Audit of Surgical Mortality, which after some 11 years reports a proforma completion rate of 89%¹¹.

Twelve cases were described by the reporting surgeon as terminal care and therefore did not proceed further through the audit. Outstanding proformas were classified as in progress; those included as 'in progress' were 12/94 (13%) cases which SAAPM was advised were under investigation by the SA Coroner's Office. Five cases were not completed as the responsible surgeons declined to participate in the audit.

Table 2.2 provides data on the total number of proformas sent to surgeons by specialty during the audit period. The number of deaths included has increased by 12% (440 to 493) in the 06/07 audit period compared with the previous reporting period. This is a reflection of the increased hospital and surgeon participation.

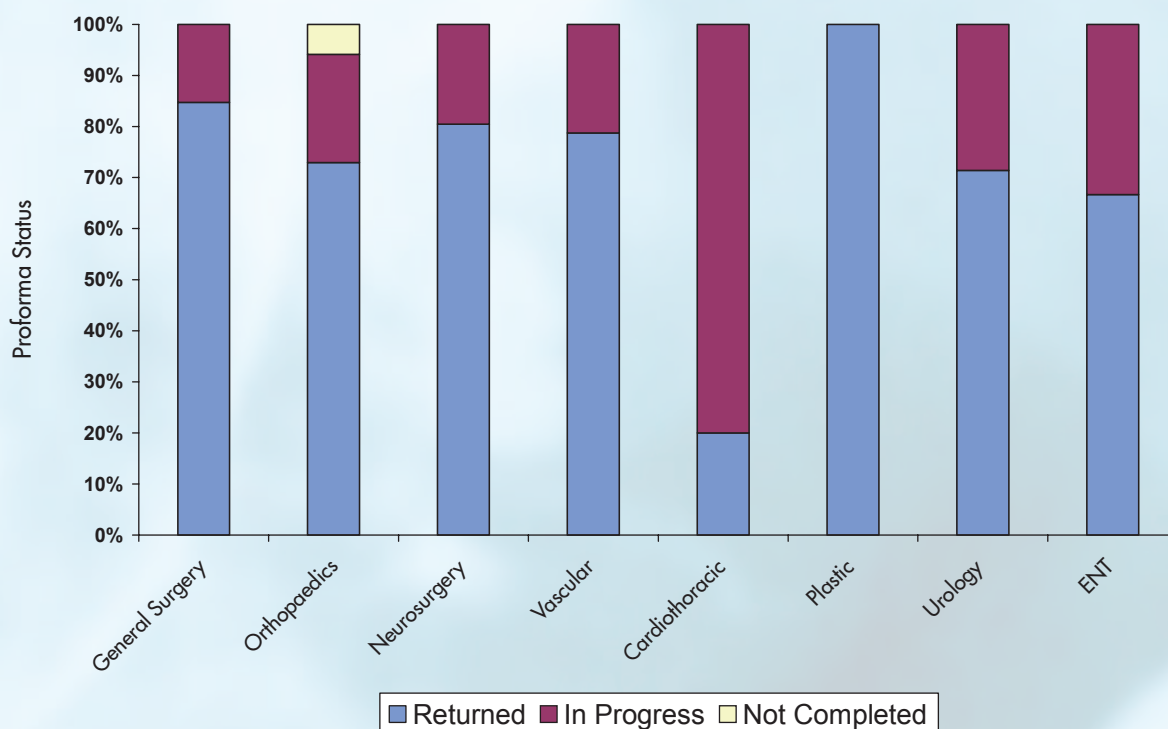
The proportion of proformas completed by specialty for the current audit year is illustrated in Fig 2.4. Where SAAPM has received a notification of a death under a surgeon who has chosen not to participate, the case is recorded as not completed.



Table 2.2 Number of proformas sent out by speciality

Specialty	05/06	06/07
General Surgery	181	229
Orthopaedic	82	80
Neurosurgery	64	82
Vascular	50	47
Cardiothoracic	35	25
Plastic & Reconstructive	11	8
Urology	10	7
ENT/ Head & Neck	7	15
Total	440	493

Figure 2.4 Proportion of Proformas completed by speciality





2.5 Assessments

All cases which fit the inclusion criteria of SAAPM are first line peer reviewed by a surgeon in the relevant specialty. During the audit period, 329/387 (85%) of the included proformas had undergone first line assessment. The first line assessors felt there was an area which required clarification through a second line review of case notes in 26/329 (8%) of cases. Table 2.3 provides data on cases which have undergone first and second line assessment. The percentage of cases being referred to second line assessment has fallen in the second audit year. This is consistent with a decreasing referral to second line assessment reported by WAASM over 5 years of reporting¹. The outcomes of the assessments will be discussed in more detail in the Results section.

It is hoped that the establishment of ANZASM will provide an opportunity for second line assessments to be undertaken by interstate clinicians. This will be of particular advantage with regard to smaller specialties.

Table 2.3 Cases which have undergone assessment (2006-2007)

	2005/06	2006/07
Completed Proformas [§]	328	387
1 st Line Assessment Completed	296 (90%)	329 (85%)
2 nd Line Assessment Completed	37 (11%)	26 (8%)

[§] Terminal Care cases excluded



3 Results

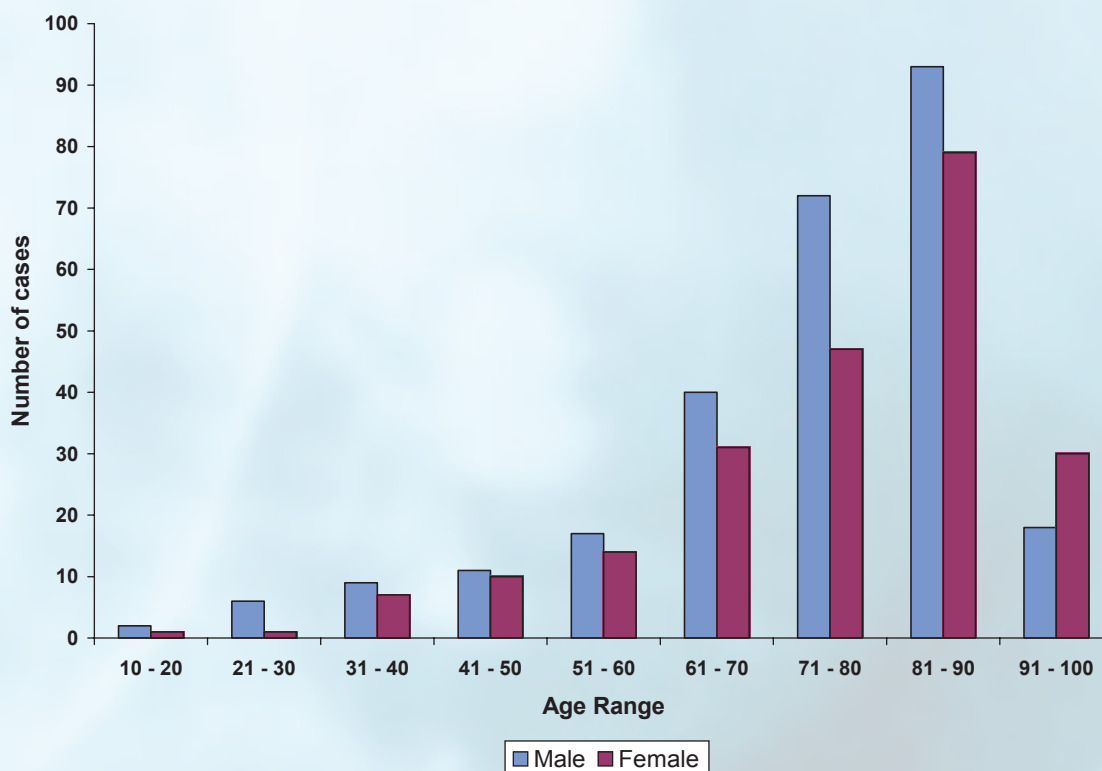
SAAPM has completed two years of data collection (1 July 2005 – 30 June 2007). There have been 933 notifications of death and 715 proformas returned for assessment. In the current audit cycle (1 July 2006 – 30 June 2007) 399 proformas were returned and 329 underwent assessment. Twelve cases were considered to be terminal care by the reporting surgeons were therefore excluded from further audit assessment; the number of cases included in this audit period was 387.

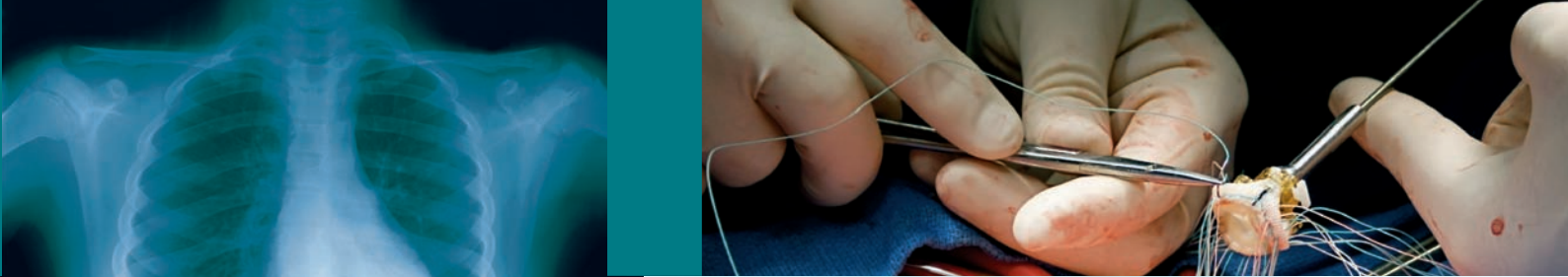
3.1 Age and sex distribution

In the current reporting period, there were 493 reported deaths. Of these, 270 were male (median age 79) and 223 were female (median age 80).

Figure 3.1 indicates the age and sex distribution of the reported cases. Consistent with the previous SAAPM reporting period, patients between the ages of 71 and 90 years accounted for 59% of all cases. Most patients were in the 81-90 year age group which is consistent with data reported by WAASM¹. In the 81-90 year age groups, males had the highest number of deaths (54%) which is a reversal of the gender balance on the previous SAAPM reporting year. In all age groups, males had the highest number of deaths except for the 91-100 year age group.

Figure 3.1 Ages and sex distribution (06/07)





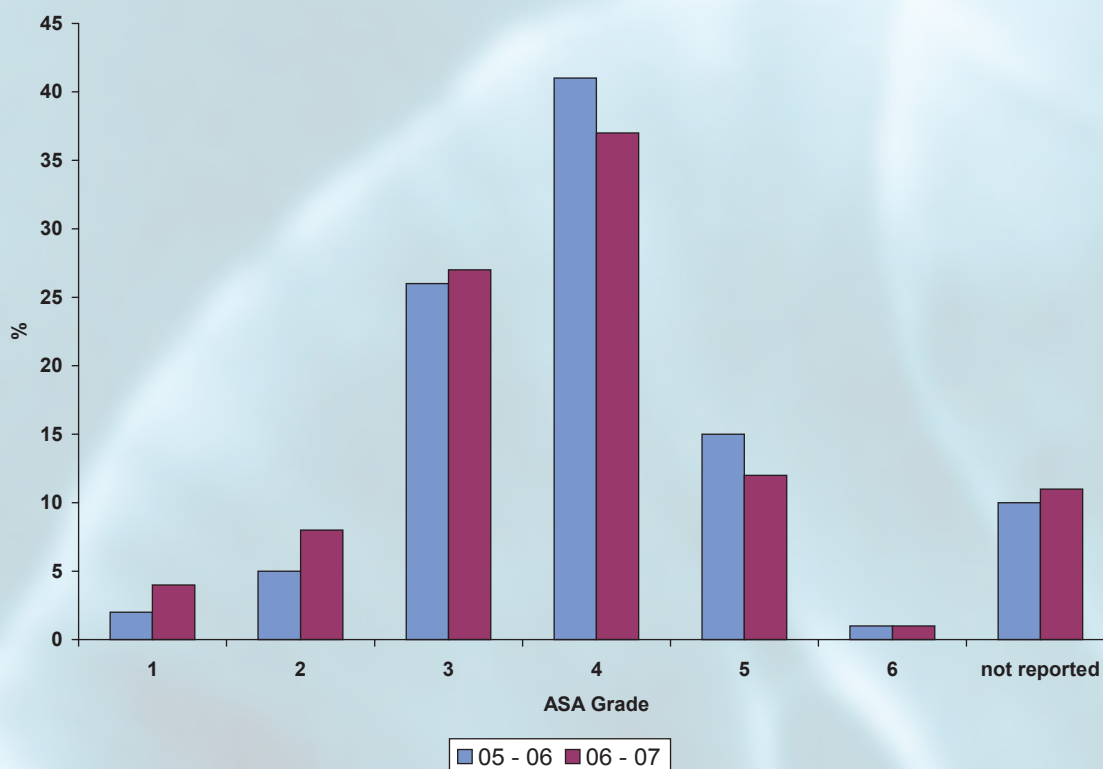
3.2 ASA grade

Figure 3.2 provides data on the ASA grade of patients over the two SAAPM audit periods. The most frequently reported pre-operative ASA grade of cases audited over both years was grade 4. This finding is consistent with data collected by both SAAPM in 05/06 and WAASM¹. Patients assessed as ASA grade 4 are considered to have an incapacitating systemic disease that is a constant threat to life. Patients with ASA grades of 3 & 4 show a statistically significant association with postoperative morbidity.² The frequency distribution of ASA grades reported here reflects the complex medical condition of the majority of cases audited. Characteristics of ASA grading can be found in Appendix 1.

3.3 Surgical diagnosis

The main surgical diagnoses reported by surgeons are provided in Table 3.1. The 11 categories detailed, totalling 230 cases, represent 59% of all confirmed surgical diagnoses reported in the 387 returned surgical proformas. The most frequently occurring surgical diagnosis was fractured neck of femur, reflecting the same result as the SAAPM 2006 data³.

Figure 3.2 Comparison of ASA Grade 05/06 – 06/07)



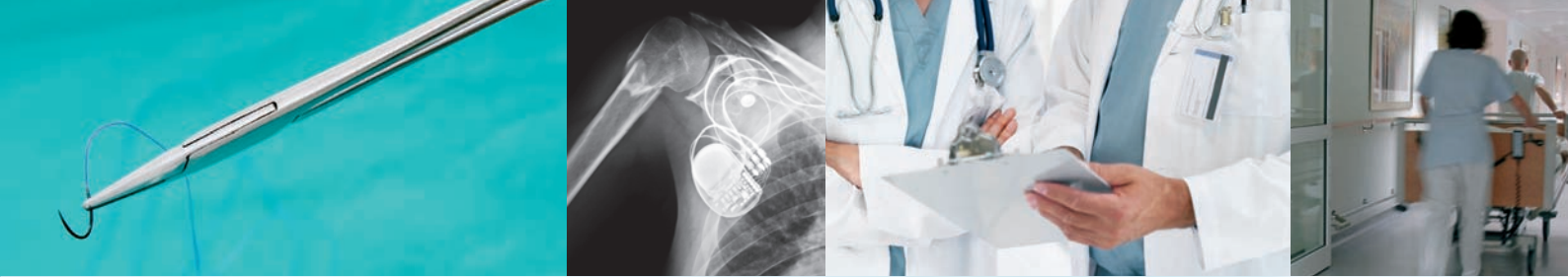
³Data not reported in 10% of 05/06 and 11% of 06/07 cases



Recent research has suggested that 4% of patients aged over 50 years who have a hip fracture will die whilst in hospital.¹⁰ Notifications of death sent to SAAPM by participating hospitals show that 89% (438/493) of patients were aged over 50 years. Advanced age was second to cardiovascular disease in reported comorbidities in this audit period, again reflecting the results of the previous SAAPM report.

Table 3.1 The most frequently reported surgical diagnosis

Surgical Diagnosis	n	Percentage of total proformas returned (n = 387)
Fractured neck of femur	43	11
Intracranial haemorrhage (ICH, SDH, SAH)	38	10
GI malignancy (18 colorectal cancer, 17 other)	35	9
Bowel obstruction	26	7
Abdominal aortic aneurysm (AAA)	21	5
Acute abdomen (peritonitis/perforation)	19	5
Ischaemic gut	14	4
Multi-trauma	9	2
Neuro-trauma	9	2
CNS tumours	8	2
Pancreatitis	8	2
Total	230	59%



3.4 Comorbidities

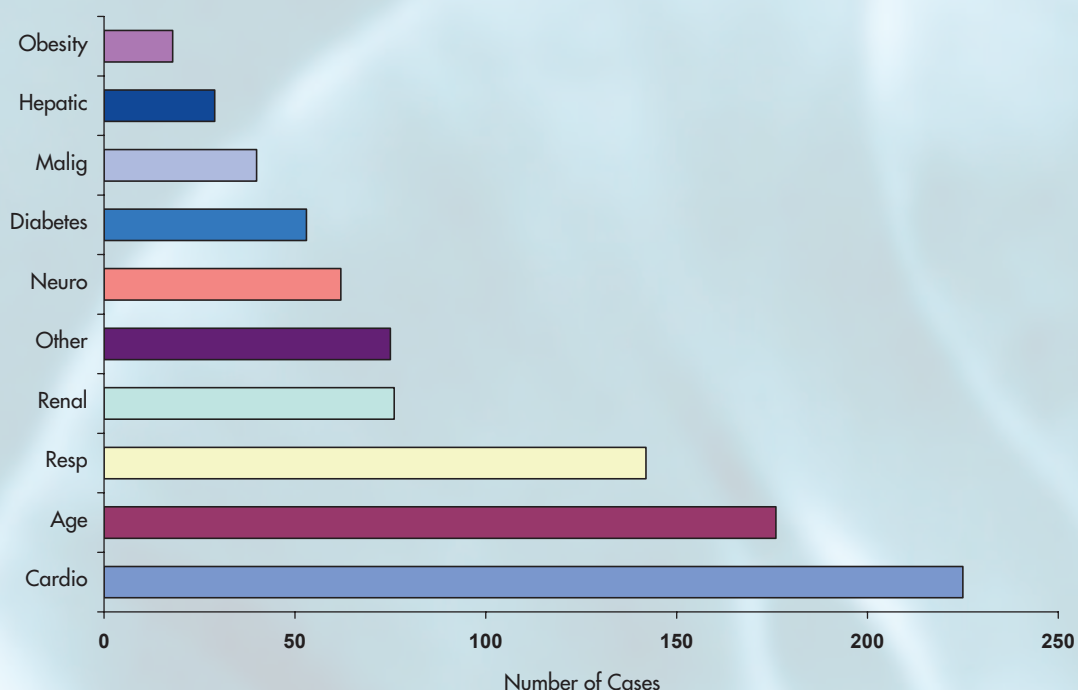
Comorbidities reported by surgeons are reflected in Figure 3.3. Cardiothoracic, age-related and respiratory factors were the most frequently occurring factors. This is consistent with the previous SAAPM, WAASM and TASM reports.^{1,3,4}

Evidence from overseas surgical mortality audits suggest that with an aging population, the surgical admissions of elderly patients is increasing and that the admissions are mostly emergency rather than elective.¹³ Internationally, contemporary debate questions whether or not it is more appropriate for postoperative care of elderly hip fracture patients to occur on specialist 'Care of the Elderly Units' rather than orthopaedic wards.¹³ These results may indicate that greater interaction with specialist Gerontologists should occur on surgical wards in order to reduce the impact of invasive procedures on this at-risk group.

Obesity was the least reported co-factor. This finding is in contrast with the most recent reporting on obesity trends in Australia. However as the most frequently-occurring age range of this audit is 70-90 years it is possible that this group predates many of the modern risk factors attributed to the national obesity epidemic.

Surgeons are asked to indicate the comorbidities which form the background to a patient's final admission. As discussed in section 3.1, 59% of patients were in the 71-90 year age group are the most frequently occurring in the 2006/2007 SAAPM data set. In this age group, 28% (62/220) of patients had at least three comorbidities. The data underlines the complexities of managing this high risk age group.

Figure 3.3 Comorbidities in completed cases





3.5 High dependency and intensive care units

Table 3.2 provides data on the surgeons' use of, and assessors view on the use of HDU and ICU. In 281/329 (85%) of completed cases, surgeons reported having used either high dependency unit (HDU) or intensive care unit (ICU) facilities in patient management. In 20/329 (6%) of cases, either the first or second line assessors considered that such high level care would have been appropriate in those particular cases, but was not used. The lack of use or under use of HDU was reported in 12/329 (4%) of cases.

Table 3.2 Actual use and assessor opinion of use of high dependency unit or intensive care unit

No of Cases (%)	2006/07	(%)
Use of ICU	Pre-operatively	126 (38)
	Post-operatively	86 (26)
Use of HDU	Pre-operatively	44 (13)
	Post-operatively	25 (8)
Total		281[§] (85)
Assessors opinion[#] on cases where patient was not admitted to ICU or HDU		
ICU not utilised	1 st line assessor [¶]	3 (<1)
	2 nd line assessor [*]	2 (<1)
HDU not utilised	1 st line assessor [¶]	12 (4)
	2 nd line assessor [*]	3(1)
Total		20 (6)

[#] Assessors may have nominated both ICU & HDU use would have been beneficial

[§] Data not supplied for 48 cases

[¶]First line assessments n = 329; ^{*} second line assessments n = 26



3.6 Clinical incidents

Of the 329 cases which have undergone assessment, 81% of deaths were related to the disease process, and there were no areas which raised comments from the assessors.

There were 64 cases (19%) in which assessors reported an area of consideration, an area of concern or an adverse event. This incidence rate is lower than the data reported by SAAPM in 05/06 (58/296; 20%).³ This reduction is in the context of a 12% increase in reported deaths.

Of the 329 cases which have undergone assessment

265 (81%) Were related to the disease process

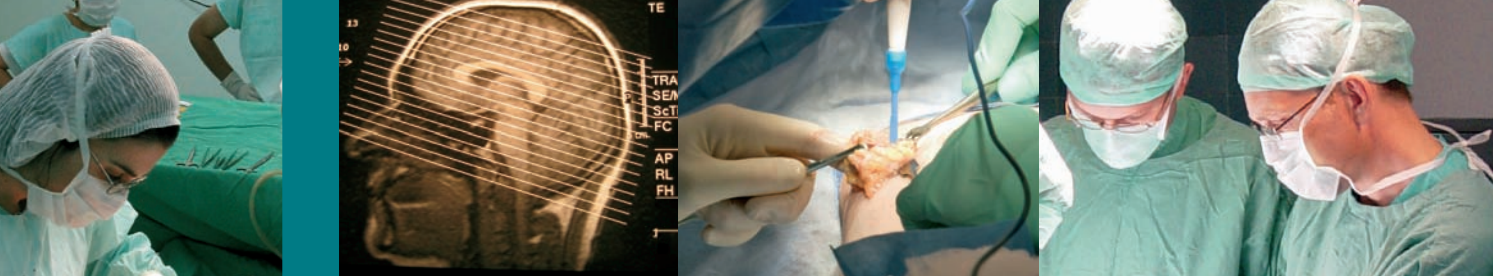
64 (19%) Were cases with Clinical Incidents

Of the cases assessed as having clinical incidents:

36 (11%) Cases were associated with areas for consideration

18 (6%) Cases were associated with areas of concern

10 (3%) Cases were associated with an adverse event



Tables 3.3, 3.4 and 3.5 provide the breakdown of data on clinical incidents in relation to patient outcome, preventability and the responsible clinical unit. Of ten events which were assessed as adverse, nine were considered to have caused the death of a patient who would otherwise have been expected to survive. Of these, eight adverse events were assessed as being 'probably' preventable and six were attributed to the surgical team. Of the 64 identified clinical incidents, 30% (19/64) related to pre or post-operative management issues.

Table 3.3 Patient outcome associated with areas of consideration, concern or adverse events reported by assessors

Clinical incident	Made no difference to outcome	May have contributed to death	Caused the death of a patient who would otherwise be expected to survive	Missing data/ No response	Total
Area of consideration	18	17		1	36
Area of concern	3	13	2		18
Adverse event		1	9		10
Total	21	31	11	1	64

Table 3.4 Preventability of event associated with areas of consideration, concern or adverse events reported by assessor

Clinical incident	Preventability					Total
	Definitely	Probably	Probably not	Definitely not	Missing data/ No response	
Area of consideration	3	15	15		3	36
Area of concern	5	9	4			18
Adverse event		8	1		1	10
Total	8	32	20		4	64



Table 3.5 Responsible unit associated with areas of consideration, concern or adverse events reported by assessors

Clinical Incident	Associated with					Total
	Surgical team	Clinical team	Hospital	Other	Missing data/No response	
Area of consideration	22	6	2	5	1	36
Area of concern	7	3	1	7		18
Adverse event	6	2	1	1		10
Total	35	11	4	13	1	64

The total number of clinical incidents reported in this audit period is higher than in the 05/06 reporting period (64 compared to 58); the number of deaths reported overall has also increased by 12%. It is difficult to compare the two periods however as only three of the seven participating hospitals in the first (05/06) audit period were audited for a full 12 months. Data collection was initiated in two of the hospitals in April 2006, and was therefore contributing to the data pool for only two months in the first audit period. In the 06/07 audit period, only eight of the twelve participating hospitals participated for a full 12 months.

The increasing experience of first and second line assessors may also have influenced these outcomes; in the 07/08 audit period the current 12 participating hospitals will have full datasets for analysis, which will also impact on the total numbers of reported incidents.

Table 3.6 provides details of assessor comments in all reported areas of consideration. The most frequently occurring areas of consideration included surgeon involvement in the decision to operate and delay in diagnosis in the emergency department. Preoperative fluid balance, supervision of junior surgeons, the choice of procedure and anticoagulation management were also reported by assessors as having an impact on patient outcome.



Table 3.6 The areas of consideration reported by assessors in emergency and elective cases

Admission type	Area of consideration	Frequency	
Emergency	Delay <ul style="list-style-type: none"> • Transfer • Diagnosis in ED 	1 3	
	Preoperative management <ul style="list-style-type: none"> • Preoperative fluid balance 	2	
	Surgeon involvement <ul style="list-style-type: none"> • Decision to operate • Surgeon too junior • Surgeon not present at procedure 	3 2 1	
	Choice of procedure	2	
	Technical failure <ul style="list-style-type: none"> • Led to limb ischaemia resulting amputation 	1	
	Post operative management <ul style="list-style-type: none"> • Should have been in HDU • Should have been in ICU or HDU 	1 1	
	Aspiration pneumonia <ul style="list-style-type: none"> • Failure to place NG tube • Feeding; nursing issue (post operative) 	1 1	
	Lack of surgeon access to medical units	1	
	Falls <ul style="list-style-type: none"> • 2 x falls in hospital • Fall in nursing home 	1 1	
	Anticoagulation management	2	
	Resource issues <ul style="list-style-type: none"> • Early extubation of ICU patient 	1	
	Review of not for resuscitation order post ICU	1	
	Identification of source of sepsis	1	
	Elective	DVT prophylaxis not given	1
		Preoperative assessment <ul style="list-style-type: none"> • ASA 3 with known cardiac disease • Underassessment of poor respiratory function • Lack of anaesthetic and cardiology pre-op assessment 	1 1 1
Delay <ul style="list-style-type: none"> • Diagnostic imaging delay resulted in delay to procedure 		1	
Major haemorrhage (intraoperative)		1	
Long procedure in ASA4 patient		1	
Failure to place NG tube for prevention of aspiration pneumonia		1	
Post operative care		1	
Total		36	



Table 3.7 provides details of assessor comments in all reported areas of concern.

Delays in transfer, diagnosis, access to theatre and communication issues between medical staff were the most frequently occurring areas of concern reported by assessors. Patient related issues such as refusing further treatment accounted for 16% (3/18) of the reported areas of concern.

Table 3.7 The areas of concern reported by assessors in emergency and elective cases

Admission type	Area of concern	Frequency
Emergency	Communication issues	
	<ul style="list-style-type: none"> Insufficient information from transferring hospital 	1
	<ul style="list-style-type: none"> Lack of junior registrar & surgeon communication led to delay in senior medical input 	1
	Delay	
	<ul style="list-style-type: none"> Theatre access delay resulted in DVT/PE 	1
	<ul style="list-style-type: none"> Diagnosis 	1
	<ul style="list-style-type: none"> Diagnosis by transferring hospital 	1
	<ul style="list-style-type: none"> Referral from transferring hospital 	1
	<ul style="list-style-type: none"> Diagnosis despite appropriate investigation previously 	1
	Surgeon involvement	
	<ul style="list-style-type: none"> Decision to operate 	1
	<ul style="list-style-type: none"> High risk patient undergoing 2nd procedure 	1
	Postoperative management	
<ul style="list-style-type: none"> Postoperative monitoring 	1	
Respiratory failure		
	1	
Tracheal injury during emergency intubation		
	1	
Patient related issues		
<ul style="list-style-type: none"> refused treatment after technically uneventful procedure 	1	
<ul style="list-style-type: none"> patient refused surgery 	1	
<ul style="list-style-type: none"> inability to adequately decompress stomach (patient disorientated) 	1	
Fluid management		
<ul style="list-style-type: none"> both medical and surgical teams 	1	
Aspiration from premature removal of NG tube		
	1	
Elective	Choice of procedure	1
Total		18

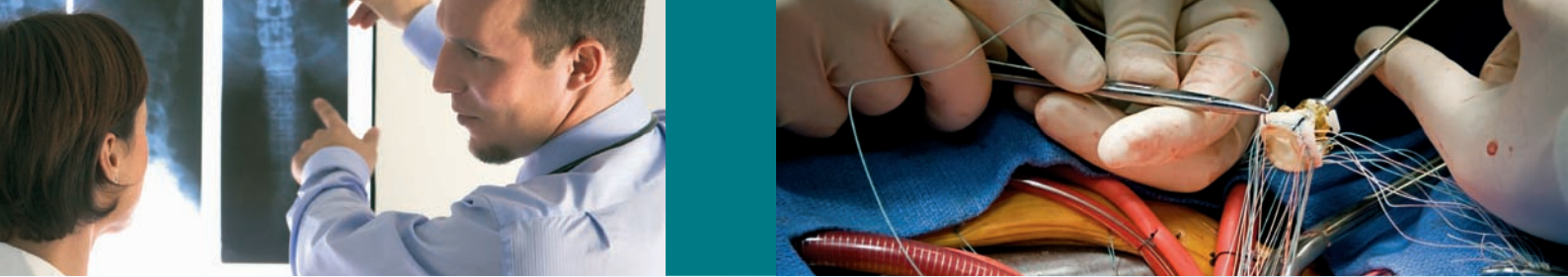


Table 3.8 provides details of assessor comments in all reported adverse events. Of the 329 cases assessed during the audit period, 10 (3%) were considered adverse events by the assessor. Adverse events that were attributed to emergency cases included a fall in hospital, aspiration and haemorrhage in two patients of the Jehovah Witness faith who refused transfusion. In elective admissions, incidents considered adverse events by assessors included a delay recognising a complication, pulmonary embolus (PE), and an unforeseeable complication of postoperative care, diffuse mesenteric ischaemia.

Table 3.8 The adverse events reported by assessors in emergency and elective cases

Admission type	Adverse event	Frequency
Emergency	Aspiration in patient with NG tube	1
	Fall in hospital fall causing cerebral injury	1
	Interventional radiology procedure resulting in arterial rupture	1
	Bladder perforation during catheter irrigation	1
	Intra-operative haemorrhage in Jehovah's Witness	1
	Post-operative haemorrhage in Jehovah's Witness	1
Elective	PE	1
	Radiological treatment resulting in middle cerebral artery perforation in a fatal SAH	1
	Gastric perforation post operatively	1
	Post operative care <ul style="list-style-type: none"> • diffuse mesenteric ischaemia 	1
Total		10

3.7 Admission type

The admission status and how it related to clinical incidents is described in Table 3.9. Of the 329 cases assessed, 84% were emergency admissions, 18% (48/277) of which were associated with a clinical incident. Elective admissions made up 12% (40/329) of all cases audited of which 35% (14/40) were associated with a clinical incident. Terminal care cases, which did not progress through the audit process, accounted for 4% (12/329) of all cases.



Table 3.9 Admission status and clinical incident associated with assessed cases

Admission Type	Clinical Incident [§]		Total Assessments
	Yes	No	
Emergency	48	229	277 (84%)
Elective	14	26	40 (12%)
Terminal Care	0	12	12 (4%)
Total	62	267	329

[§]Refers to an area of consideration, area of concern or an adverse event

3.8 Operative and non-operative data

Of the 387 patients included in the current audit period, 56% (215/387) of cases underwent a surgical procedure and 44% (172/387) did not.

The number of operative and non-operative cases by specialty is provided in Table 3.10. The General Surgical specialty accounted for 49% (191/387) of all cases and 47% (107/215) of all operative deaths.

Table 3.10 Number of operative and non-operative cases by specialty

Specialty	Operation				Total
	Yes	(%)	No	(%)	
General	101	53	90	47	191
Neurosurgery	27	40	39	60	66
Orthopaedic	48	77	14	23	62
Vascular	21	56	16	44	37
Otolaryngology Head & Neck	6	60	4	40	10
Plastic & Reconstructive	5	62	3	38	8
Urology	4	50	4	50	8
Cardiothoracic	3	60	2	40	5
Total	215	56	172	44	387



Although the cases included in this audit must have been under the care of a surgeon, it is not a criterion that the patient undergoes an operation. For a number of reasons, a patient may be admitted under a surgeon and die without undergoing a surgical procedure. Table 3.11 provides data on the reasons given by surgeons for no operation being performed. In some cases surgeons recorded more than one response.

Table 3.11 Reasons for non operation

Not a surgical problem	40
Active decision not to operate	51
Patient refused operation	12
Rapid death (related to the disease process)	9
Total#	112

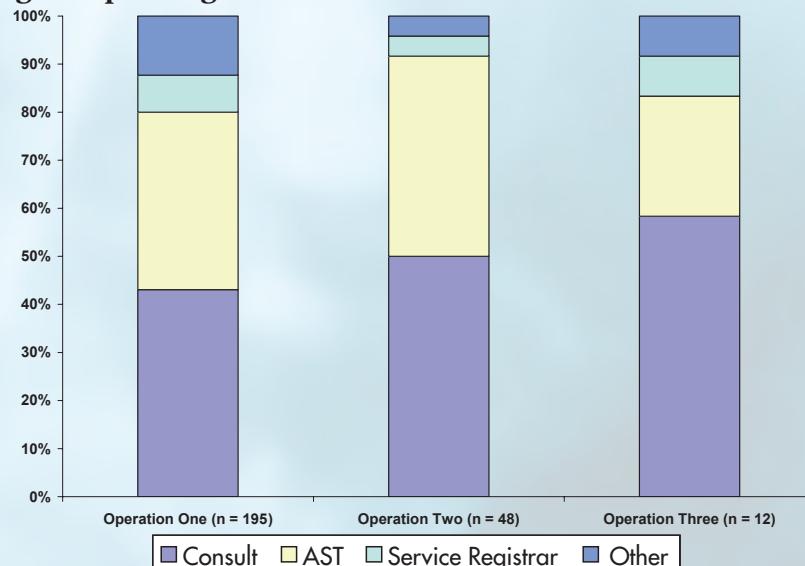
#more than one response was recorded for some cases

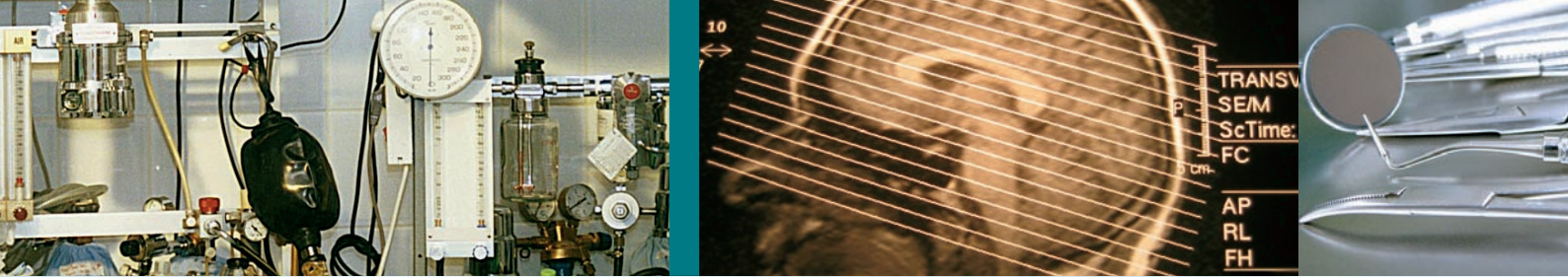
3.9 Grade of surgeon operating

Predominantly, notifications of death are sent to SAAPM from large metropolitan public hospitals. As these institutions are the primary locations for surgical training, part of the SAAPM audit process involves examining the grade of surgeon undertaking the first and any subsequent surgical procedures during the patient's final admission. Patients returning to theatre are generally in a poorer condition and present as a higher surgical risk. Data from the current reporting period, provided in Figure 3.4 reveals that surgeons were the primary surgeon in 43% (84/195) of first procedures. The proportion of surgeons operating where a subsequent procedure was necessary increased to 50% (24/48) for the second procedure and 58% (7/12) for the third procedure.

The increase in surgeon participation in subsequent procedures reported here mirrors the trend observed in other similar audits.¹

Figure 3.4 Grade of surgeon operating





3.10 DVT prophylaxis

A primary role of SAAPM is to identify and communicate areas in perioperative care which may be improved or where repeated adverse clinical incidents are occurring. The impact of clinical events on health resources include delayed recovery (increased length of stay), readmission to hospital or unplanned use of post-discharge services.⁵

An important aspect of perioperative management is deep vein thrombosis /pulmonary embolus (DVT)/(PE) prophylaxis, a common complication of hospitalisation. DVT will occur in approximately 1/1000 patients from developed countries and approximately 1% of all hospital admissions will die from PE.⁶

Prophylaxis may take the form of medication such as low molecular weight heparin (LMWH) and aspirin or physical pressure such as mechanical compression and anti-embolic stockings. Recent literature suggests that targeted prevention of DVT should entail assessing the inherent risk in the patient in addition to their associated clinical condition, rather than acute management alone.⁶

Post-discharge prophylaxis is reliant on patient compliance. Kable *et al* (2004)⁵ reported in a prospective post-discharge survey, that of the 96% of major joint replacement patients who were instructed in the post-discharge use of thrombo-embolic stockings, only 54% complied with the recommended six weeks of use.

Of the 387 returned proformas, surgeons reported they had used a form of DVT prophylaxis in 219 (57%) of cases. Table 3.12 provides data on the specific type of DVT prophylaxis used.

Not all patients are suitable for anticoagulant prophylaxis, for example those presenting with a haemorrhage, who are coagulopathic or being treated conservatively. In some cases mechanical compression (TED stockings) may assist when chemical measures are not indicated. In 32% (124/387) of cases, surgeons reported they did not use DVT prophylaxis. Of the cases where the surgeon reported the reason, 18% (22/124) of patients were being treated conservatively, 10% (12/124) were coagulopathic or had elevated International Normalised Ratio (INR), and 18% (22/124) presented with a haemorrhage or had a rapid death on arrival at hospital. Table 3.13 provides data on the reasons given by surgeons for not using DVT prophylaxis. In only one case did an assessor identify that the lack of DVT prophylaxis contributed to a patient's death.

The use of DVT prophylaxis was considered inappropriate by assessors in 1% (4/219) of cases. In 40 cases the question relating to DVT prophylaxis was not completed.

Table 3.12 Types of DVT prophylaxis used

Heparin/LWMH	Mechanical compression	Warfarin	Anti-embolic stockings	Aspirin	Other
155	46	8	93	9	3

¥ Some surgeons indicated the use of two forms of prophylaxis i.e. mechanical and medication



Table 3.13 Reasons cited by surgeons for non use of DVT prophylaxis

Reason	Number of cases
Conservative/palliative treatment	22
Already on heparin/aspirin	7
Rapid death	11
Presented with haemorrhage	11
Elevated INR/liver co-morbidity, coagulopathic	12
Mobilising	2
No specific reason	3
Total	68[§]

[§] Not all surgeons reported reasons for not using DVT prophylaxis

3.11 Fluid balance

The management of perioperative fluid balance can directly contribute to surgical outcomes.⁷ Trauma and anaesthesia affect the body's capacity to control internal and external fluid/electrolyte balance.⁷ Data from WAASM¹ indicates that the risk of postoperative complications is increased in patients receiving significant volumes of fluid containing sodium. In this regard, elderly patients with low body weight were found to be at increased risk.

In 27/300 (9%) of cases, surgeons indicated that fluid balance was an issue; however surgeons indicated fluid balance was an issue in only five of the twelve cases reported by first line assessors indicated the same issue. Similarly, fluid balance was indicated as an issue in two second line assessments although the surgeon had not indicated this on the surgical case form. Table 3.14 details these findings.

Table 3.14 Fluid balance issues identified by surgeons and assessors

	Surgeon	1 st Line Assessor	2 nd Line Assessor	Total
Fluid balance issue	27	12 [∞]	2 [∞]	41

[∞]some cases were not indicated by surgeons



3.12 Post-mortem

Post-mortem (PM) examination is required in many medico-legal systems⁸ and may provide information which is contrary to the clinician’s original view of the cause of death.^{9, 13} The Royal College of Pathologists maintains that autopsies make an invaluable contribution to medical knowledge and advancement in healthcare, and may also benefit next of kin¹⁶, yet the rate of PM examination is falling both in Australia and internationally.¹⁴ Literature from New Zealand suggests the local clinical autopsy rate is as low as 2%¹³ and some authors have attributed the fall to cultural issues, fuelled by public perceptions surrounding tissue harvesting.⁸

The data collected from this audit confirms the decline in PM examination. In the 05/06 reporting period, 49 PM examinations were reported to SAAPM; however, in the 06/07 audit period only 40 were reported. Given the increased number of deaths reported in the latter period, this represents a further decline in the use of PM. Of the 40 cases referred for PM examination, in five cases PM was refused. Four surgeons advised that they had read the Coroner’s report prior to completing the surgical case form. In two cases, surgeons indicated they would have preferred a PM although none was performed. Table 3.15 provides data on PM information collected by SAAPM.

At the time the audit period was closed, 12 cases were outstanding and known to be awaiting coronial investigation. Access to case notes is often limited once a case is transferred to the Coroner’s office. Limited PMs are generally performed in hospital settings with the limitations being set by the next of kin.⁸ The results of the truncated examination are available more quickly than a full PM. This process has been adopted in Queensland, where the Coroner may confine the PM examination to a region of interest. A recently published study examined the results of 136 PM cases. It was reported that in 17% of cases the result of a truncated PM differed from that of a full PM.⁸ This indicates that whilst a full PM takes longer, the information obtained is more reliable. One of the most important contributions autopsies make to education and quality in healthcare is to ensure that diseases are diagnosed accurately in the future and treated appropriately.¹⁵

Table 3.15 Post mortem examinations in cases identified by surgeons

Post mortem performed	Yes		No	Refused	Missing Data
	Hospital	Coroner			
	2	38	190	5	152

¥ does not include 12 terminal care cases



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 - Mr Adrian Anthony General Surgery Representative
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 - Mr Rob Fitridge Vascular Specialty Representative
 - Dr Linda Ferris Orthopaedic Specialty Representative
 - Mr Chris Butcher Orthopaedic Specialty Representative
 - Professor Don Moyes Anaesthetist Representative
 - Dr Marie Gould Anaesthetist Representative
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 - Mr David Walsh Surgical Representative
 - Mr Glenn McCulloch Surgical Representative
 - Prof Don Moyes Anaesthetist Representative
 - Dr Suzy Szekely Anaesthetist Representative
 - Prof Chris Baggoley South Australian Department of Health
 - Ms Christy Pirone South Australian Department of Health
 - Ms Chris Barber SAAPM Project Manager

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Appendix

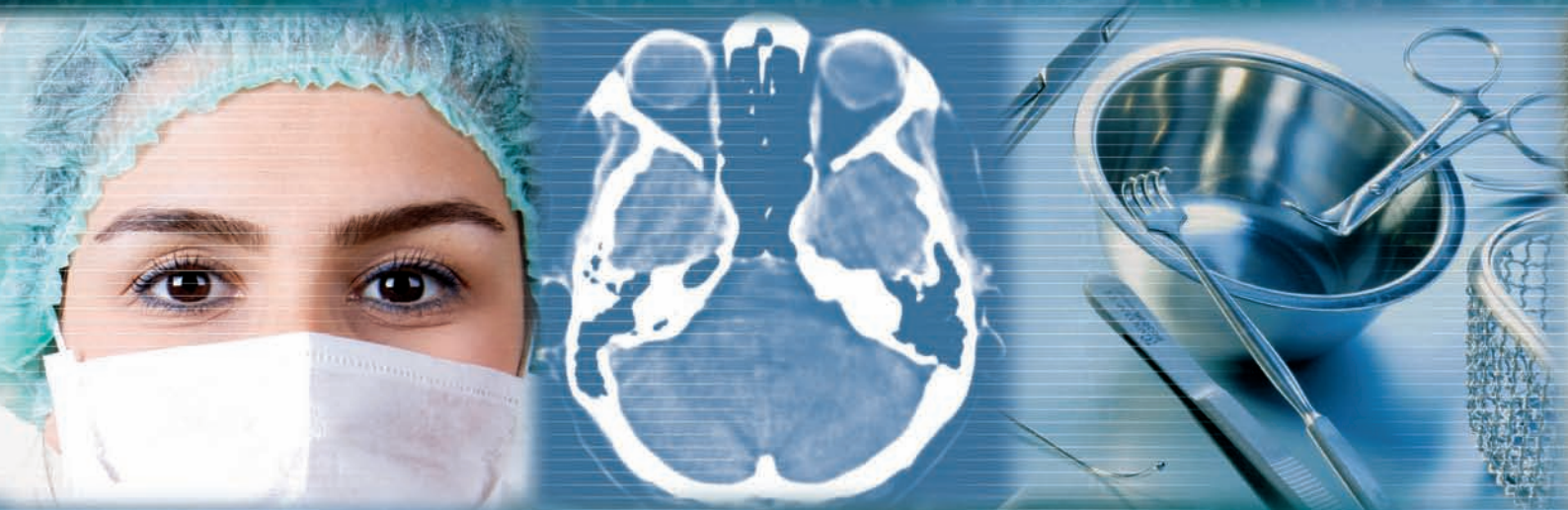
ASA grade	Characteristics
1	A normal healthy patient
2	A patient with mild systemic disease
3	A patient with severe systemic disease which limits activity, but is not incapacitating
4	A patient with an incapacitating systemic disease that is a constant threat to life
5	A moribund patient who is not expected to survive 24 hours with or without an operation
6	A brain dead patient for organ donation



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