



Royal Australasian College of Surgeons

# WAASM

## Annual Report 2005

**W**estern  
**A**ustralian  
**A**udit of  
**S**urgical  
**M**ortality



THE UNIVERSITY OF  
WESTERN AUSTRALIA

## Contact

Western Australian Audit of Surgical Mortality  
Royal Australasian College of Surgeons  
Room 112, CTEC, M308  
The University of Western Australia  
35 Stirling Highway  
Crawley WA 6009

Telephone: (08) 6488 8691

Facsimile: (08) 6488 8560

Email: [waasm@surgeons.org](mailto:waasm@surgeons.org)

Website: <http://www.surgeons.org/Content/NavigationMenu/WhoWeAre/Regions/WA/WAASM/default.htm>

---

## Table of Contents

---

	<b>Page</b>
Chairman's Report	4
Abbreviations	5
Executive Summary	6
Introduction	8
Background	8
Project Description	9
Review of Progress	11
Results	12
Definitions and Reporting	12
Participation	13
Completed Cases	17
Suboptimal Care	20
Admissions	22
Operative and Non-Operative Deaths	25
Prophylaxis of Thromboembolism	28
Grade of Surgeon – Teaching Hospitals	29
Post-Mortems	30
Funnel Plot of Hospital Performance	31
Acknowledgements	32
References	32
Appendices	33

---

## Chairman's Report

---

The 2003 and the 2004 Annual Reports both urged WA surgeons to participate in WAASM. The substantial media interest following the release of the 2004 report was almost wholly directed towards the issue of non-participation. This is the central concern of the Health Consumer Council of Western Australia. A recent editorial in the *Medical Journal of Australia*<sup>1</sup> noted that 'only 100% participation can give the assurance that the public deserves'. The Royal Australasian College of Surgeons is currently introducing the Australian and New Zealand Audit of Surgical Mortality and this will undoubtedly be seen by government as a test as to whether the profession can self regulate. Anything other than complete participation will be seen as demonstrating that the College cannot be trusted to monitor something as fundamental as death after surgery. Government regulation would then be inevitable. The small numbers of surgeons who do not participate or return a low proportion of proformas need to recognise that they are potentially doing their colleagues and profession a great disservice. Once again WAASM urges all WA surgeons to participate and to complete every proforma in detail.

This interim report has been produced to update WAASM's data to the end of 2004. All subsequent reports will be based on calendar year. This interim report confirms a number of positive trends noted in the 2004 Annual Report. This is perhaps not surprising as 73% of WA surgeons admitted that WAASM has changed their practice in at least one area. This is the very essence of

surgical audit. The 2004 Scottish Audit of Surgical Mortality Annual Report<sup>2</sup> includes similar compelling data of improved outcome.

Two observations demonstrate how WAASM has changed practice. During 2004 there was a substantial increase in teaching hospital consultant participation during second and third operations. This is an issue WAASM flagged in both previous reports. Consultants have clearly responded to this observation. There has been a reduction in futile operations, another issue WAASM highlighted in both its previous reports. Over and above this, the proformas now clearly document that surgeons, in conjunction with patients and family members, are making definite and clear decisions about limiting the scope of treatment. This applies to both operative and non-operative patients. In large part these decisions to limit treatment are prompted by a realistic assessment of medical co-morbidity and quality of life, rather than as a response to a surgical mishap. These decisions are not easy and require fine clinical judgement, but with an increasingly aging population surgeons will need to address this issue more frequently.

Technical mishaps and delays remain the leading deficiencies of care in elective and emergency patients respectively. In WA in 2004, 19% of audited deaths followed an elective admission *versus* 10% in Scotland<sup>2</sup>. Although comparisons across the world are fraught with difficulty this substantial difference should give every WA surgeon cause to reflect on any death following elective surgery.

**James Aitken**  
**WAASM Chairman**

---

## Abbreviations

---

95% CI	95% confidence interval
99% CI	99% confidence interval
AST	Advanced Surgical Trainee
ANZASM	Australian and New Zealand Audit of Surgical Mortality
BST	Basic Surgical Trainee
CNR	Case Note Review
CTEC	Clinical Training and Education Centre at the University of Western Australia
DoC	Deficiencies of Care
DoH	Department of Health
DVT	Deep Vein Thrombosis
ENT	Ear Nose and Throat
GP	General Practitioner
HDU	High Dependency Unit
ICU	Intensive Care Unit
IQR	Interquartile range
PE	Pulmonary Embolism
RACS	Royal Australasian College of Surgeons
SASM	Scottish Audit of Surgical Mortality
SoC	Suboptimal Care
SR	Service Registrar
TMS	Theatre Management System
TOPAS	The Open Patient Administration System
UK	United Kingdom
UWA	University of Western Australia
WA	Western Australia

---

## Executive Summary

---

This is the third Annual Report prepared by the Western Australian Audit of Surgical Mortality (WAASM). It is an interim report which includes data on deaths reported to WAASM up to the end of 2004. This will facilitate future reporting on complete calendar years.

WAASM is an external, independent peer review audit of the process of care associated with surgically related deaths in Western Australia (WA). WAASM is managed by the Royal Australasian College of Surgeons (RACS) and funded by the WA Department of Health. WAASM has protection under both State and Federal Legislation. The principle aim of the WAASM is to improve the quality of healthcare through the feedback of information to surgeons.

WAASM is notified of all deaths that occur under the care of a surgeon in WA. WAASM sends the surgeon a proforma for completion. This proforma is then assessed by a first line assessor. He/she will then determine if this case should undergo a case note review (CNR). CNR's are undertaken where deficiencies of care are thought to have occurred or where a review could usefully draw attention to lessons to be learned. WAASM disseminates information back to individual surgeons, all surgeons and hospitals. Information is aggregated and anonymous.

### REVIEW OF PROGRESS

WAASM has continued to manage the audit process and encourage participation of surgeons in the process. 2004 was a successful

year for WAASM and has been previously described.<sup>3</sup> Details of audited cases reported in 2005 will be included in the next annual report. WAASM is currently undertaking a review of cases where surgeons have reported problems with fluid balance. A discussion forum on the problems associated with anti-coagulation in the peri-operative patient is planned for early 2006.

## RESULTS

### Participation

There were 2006 deaths reported to WAASM from 2002 to 2004. At time of analysis, 1234 (62%) had completed the audit process. 192/225 (85%) consultants surgeons associated with these deaths had returned the WAASM proforma. Only 2% of surgeons indicated they did not wish to participate in WAASM.

### Demographics

There were 29 cases admitted for terminal care and excluded from the full audit process. We report on 1205 completed audited cases. The median length of stay in hospital for this group of patients was 7 days (IQR 3-17 days). The median age was 79 years (IQR 70-86). 91% of patients had one or more significant co-morbidity that contributed towards death. ICU was required for 36% of these cases.

### Suboptimal Care

In the majority of cases (70%), assessors indicated there were no areas where the care of the patient could have been improved. In

120/1205 (10%) cases assessors noted that care could have been improved or different (area for consideration). In 239 (20%) cases assessors reported there were deficiencies of care (DoC), ie areas of concern or adverse events. In 54 (4%) of these cases assessors felt that an adverse event had caused the death of a patient and 29 of these events (2% of 1205) were preventable. The proportion of DoC decreased from 25% in 2002 to 17% in 2004.

## **Admissions**

There were more emergency admissions (n=938) than elective admissions (n=267) in these audited deaths. Elective admissions were associated with a significantly higher proportion of DoC (30%) than emergency admissions (17%) ( $P < 0.0001$ , Pearson chi squared test). The proportion of DoC associated with both emergency and elective admissions decreased from 2002 to 2004. DoC associated with elective admissions were predominantly related to treatment received, whereas emergency admissions were associated with delays in receiving treatment.

## **Operative and Non-operative Deaths**

The proportion of audited deaths where no operation was performed increased from 19% in 2002 to 24% in 2004. Cases where an operation was performed (n=940) were associated with a higher proportion of DoC (23% v 8%) than cases where no operation

was performed (n=265).

## **Prophylaxis of Thromboembolism**

Audited cases where DVT prophylaxis was used increased from 61% in 2002 to 68% in 2004. Assessors reported that the use of DVT prophylaxis was appropriate in 96% of cases in 2004. This increased from 89% in 2002.

## **Grade of Surgeon**

In teaching hospitals, 84% of operations (n=582) were performed by either consultants or advanced surgical trainees. In 2004 the proportion of operations in which the consultant was the primary surgeon, if the patient underwent a second or third operation, increased from previous years.

## **Post-Mortems**

A hospital post-mortem was performed in 21/1205 (2%) surgical deaths. 9% of surgeons indicated that they would have preferred a post-mortem where none had been conducted.

## **Funnel plots**

A funnel plot of the WAASM hospital data indicated that clinical care in WA is of a high standard and there were no outliers where individual performance is significantly different from the overall average performance.

---

## Introduction

---

This is the third Annual report prepared by WAASM. The first report<sup>4</sup> included a detailed description of the background and methodology of the project and an overview of data collected during the first 22 months of the audit. The second report<sup>3</sup>, published in May 2005, concentrated on two and a half years of data from January 2002 to June 2004. We reported on the project successfully emerging from its 'set up' stage and gaining the support and confidence of the surgical community and influencing change in practise.

In January 2005 there was a change in the structure of the audit with the Royal Australasian College of Surgeons adopting management of the project from the University of Western Australia. This 2005 interim annual report is a smaller, concise report which includes data to the end of December 2004. This will facilitate future reporting on complete calendar years. 2005 has been a busy and productive year for WAASM – and the results from this year will be included in the WAASM 2006 Report which will be published in mid 2006.

---

## Background

---

The Western Australian Audit of Surgical Mortality (WAASM) is an external, independent peer review audit of the process of care associated with surgically related deaths in Western Australia. WAASM methodology is based on the Scottish Audit of Surgical Mortality (SASM).<sup>5</sup> WAASM commenced on 1 June 2001 as a pilot study in five participating hospitals in the metropolitan area of Perth. On the 1 November 2001 the project was extended to all Western Australian hospitals in which surgical procedures take place. In 2005 The Royal Australasian College of Surgeons (RACS) formed the Australian and New Zealand Audit of Surgical Mortality (ANZASM), with the purpose of extending a similar mortality audit to other states and territories.

WAASM is funded by the WA Department of Health. In January 2005 the management of WAASM transferred from the University of Western Australia (UWA) to the RACS. A new management committee, the RACS WAASM Management Committee was formed (Page 32) to oversee the project.

### **Protection under State and Federal Legislation**

The RACS WAASM Management Committee is registered under the Western Australian Health Services (Quality Improvement) Act 1994 (Gazetted 26 July 2005). The Committee also has protection under the Commonwealth Qualified Privilege Scheme under Part VC of the Health Insurance Act 1973 (Gazetted 7 November 2001).

---

## Project Description

---

### Aim

The principle aim of the WAASM is to improve the quality of healthcare through the feedback of information to surgeons.

### Inclusion Criteria

WAASM audits all deaths that occur in hospital whilst under the care of surgeon, regardless of whether an operation has occurred. If a patient is admitted under the care of a physician and subsequently undergoes an operative procedure, the case is included in the audit process. Terminal care cases are excluded.

### Notifications of deaths

WAASM is notified of deaths that occur in hospitals in two ways. WAASM is notified of deaths through the TOPAS system. Medical records departments at private and smaller regional hospitals that are not linked into the TOPAS system send WAASM notification of deaths directly. WAASM would like to acknowledge the large part that medical records departments in all hospitals contribute to the audit process.

### Participation

Participation in WAASM is voluntary. The core audit process is a confidential peer review of surgical mortality and educational feedback to surgeons by surgeons. The

majority of surgeons in WA participate in WAASM. Surgeons complete and sign a form indicating whether they agree to participate in the audit and whether they agree to be first and/or second line assessors. No identifiable information is available from WAASM relating to hospitals, surgeons or patients. No information is available on the identity or performance of individuals. WAASM is protected by qualified privilege under both State and Commonwealth acts.

### Methods

After notification of a death, WAASM sends the associated consultant surgeon a proforma for completion. This is returned to WAASM and anonymously assessed by a different surgeon. He/she will determine if the case should undergo a second line assessment. These case note reviews are undertaken where deficiencies of care are thought to have occurred during the pathway of care before death or where a review could usefully draw attention to lessons to be learned, either for clinicians involved in the case or as part of collated assessments for wider distribution. Surgeons receive feedback from assessors on their cases. Feedback disseminated to all surgeons, hospitals or the public is aggregated, anonymised and events are not linked to patients, surgeons or hospitals. WAASM operates in an open and blame free manner. The process is managed by the WAASM team and co-ordinated through an extensive database.

## Feedback

The core purpose of WAASM is the feedback of information to inform, educate and facilitate change and improve practise. WAASM provides feedback in the following ways:

- Individual surgeons receive feedback from first or second-line assessors on their cases.
- All surgeons receive summaries of second line reviews, newsletters and copies of annual reports.
- The participating hospitals receive reports on data relating specifically to their hospitals.
- The Annual Reports are available on the WAASM website ([www.surgeons.org](http://www.surgeons.org)) for consumers to access.

## Reports and Results

WAASM reports results annually in the form of an annual report (available from the WAASM office or the WAASM website). In a survey of surgeons and hospitals 87% of hospital management respondents and 70% of respondent surgeons indicated they had read the WAASM annual report. 73% of surgeons indicated that they had changed their practise in at least one way as a result of WAASM.<sup>3</sup>

WAASM also reports annually to hospitals providing both a general report on data from all hospitals and information specific to the individual hospital.

Information is aggregated and anonymous. No information is available on individual patients, surgeons or hospitals.

---

## Review of Progress

---

This 2005 report is an interim report. Recommendations made in the WAASM 2004 Annual Report<sup>3</sup> are currently in progress.

### Recommendations from WAASM 2004 Annual Report

1. Detailed analysis of problems associated with fluid balance.  
*WAASM is currently conducting a review of case notes.*
2. An analysis of data to explore deficiencies of care associated with elective and emergency operations.  
*WAASM has reported DoC in detail (page 23-24) and will extend this analysis.*
3. Contribute to discussion on anti-coagulation in the peri-operative surgical patient.  
*This is currently under discussion with a forum planned for 2006.*
4. To expand the number of first line assessors.  
*Surgeons have been approached to volunteer as specialty specific first line assessors.*
5. Encourage and increase participation.  
*WAASM has tried to facilitate increased participation and results from 2005 should indicate an increase in participation.*
6. Integrate with the Theatre Management System of Public Hospitals.  
*To be explored.*
7. Develop specialty specific proformas  
*A specific neurosurgical proforma was developed to circumvent duplication of effort with other audits.*

---

## Results

---

### Definitions and Reporting

Surgeons report deficiencies of care associated with the care of a patient. These are assessed by first and/or second line assessors.

Surgeons and assessors report these deficiencies of relation to the following criteria:

- Area for CONSIDERATION (where the clinician believes areas of care COULD have been IMPROVED or DIFFERENT, but recognises that it may be an area of debate).
- Area of CONCERN (where the clinician believes that areas of care SHOULD have been better).
- ADVERSE EVENT (defined as an unintended 'injury' caused by medical management rather than by disease process, 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).

Surgeons assess the impact of the incident on outcome, whether it:

- Made no difference to outcome
- May have contributed to death
- Caused the death of patient who would otherwise be expected to survive

Surgeons give their opinion as to whether the incident was preventable:

- Definitely
- Probably
- Probably not
- Definitely not

The surgeon indicates who the incident was associated with:

- Audited surgical team
- Another clinical team
- Hospital
- Other

For reporting, events are grouped into suboptimal (SoC) or deficiencies of care (DoC):

1. Suboptimal care (SoC) includes all events (consideration, concern and adverse events).
2. Deficiencies of care (DoC) includes only areas of concern and adverse events. Areas for consideration have been excluded because these events usually make no difference to outcome and are an indication that there were different options.

Some cases are associated with more than one incident of deficient care. Where analysis of events is reported by case, the most serious event has been ascribed to the case.

The analyses contained in this report are of events ascribed to the case by either the first or second line assessor (assessors). The events and the effect on outcome are the opinion of the assessors.

## Participation

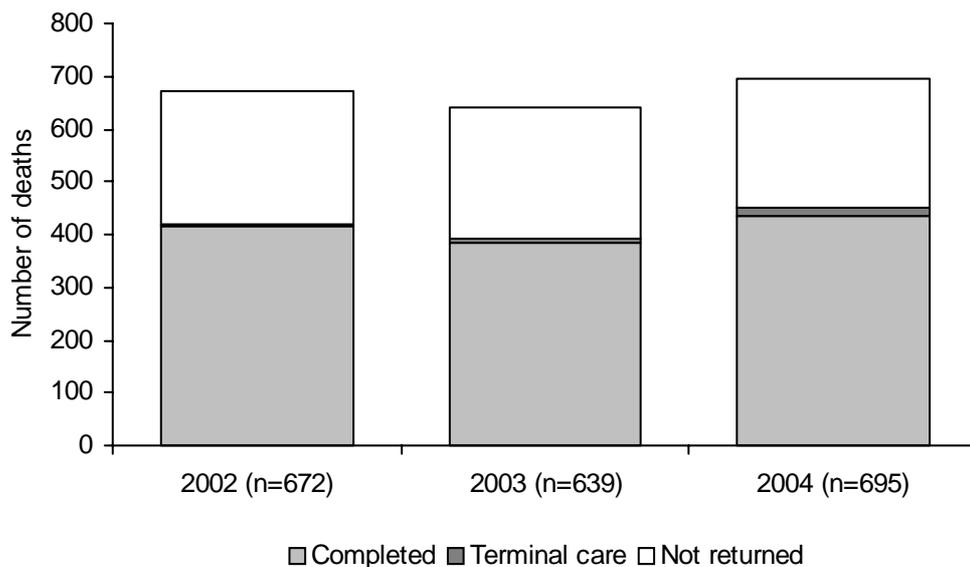
### Key points

Data in this report includes the years 2002, 2003 and 2004 (n=2006).

At the time of analysis:

- 1234/2006 (62%) cases had completed the audit process.
- 192/225 (85%) consultant surgeons who were associated with a death completed at least one proforma.
- Only 5 (2%) surgeons indicated that they did not wish to participate in WAASM.
- 1503 (75%) reported cases were from the three largest metro hospitals.
- Prior to May 2005 the neurosurgeons took part in their own internal audit which led to duplication of effort. Following discussions, the neurosurgeons now participate more comprehensively in WAASM. This will be reflected in the annual report 2006.

Figure 1: Deaths audited by WAASM | January 2002 to 31 December 2004 (n=2006)



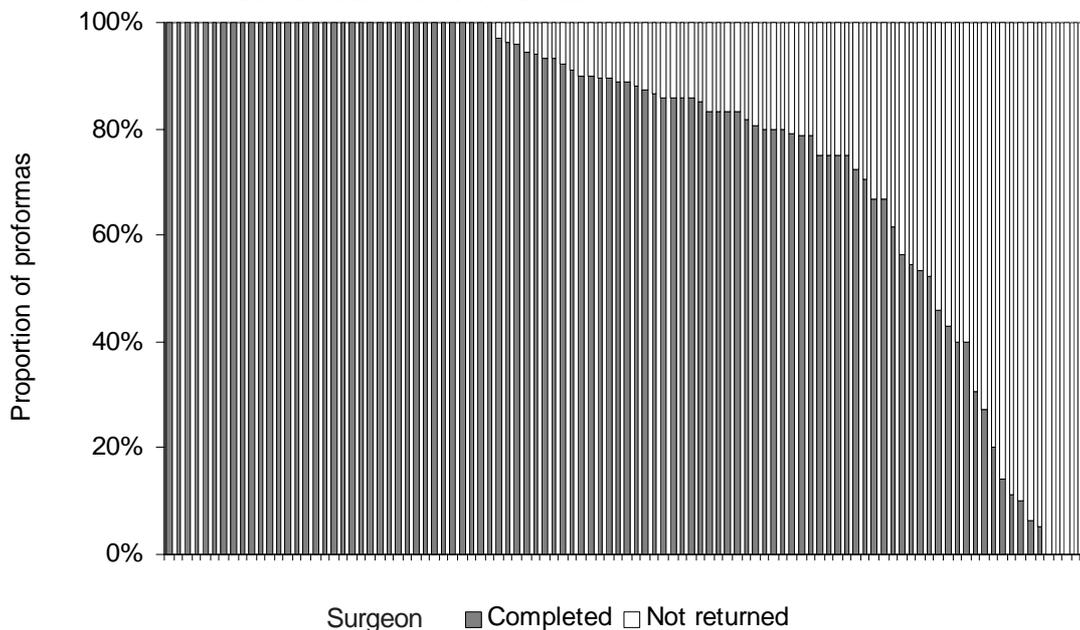
## Participation by Consultants

The audit process is a multi-step process (Appendix 1). Auditing a case is dependant on the surgeon returning the completed proforma to the WAASM office, the

completion of the first line assessment and if warranted, a second line assessment. The median time for surgeons to complete a proforma is 22 days (interquartile range 10 to 50 days).

## Participation by Consultants

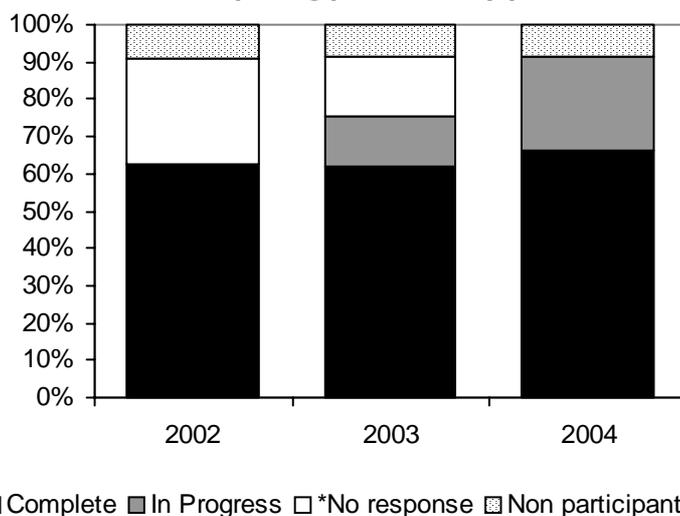
**Figure 2: Proportion of proformas returned by surgeons who were associated with 5 or more deaths**



- Participation by surgeons in the audit process is voluntary.
- 225 surgeons were associated with 2006 deaths reported between 2002 and 2004.
- 192 (85%) surgeons completed and returned at least one proforma.
- 173 (9%) cases were associated with 2% of surgeons who do not participate in the audit.

- A further 294 (15%) cases were associated with surgeons who had not returned the proforma within 2 years. Proformas not returned within two year are recorded as 'no-response'\*.

**Figure 3: Proportion of consultants completing proformas by year**



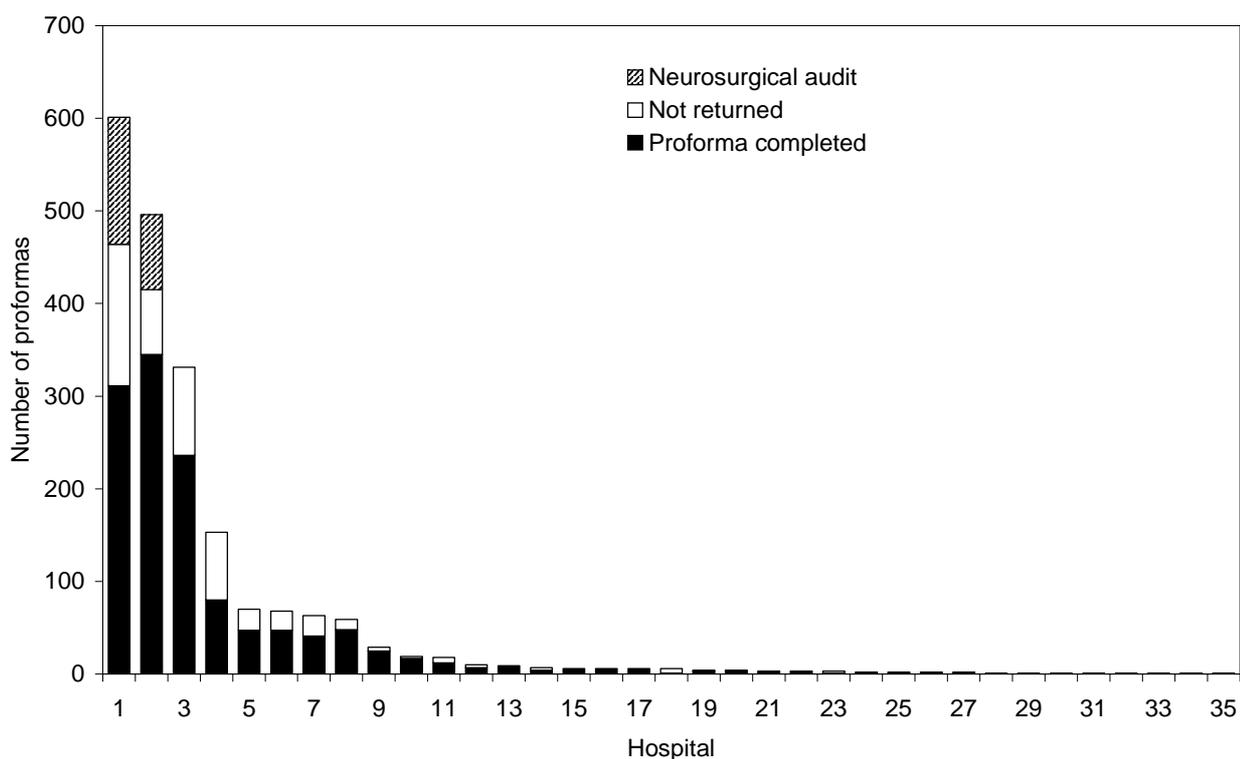
**Table 1: Participation by surgeons – proformas completed and returned**

	2002 (n=672)	2003 (n=639)	2004 (n=695)
Proformas complete	63%	62%	66%
Non-participants	9%	8%	8%

## Participation by Hospital

- Participation in the audit by hospitals is voluntary.
- 35 Hospitals were associated with the 2006 deaths reported between 2002 and 2004.

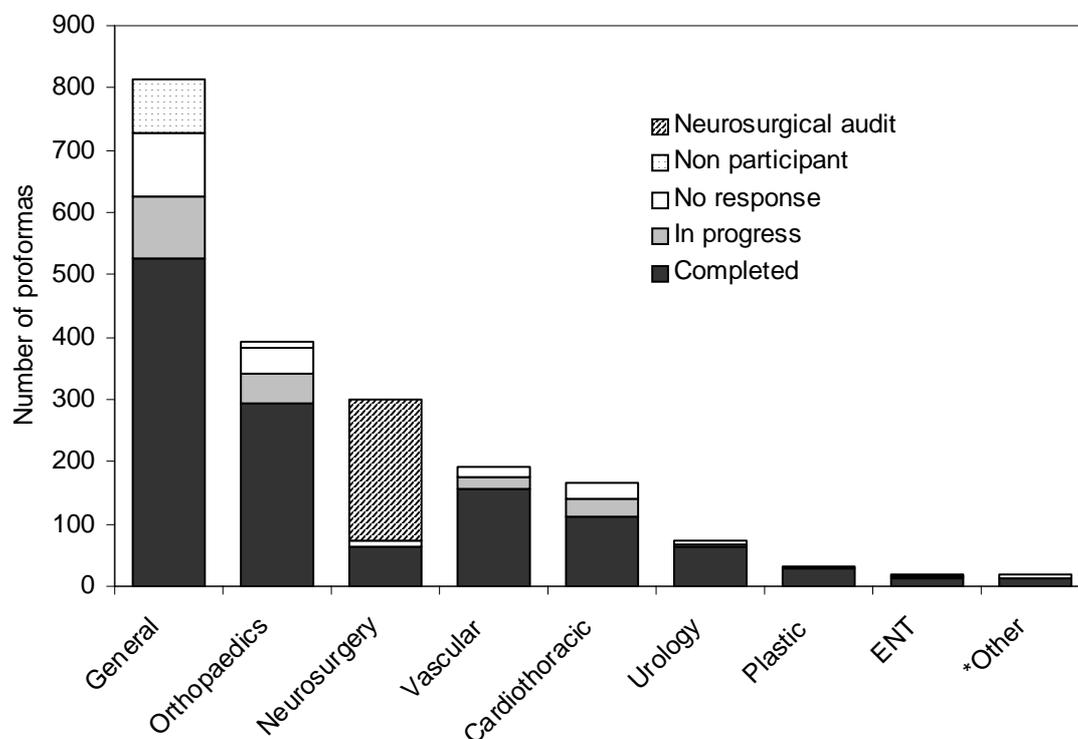
**Figure 4: Proformas returned by hospital (2002 to 2004 n=2006)**



\* During this time period these neurosurgical cases were scrutinised under the neurosurgical departmental audit and WAASM proformas were not completed.

## Participation by Specialty

Figure 5: Numbers of proformas returned by specialty (2002 to 2004 n=2006)



\* 'other' specialties includes ophthalmology, paediatrics, obstetrics & gynaecology, oral/maxillofacial

- Neurosurgeons were involved in their own departmental audits and due to duplication of effort did not participate fully in WAASM. In 2005, after discussion with the neurosurgeons, WAASM modified their data collection procedures to facilitate the participation in WAASM by neurosurgeons.
- Figure 5 indicates those neurosurgical cases which were not audited by WAASM, but assessed under different projects.

## Completed Cases | Jan 2002 to 31 December 2004

### Key points

29 (2%) cases were terminal care and excluded from the audit process.  
 1205 cases completed the audit process and are reported on here.  
 The median age of all audited cases was 79 years (IQR 70-86).  
 The median length of stay in hospital before death for all audited cases was 7 days (IQR 3-17).  
 91% of audited cases had one or more significant co-morbidity that contributed towards death.  
 In 18% of cases surgeons reported malignancy contributed towards death.  
 Patients used ICU in 36% of cases. Assessors indicated HDU should have been used in a further 11% of cases.

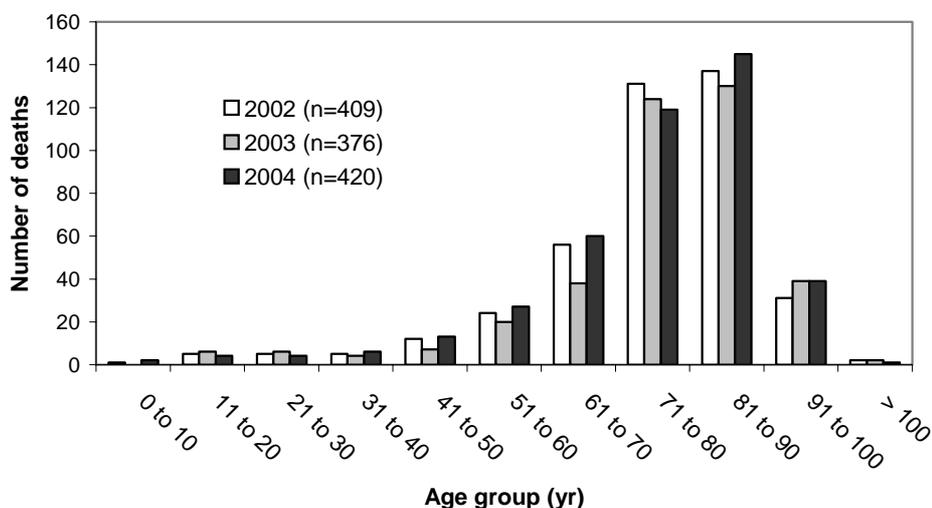
### Terminal Care Table 2: Terminal care cases by year

Proformas returned	2002 (n=414)	2003 (n=385)	2004 (n=435)	Total (n=1234)
Completed audited cases	409	376	420	1205
Excluded terminal care cases	5 (1%)	9 (2%)	15 (4%)	29 (2%)

### Demographics Table 3: Median age \* Interquartile range

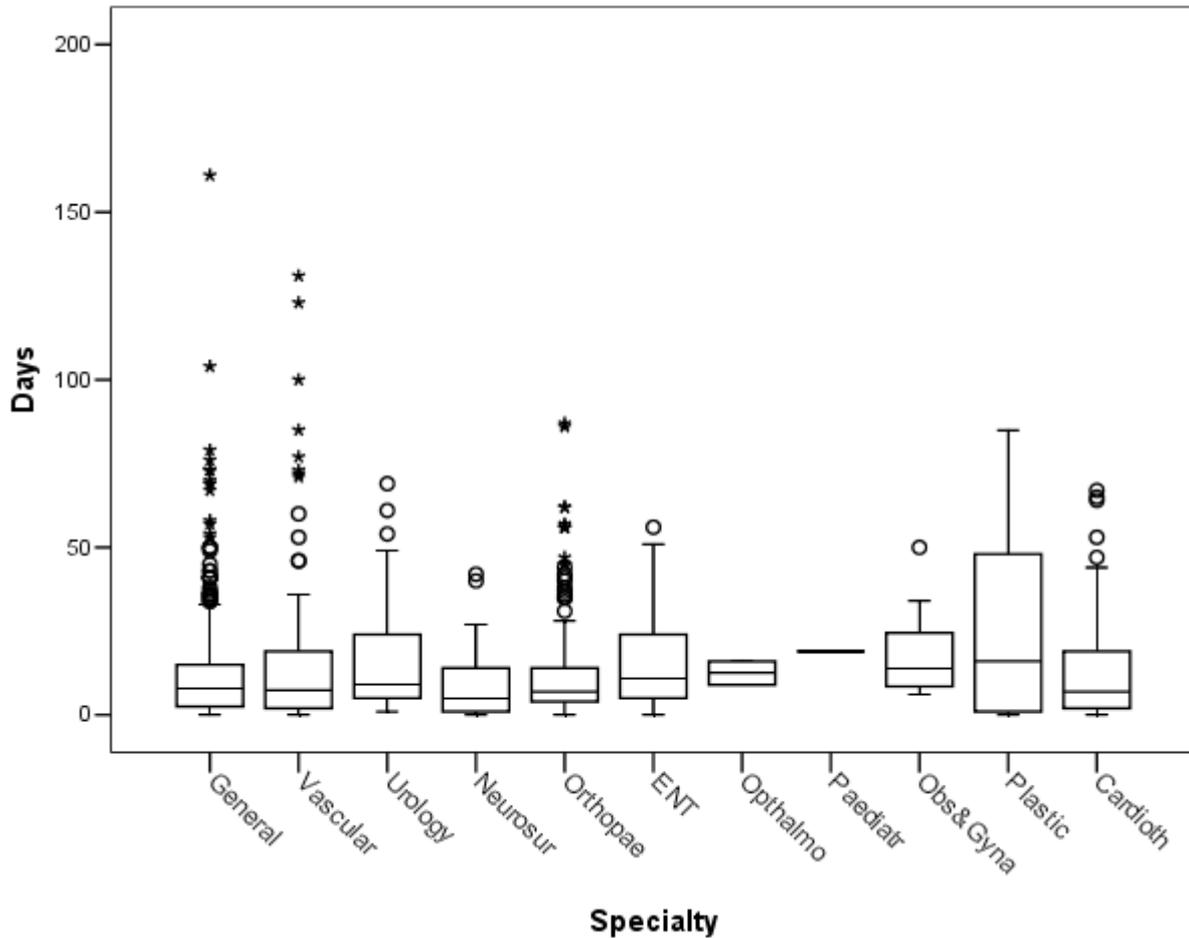
	2002	2003	2004	Total
Males	77 [67-84]*(n=209)	78 [69-83](n=224)	77 [66-83](n=223)	77 [68-83.75] (n=656)
Females	79.5 [72-86](n=200)	83 [76-89](n=152)	82 [73-88](n=197)	82 [73-88] (n=549)
All patients	78 [70-85](n=409)	79 [72-87](n=376)	79 [69-86](n=420)	79 [70-86] (n=1205)

Figure 6: Age distribution of audited deaths (n=1205) by year



## Length of Stay in Hospital

Figure 7: Box and whisker plot of days from hospital admission to death, by specialty (n=1205)



In a box-and-whisker plot, the central box represents the values from the lower to upper quartile (25th to 75th percentile). The middle horizontal line represents the median. The vertical line (whiskers) extends from the minimum to the maximum value, excluding *outliers* and *extreme* values which are displayed as separate points.

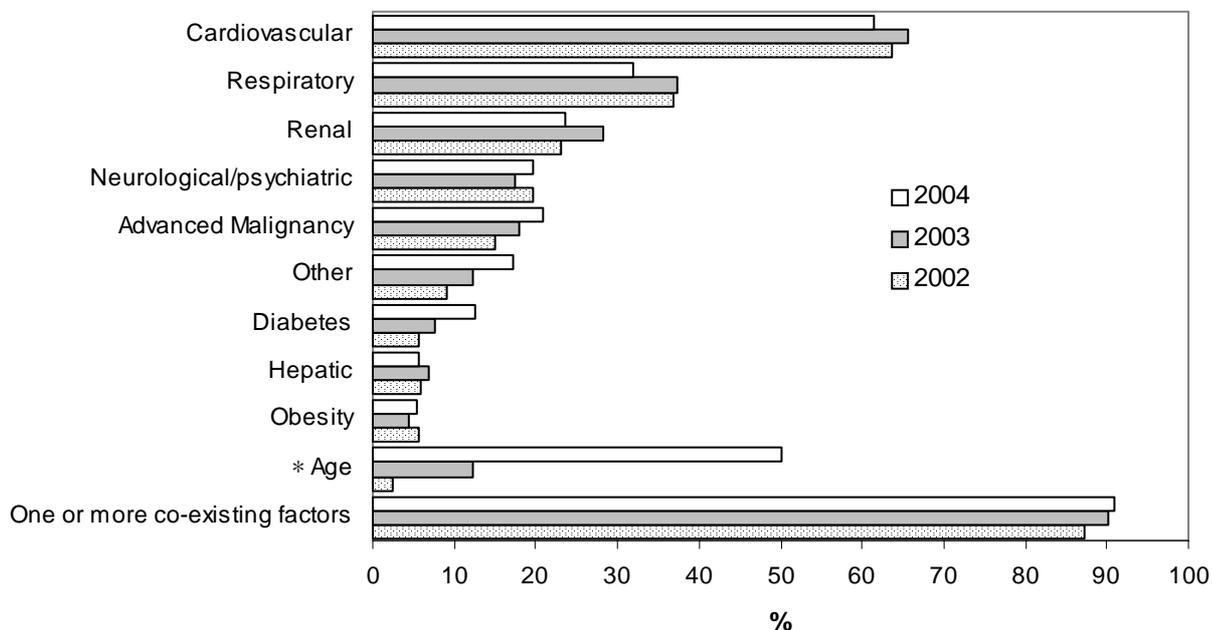
An *outlier* is defined as a value that is larger than the upper quartile plus 1.5 times the interquartile range (circles).

An *extreme* value is defined as a value that is larger than the upper quartile plus 3 times the interquartile range (stars).

- The median length of stay in hospital for all audited cases was 7 days (IQR 3 to 17).

## Co-morbidity and Malignancy

**Figure 8: Co-morbidity in audited cases**



\* Age was added as a co-morbidity variable in November 2003.

**Table 4: Malignancy present in audited cases**

	n	Malignancy present	Malignancy contributed towards death
2002	390	105 (27%)	60 (15%)
2003	360	103 (29%)	63 (18%)
2004	407	117 (29%)	86 (21%)
Total	1157	325 (28%)	209 (18%)

- 1078/1186 (91%) of audited cases had one or more significant co-morbidity that contributed towards death.

## Use of ICU and HDU in audited cases

**Table 5: Use of ICU and HDU (Assessors' response)**

	2002 (n=409)	2003 (n=376)	2004 (n=420)	Total (n=1205)
ICU used	138 (34%)	140 (37%)	158 (38%)	436 (36%)
HDU used	39 (10%)	35 (9%)	49 (12%)	123 (10%)
ICU should have been used	9 (2%)	1 (<1%)	13 (3%)	23 (2%)
HDU should have been used	66 (16%)	33 (9%)	28 (7%)	127 (11%)

## Suboptimal Care

### Key Points

In the majority of audited cases (70%) assessors indicated there were no deficiencies associated with the care that the patient received.

239 (20%) cases were associated with deficiencies of care (areas of concern or adverse events).

In 54 (4%) cases assessors felt that an adverse event had caused the death of a patient.

29 (2%) of these incidents were considered preventable.

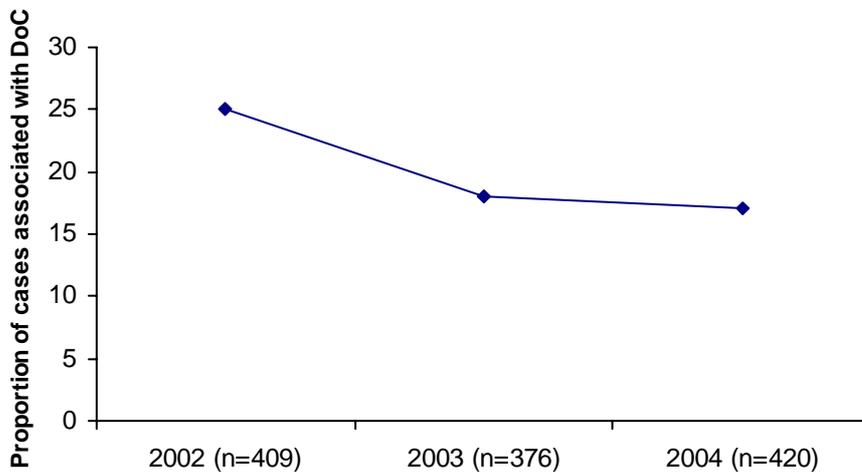
The proportion of cases associated with DoC has decreased from 25% in 2002 to 17% in 2004.

**Table 6: Number of deaths associated with areas for consideration, of concern or adverse events as reported by assessors (most significant event only)**

Year	Area of	None	Made no difference to outcome	May have contributed to death	Caused death	Total
2002	Consideration		17 (42%)	1 (<1%)		18 (4%)
	Concern		13 (3%)	29 (7%)		42 (10%)
	Adverse event			38 (9%)	24 (6%)	62 (15%)
		<b>287 (70%)</b>	<b>30 (7%)</b>	<b>68 (17%)</b>	<b>24 (6%)</b>	<b>409</b>
2003	Consideration		28 (7%)	4 (1%)		32 (8%)
	Concern		9 (2%)	22 (6%)	1 (<1%)	32 (8%)
	Adverse event			16 (4%)	17 (5%)	33 (9%)
		<b>279 (74%)</b>	<b>37 (10%)</b>	<b>42 (11%)</b>	<b>18 (5%)</b>	<b>376</b>
2004	Consideration		50 (12%)	18 (4%)	2 (<1%)	70 (17%)
	Concern		16(4%)	21 (5%)	1(<1%)	38 (9%)
	Adverse event		3 (1%)	16 (4%)	13 (3%)	32 (8%)
		<b>280 (67%)</b>	<b>69 (16%)</b>	<b>55 (13%)</b>	<b>16 (4%)</b>	<b>420</b>

- From 2002 to 2004 there were no deficiencies associated with the care of the patient in 70% of cases.
- In 120 (10%) cases assessors thought that there were areas for consideration where care could have been improved or different.
- 239 (20%) of cases were associated with deficiencies of care.
- In 54 (4%) cases (n=1205) assessors felt than an adverse event had caused the death of a patient (detailed in Table 7).
- 29 of these events (2% of 1205) were considered probably preventable.
- The proportion of reported deficiencies of care decreased from 25% in 2002, to 18% in 2003, to 17% in 2004 (Figure 9).
- Details of areas for consideration, of concern and adverse events are listed in Appendices 2, 3 and 4.

**Figure 9: Proportion of audited cases associated with DoC (2002 to 2004)**



**Table 7: Events which assessors thought had caused the death of a patient (n=1205)**

<b>Related to open surgery</b>	<b>28 (2%)</b>	<b>Related to endoscopic surgery</b>	<b>3 (&lt;1%)</b>
Anastomotic leak after open surgery	10	Perforation of duodenum	1
Open surgery, organ related, technical	6	Operation induced acute pancreatitis after endoscopic operation	1
Post operative bleeding	4	Bladder complication of endoscopic operation	1
Infection of hip prosthesis	3	<b>Drug-related problems</b>	<b>2 (&lt;1%)</b>
Extension of ischaemia	1	Over anticoagulation	1
Dislocated hip prosthesis	1	Over anticoagulation before admission	1
CVA following open surgery	1	<b>Related to radiological surgery</b>	<b>1 (&lt;1%)</b>
Bowel infarction after open vascular operation	1	Heart complication of radiological operation	1
Blood clot dislodged	1	<b>Delays</b>	<b>1 (&lt;1%)</b>
<b>General complications</b>	<b>8 (1%)</b>	Delay to operation caused by missed diagnosis	1
Pulmonary embolus	3	<b>Staff problems</b>	<b>1 (&lt;1%)</b>
Wound infection	2	Fatigue of surgeon operating	1
CVA	1	<b>Communication failures</b>	<b>1 (&lt;1%)</b>
Peri operative cerebral ischaemia or infarction	1	Poor communication in Emergency Department	1
Aspiration pneumonia	1	<b>Failure to use facilities</b>	<b>1 (&lt;1%)</b>
<b>Patient factors</b>	<b>7 (&lt;1%)</b>	Failure to use DVT prophylaxis	1
Injury caused by fall in hospital	6	<b>Incorrect inappropriate therapy</b>	<b>1 (&lt;1%)</b>
Patient refused treatment	1	Operation should not have been done or was unnecessary	1

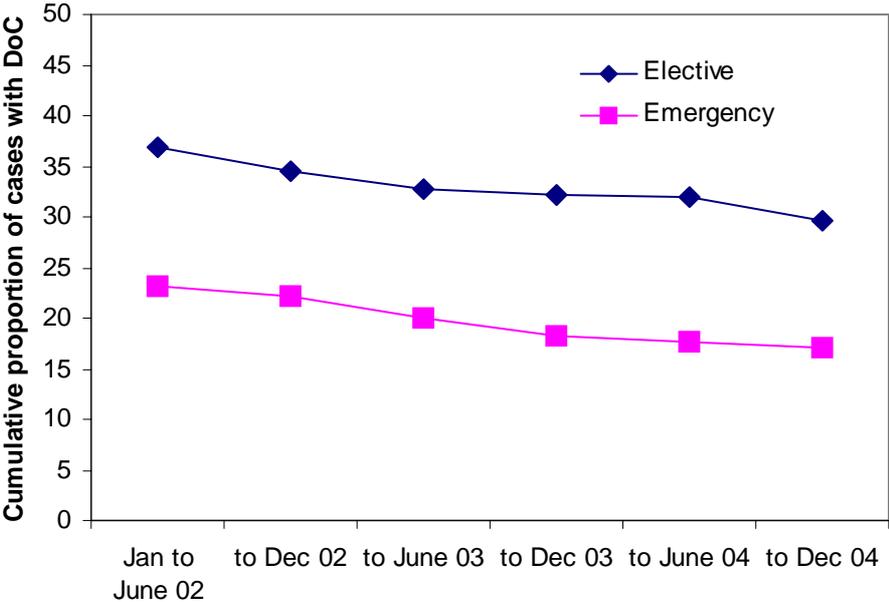
# Admissions

## Key Points

There were more emergency admissions (938) than elective admissions (267) in these audited deaths. The audited elective admissions were associated with a significantly higher proportion of DoC (30%) than emergency admissions (17%). 94% of elective admissions underwent an operative procedure compared with 73% of emergency admissions. DoC associated with elective admissions were predominantly related to the treatment received whereas emergency admissions were associated with delays to receiving treatment.

## Elective and Emergency Admissions

**Figure 10: Proportions of emergency and elective admissions associated with deficiencies of care – six monthly cumulative proportions (Jan 2002 to Dec 2004)**



- 79/267 (30%) elective admissions were associated with at least one DoC compared to 160/938 (17%) emergency admissions. This difference was significant ( $P < 0.0001$ , Pearson chi squared test).
- The proportion of DoC associated with both elective and emergency admissions decreased from 2002 to 2004 (Figure 10).

**Table 8: Elective and emergency admissions – whether an operation was performed.**

		<b>Elective admission</b>	<b>Emergency admission</b>	<b>Total</b>
2002	Operation	106 (96%)	226 (76%)	332 (81%)
	No op	4	73	77
	Total	110	299	409
2003	Operation	71 (92%)	219 (73%)	290 (77%)
	No op	6	80	86
	Total	77	299	376
2004	Operation	75 (94%)	243 (72%)	318 (75%)
	No op	5	97	102
	Total	80	340	420

- In total 252/267 (94%) of elective admissions underwent an operative procedure compared with 688/938 (73%) of emergency admissions (Table 8).

**Table 9: DoC associated with emergency admissions (n=938) and elective admissions (n=267)**

Some cases are associated with more than one DoC. All deficiencies of care associated with an emergency or elective admissions have been included in this table.

<b>Area of Concern or Adverse event</b>	<b>emergency</b>		<b>elective</b>	
	<b>n</b>	<b>% of 254</b>	<b>n</b>	<b>% of 147</b>
Delays	59	23%	21	14%
Related to open surgery	38	15%	41	28%
Incorrect inappropriate therapy	24	9%	23	16%
General complications	21	8%	14	10%
Failure to use facilities	20	8%	9	6%
Communication failures	20	8%	7	5%
Diagnosis-related problems	15	6%		
Staff problems	13	5%	8	5%
Drug-related problems	11	4%	5	3%
Patient factors	10	4%	2	1%
Related to radiological surgery	5	2%		
Transfer problems	4	2%	1	1%
Related to endoscopic surgery	3	1%	7	5%
Resuscitation problems	3	1%		
Assessment problems	3	1%	9	6%
Related to laparoscopic surgery	1	<1%		
Anaesthesia-related problems	1	<1%		
Equipment-related problems	1	<1%		
Problems with blood/blood products	1	<1%		
Monitoring problems	1	<1%		
<b>Total</b>	<b>254</b>	<b>100</b>	<b>147</b>	<b>100</b>

- With regard to delays as detailed in Tables 10 and 11, elective admissions were more likely to be associated with delays in recognising complications of treatment whereas emergency admissions were associated with delays in receiving treatment.

**Table 10: Detailed description of delays (n=21) associated with elective admissions (n=267)**

<b>Delay</b>	<b>n</b>	<b>% of 21</b>
Delay in recognising complications	10	48%
Delay starting DVT prophylaxis	4	19%
Delay to surgery (ie earlier operation desirable)	3	14%
Delay in transfer to surgeon by physicians	1	5%
Delay to operation caused by missed diagnosis	1	5%
Delay to re operation	1	5%
Delay in transfer to ICU post operatively	1	5%
Total	21	100

**Table 11: Detailed description of delays (n=59) associated with emergency admissions (n=938)**

<b>Delay</b>	<b>n</b>	<b>% of 59</b>
Delay to surgery (ie earlier operation desirable)	16	27%
Delay in transfer to surgical unit	10	17%
Delay in transfer to surgeon by physicians	8	14%
Delay starting DVT prophylaxis	6	10%
Delay in recognising complications	4	7%
Delay to operation caused by missed diagnosis	3	5%
Delay to blood transfusion	2	3%
Delay to ERCP	2	3%
Delay in diagnosis	2	3%
Delay in transferring patient to ICU	2	3%
Delay starting antibiotics	1	2%
Delay to starting ventilation	1	2%
Operation would have been better deferred or delayed	1	2%
Delay in investigating the patient	1	2%
Total	59	100

## Operative and Non-operative Deaths

### Key Points

The proportion of audited deaths where no operation was performed increased from 19% in 2002 to 24% in 2004.

In 7% of cases that underwent an operation (n=940), the operation was abandoned when finding a terminal situation.

Cases where an operation was performed (n=940) were associated with a higher proportion of DoC (23% v 8%) than cases where no operation was performed (n=265).

The more operations a patient underwent, the more likely they were to experience a DoC.

**Table 12: Proportion of audited deaths where the patient did not have an operation**

		Operation performed		Total
		yes	no	
2002	Private	79	5 (6%)	84
	Public	253	72 (22%)	325
	Total	332	77 (19%)	409
2003	Private	80	9 (10%)	89
	Public	210	77 (27%)	287
	Total	290	86 (23%)	376
2004	Private	89	12 (12%)	101
	Public	229	90 (28%)	319
	Total	318	102 (24%)	420

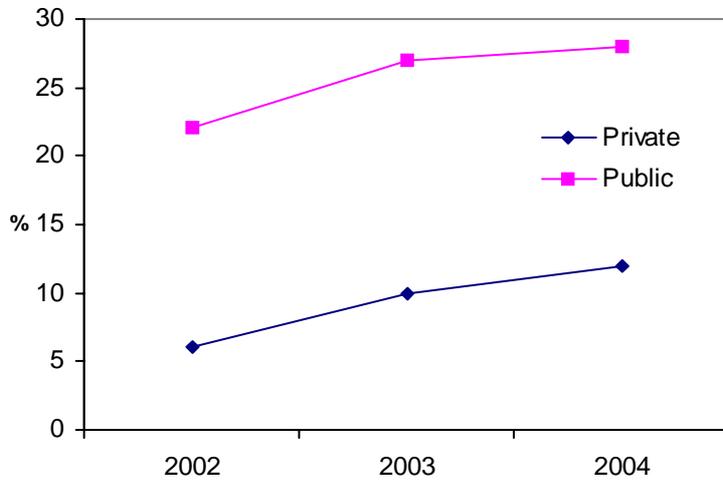
- The proportion of patients who did not have an operation increased from 2002 to 2003 to 2004 (19%, 23%, 24%).
- In 67/940 (7%) cases that underwent operation, the surgeon reported that the operation was abandoned at finding a terminal situation.

**Table 13: Assessors' comments with regard to the decision to perform an operation (2002 to 2004)**

Year	Assessors' comments	n cases
2002 (n=409) (1%)	Decision to operate queried	4
	Operation would have been better delayed	1
2003 (n=376) (4%)	Decision to operate queried	13
	Operation should not have been done or was unnecessary	2
	Operation would have been better delayed	1
2004 (n=420) (8%)	Decision to operate queried	31
	Operation should not have been done or was unnecessary	2
	Operation would have been better delayed	2

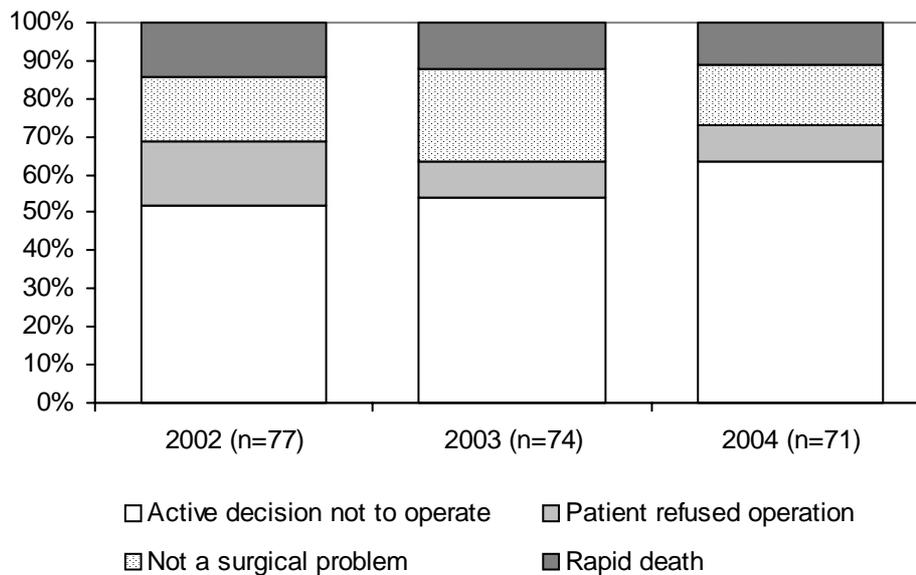
Over the course of the three years that the audit has been operating, assessors have become more critical of cases where they consider that the operation should not have been done or they query the decision to operate on the patient. In 46 of the 48 audited deaths where the 'decision to operate' was queried – this was recorded as an area for consideration (Appendix 2).

**Figure 11: Proportion of audited deaths admitted to Private and Public hospitals which did not undergo an operation**



- WAASM has previously drawn attention to cases where operations should not have taken place and encouraged consultants to discuss these issues with patients, relatives and colleagues to reduce futile operations.

**Figure 12: Reasons for no operation (n=222) 2002 to 2004**



**Table 14: Proportion of DoC associated with cases that had or did not have an operation**

Year	Op (%DoC)	No op (%DoC)
2002	332 (29%)	77 (10%)
2003	290 (21%)	86 (3%)
2004	318 (19%)	102 (11%)
Total	940 (23%)	265 (8%)

**Table 15: Number of operations that a patient underwent and cases associated with DoC**

Number of operations	Number of cases	DoC
0	265	22 (8%)
1	694	121 (17%)
2	161	54 (34%)
3 or more	85	42 (49%)

## Unplanned Readmission to Theatre

- In November 2003 a question was included in the proforma asking if there was an unplanned return to theatre.
- Of 468 responses, 53 (11%) indicated that there was an unplanned returned to theatre.
- Of these 53 cases, 22 (42%) were associated with DoC.
- These 22 cases were associated with 37 DoC (assessors noted more than one DoC in 13 cases). The DoC are listed in Table 17.

**Table 16: Deficiencies of care associated with audited cases where there was an unplanned readmission to theatre within 30 days of surgery (Data from Nov 2003 to Dec 2004)**

Area of concern or adverse event	n	Area of concern or adverse event	n
Anastomotic leak after open surgery	4	Delay to re operation	1
Better to have done diff operation or procedure	2	Drugs related complication	1
Delay in recognising anastomotic leak	2	Failed arterial reconstruction after open surgery	1
Delay in recognising complications	2	Infection of hip prosthesis	1
Injury caused by fall in hospital	2	Operation would have been better delayed	1
No protocol for DVT prophylaxis	2	Perforation of duodenum during endoscopic op	1
Poor documentation	2	Post operative bleed after laparoscopic op	1
Anastomotic leak related to laparoscopic op	1	Post operative intracranial haematoma	1
Bladder complication of endoscopic operation	1	Pre operative assessment inadequate	1
Bowel infarction after open vascular operation	1	Sepsis peritonitis related to jejunostomy	1
Decision to operate	1	Surgeon too junior	1
Delay in diagnosis	1	Tracheostomy problems	1
Delay in recognising a bleeding complication	1	Ureteric complication of open surgery	1
Delay in transfer to surgical unit	1	Wrong operation performed	1

## Prophylaxis of Thromboembolism

### Key Points

DVT prophylaxis use in audited cases increased from 61% in 2002 to 68% in 2004.

Assessors reported that the use of DVT prophylaxis was appropriate in 96% of cases in 2004. This increased from 89% in 2002.

- Surgeons indicate on the surgical proforma whether DVT prophylaxis was used, and if not, the reasons why it was withheld.
- At case review, assessors are asked to determine whether the decision on whether the use of DVT prophylaxis was appropriate.

Figure 13: Assessors view that the use of DVT prophylaxis was appropriate (six monthly cohorts)

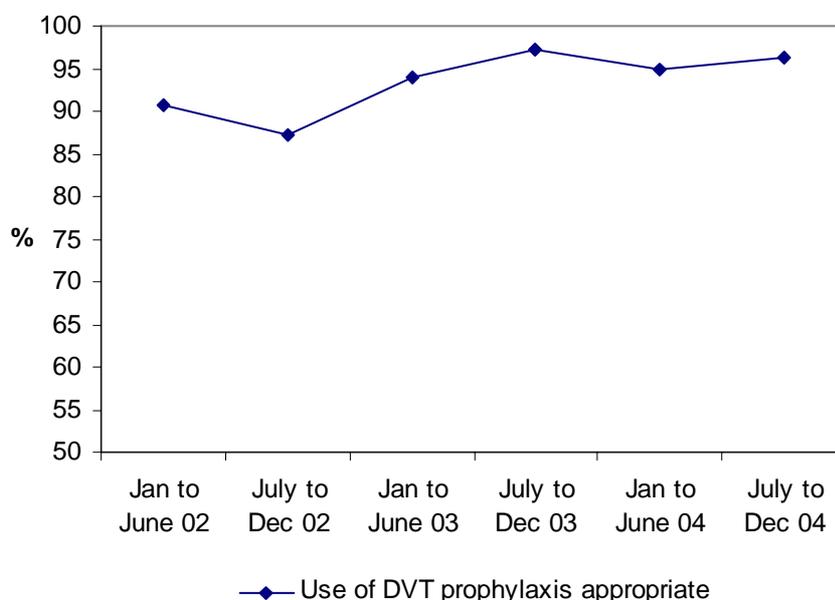


Table 17: Proportion of patients that received DVT prophylaxis and assessors' opinion, by year

Year	Patients received DVT prophylaxis	Assessors' opinion – the use of DVT prophylaxis was appropriate
2002	61% (n=375)	89% (n=384)
2003	62% (n=355)	96% (n=367)
2004	68% (n=405)	96% (n=409)
Total	64% (n=1135)	93% (n=1160)

- DVT prophylaxis is an area that WAASM has specifically targeted over the past three years. The evidence strongly suggests that practice is improving.

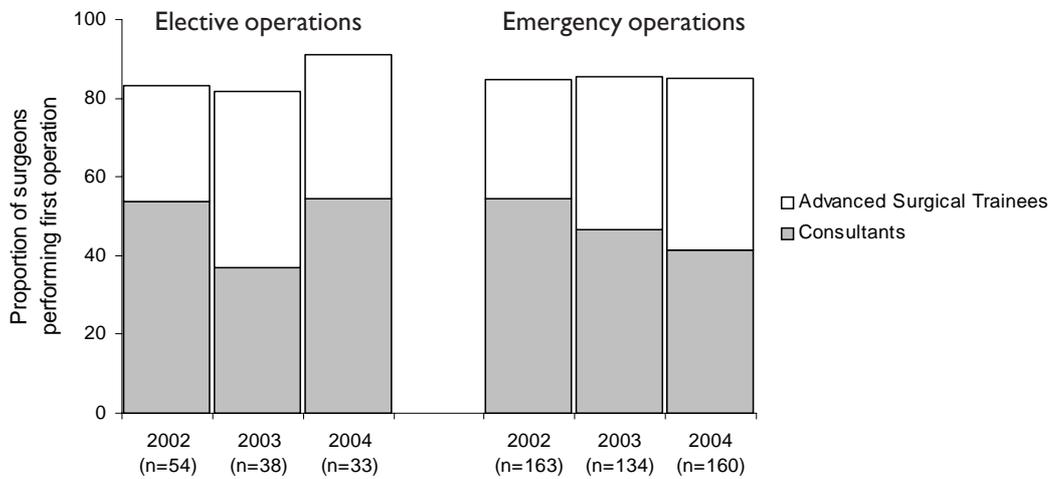
## Grade of Surgeon – Teaching Hospitals

### Key Points

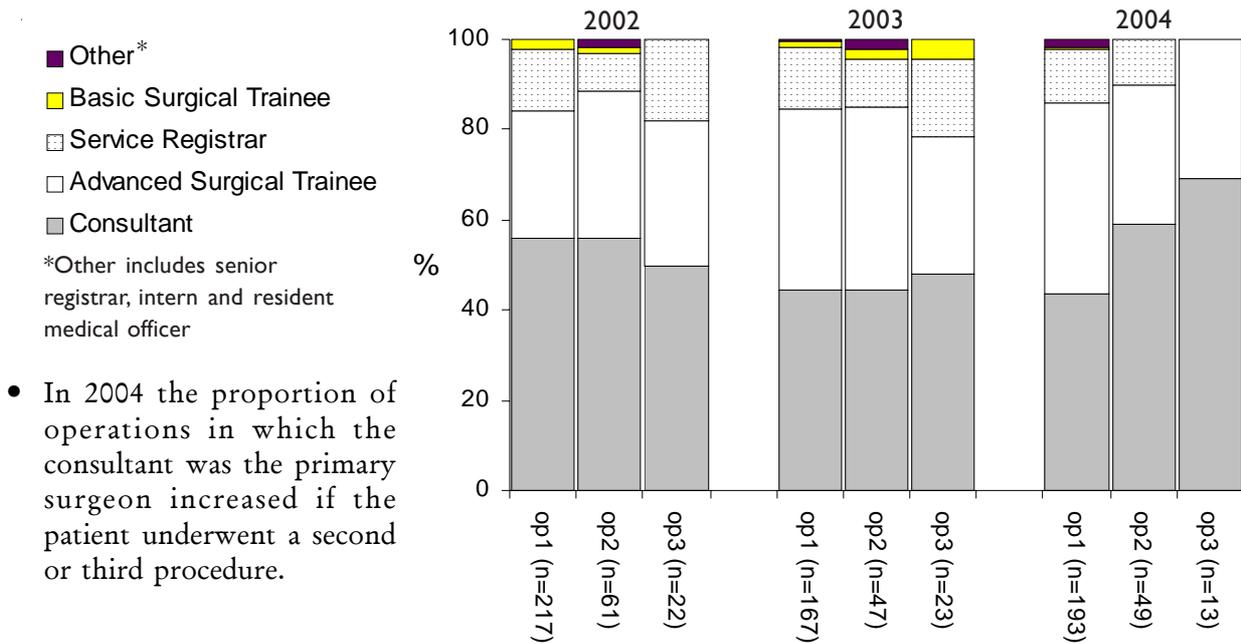
In teaching hospitals, 84% of operations (n=582) were performed by either consultants or advanced surgical trainees.

In 2004 the proportion of operations in which the consultant was the primary surgeon did increase if the patient underwent a second or third operation.

**Figure 14: The proportion of consultant surgeons and advanced surgical trainees performing the first operation in audited cases – emergency and elective admissions to teaching hospitals**



**Figure 15: Proportion of surgeons by grade performing 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> operation (audited cases admitted to teaching hospitals in WA)**



- In 2004 the proportion of operations in which the consultant was the primary surgeon increased if the patient underwent a second or third procedure.

## Post-Mortems

### Key points

A hospital post-mortem was performed in 21/1205 (2%) surgical deaths.

In 9% of cases where no post-mortem had been conducted, surgeons indicated that they would have preferred a post-mortem.

**Table 18: Post-mortems conducted – 2002 to 2004**

Post-Mortem	2002 (n=352)*	2003 (n=322)*	2004 (n=374)*	Total (n=1048)*
<b>Hospital</b>	11 (3%)	4 (1%)	6 (2%)	21 (2%)
<b>Coroner</b>	30 (9%)	34 (11%)	21 (6%)	85 (8%)
<b>None</b>	298 (85%)	274 (85%)	333 (89%)	905 (86%)
<b>Refused</b>	13 (4%)	10 (3%)	14 (4%)	37 (4%)
<b>Unknown</b>	0	12	36	48
<b>Missing data</b>	57	42	10	109

\* % calculated on complete or known data

- Over the 3 year period 2002 to 2004, 106 cases underwent post-mortem. This represents 10% of 1048 cases where post-mortem data was available.
- In 89 (9%) cases where no post-mortem was performed or the post-mortem was refused (n=942), surgeons indicated that they would have preferred a post-mortem.
- Where a post-mortem was conducted (n=106), 40 (37%) surgeons indicated that they had read the post-mortem report.
- 10 (25%) surgeons who had read the post mortem report indicated that the post-mortem contributed additional information.

## Funnel Plot of Hospital Performance

### Key Points

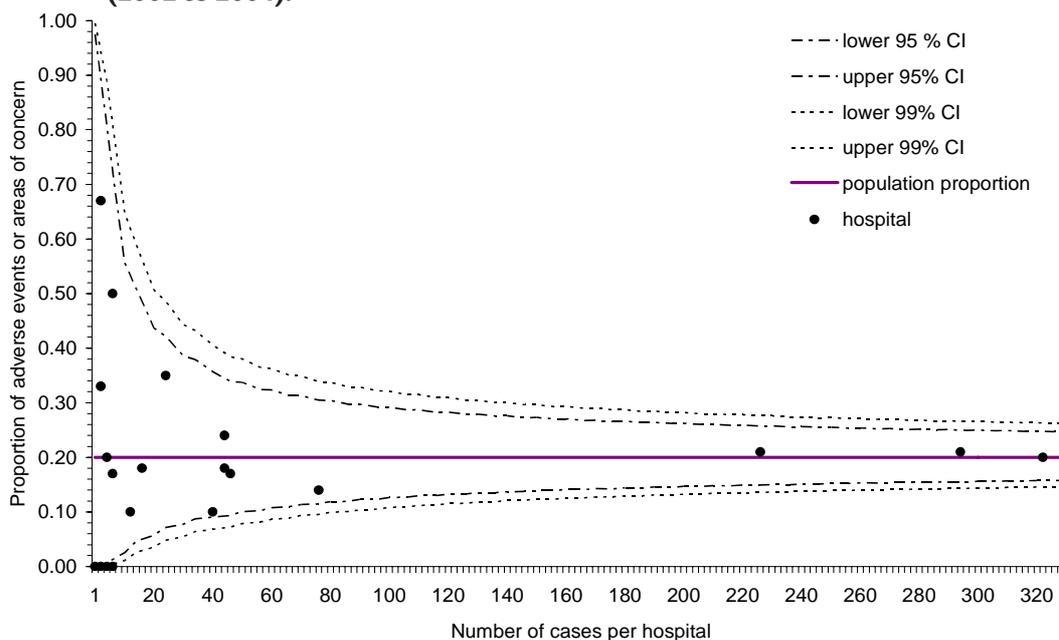
Funnel plots are a clear and succinct way of representing performance whilst allowing for small numbers.

A funnel plot of the WAASM hospital data indicated that there were no hospitals where performance was significantly different to the overall average performance.

Funnel plots are a type of control chart. The overall event proportion (population proportion) and the resulting exact 95% and 99% binomial confidence intervals are plotted on a graph. Individual event proportions are plotted against number of cases. In Figure 16 the proportion of DoC associated with

individual hospitals are plotted against the overall proportion of DoC associated with all hospitals. Points located within the region bounded by the control limits (upper and lower 95% and 99% CI) represent performance that is not significantly different from the overall population proportion.

**Figure 16: Funnel plot of proportion of deficiencies of care associated with cases per hospital (2002 to 2004).**



- WAASM data collection allows for the allocation of the source of deficiencies of care by an external assessor. If a deficiency of care occurred in one hospital, prior to the patient being transferred to a different hospital where they subsequently died, for analysis purposes, the deficiency of care will be assigned to the initial hospital.
- In the previous report WAASM plotted the proportion of DoC by individual surgeon for illustrative purposes. Some surgeons completed 100% of proformas and other surgeons completed less than 20% (Figure 2). The data therefore, does not create a true reflection of performance and we have not included the analysis here.

---

## Acknowledgements

---

WAASM acknowledges the help and support of the many people and institutions which assist in the continuation and development of this project.

- All the participating surgeons.
- The first-line assessors and, in particular, the second-line assessors for their (unpaid) time and effort in providing detailed second-line case note reviews.
- The Scottish Audit of Surgical Mortality (SASM) for ongoing support.
- The Office of Safety and Quality in Health Care at the WA Department of Health for their commitment to WAASM.
- The WA Department of Health for funding.
- The Royal Australasian College of Surgeons (RACS).
- The Medical Records Departments and their staff in all of the participating hospitals.
- The University of Western Australia for ongoing support.
- Staff at InfoHealth.

## RACS WAASM Management Committee

Assoc Prof Jeffrey Hamdorf	MBBS, PhD, FRACS
Mr James Aitken	MBBS, LRCP, MRCS, FRCS (Ed), FCS (SA), FRACS, MS
Professor David Fletcher	MBBS, FRACS, MD
Mr Robert Davies	MBBS, FRACS
Mr Stephen Baker	MBBS, FRACS, DDU
Mr Mark Smith	BS(Syd) FRCS(Eng) FRCS(Ed) FRACS.
Dr Nedra Van Den Driesen	MBBS, DTM&H, FRCA, FANZCA
Mr Ivan J Thompson	MBBS FRACS

## WAASM Staff

Chairman	Mr James Aitken
Project Manager	Ms Jenny Mountain
Research Analyst	Ms Natasha Haynes
Project Officer	Ms Claire Findlater

---

## References

---

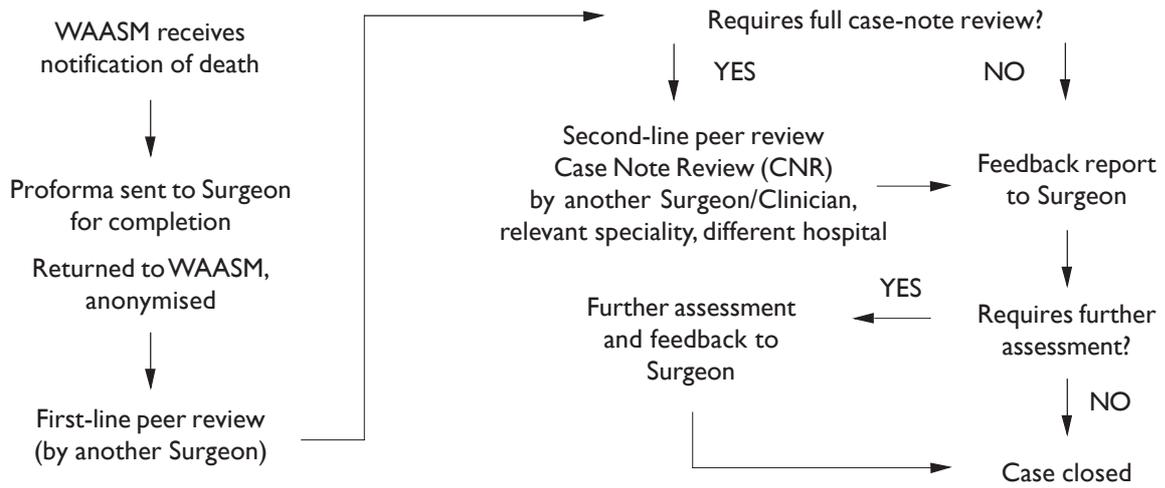
1. Thompson A, Stonebridge P, Spigelman A, Surgical Accountability: A framework for trust and change, MJA, Vol 183, 10, 21 Nov 2005, p 500.
2. SASM Steering Group. Scottish Audit of Surgical Mortality Annual Report 2004. Data 2004. [http://www.sasm.org.uk/Reports/2004Report/SASM\\_Report\\_2004\\_data.pdf](http://www.sasm.org.uk/Reports/2004Report/SASM_Report_2004_data.pdf)
3. Western Australian Audit of Surgical Mortality. WAASM annual report 2004. Crawley: The University of Western Australia, 2004.
4. Western Australian Audit of Surgical Mortality. WAASM annual report 2003. Crawley: The University of Western Australia, 2003.
5. Scottish Audit of Surgical Mortality. [www.sasm.org.uk](http://www.sasm.org.uk)

---

# Appendices

---

## APPENDIX I



## APPENDIX 2

**Areas for Consideration – assessors' opinion** (Some cases may be associated with more than one event, audited cases 2002 to 2004 (n=1205))

Summary event	n	%	Details	n	%
Incorrect/ inappropriate therapy	68	6%	Decision to operate	46	4%
			Better to have done different operation or procedure	6	<1%
			Wrong operation performed	4	<1%
			Fluid balance unsatisfactory	3	<1%
			Operation should not have been done or was unnecessary	2	<1%
			Operation would have been better delayed	2	<1%
			Wrong surgical approach used	1	<1%
			Better treated radiologically	1	<1%
			Post operative fluid balance unsatisfactory	1	<1%
			Unsatisfactory management of hypotension	1	<1%
			Tracheostomy problems	1	<1%
Delays	30	2%	Delay to surgery (ie earlier operation desirable)	9	1%
			Delay in diagnosis	5	<1%
			Delay in transfer to surgeon by physicians	3	<1%
			Delay in recognising complications	2	<1%
			Delay in transfer to ICU post operatively	2	<1%
			Delay in transfer to tertiary hospital	2	<1%
			Delay in investigating the patient	2	<1%
			Delay to blood transfusion	1	<1%
			Delay in transfer to HDU post operatively	1	<1%
			Delay starting DVT prophylaxis	1	<1%
			Delay in recognising anastomotic leak	1	<1%
			Delay starting antibiotics	1	<1%
Failure to use facilities	21	2%	Failure to use DVT prophylaxis	7	1%
			Failure to use HDU	6	<1%
			Failure to use ICU	3	<1%
			Failure to obtain a post mortem	2	<1%
			Failure to use ICU pre operatively, no ICU in hospital	1	<1%
			ERCP not used or not available	1	<1%
			Failure to use a drug for treatment or prophylaxis	1	<1%
Communication failures	16	1%	Poor documentation	10	1%
			Failure of communication unspecified	1	<1%
			Poor communication with GP	1	<1%
			Failed surgical communication through rotation of staff	1	<1%
			Poor communication between physician and surgeon	1	<1%
			Failure to communicate with senior staff	1	<1%
			Poor communication from transferring to receiving hospital	1	<1%

**Contd - Areas for Consideration – assessors’ opinion** (Some cases may be associated with more than one event, audited cases 2002 to 2004 (n=1205))

<b>Summary event</b>	<b>n</b>	<b>%</b>	<b>Details</b>	<b>n</b>	<b>%</b>
Drug-related problems	9	1%	Under anticoagulation	4	<1%
			Drugs related complication	2	<1%
			Over anticoagulation	2	<1%
Assessment problems	8	1%	Pre operative assessment inadequate	4	<1%
			Failure to investigate or assess patient fully	2	<1%
			Cardiac pre operative assessment inadequate	1	<1%
			Inadequate pre operative vascular assessment	1	<1%
General complications	6	<1%	Aspiration pneumonia	3	<1%
			Sepsis related to an intravenous line	1	<1%
			Wound dehiscence	1	<1%
			Graft infection	1	<1%
Related to - open surgery	6	<1%	Related to open surgery	2	<1%
			Heart complication of open surgery	1	<1%
			Anastomotic leak after open surgery	1	<1%
			Uncemented orthopaedic prosthesis preferable	1	<1%
			Post operative bleeding after open surgery	1	<1%
Diagnosis-related problem	4	<1%	Diagnosis missed by surgeons	3	<1%
			Diagnosis missed by radiologist	1	<1%
Staff problems	3	<1%	Problems with appropriate staffing	1	<1%
			Surgeon too junior	2	<1%
Monitoring problems	2	<1%	Inadequate monitoring	1	<1%
			Post operative inadequate respiratory monitoring	1	<1%
Patient factors	2	<1%	Patient refused treatment	2	<1%
Anaesthesia-related problems	1	<1%	Monitoring problems during regional anaesthetic	1	<1%

## APPENDIX 3

**Areas of Concern – assessors' opinion** (Some cases may be associated with more than one event, audited cases 2002 to 2004 (n=1205))

Summary event	n	%	Details	n	%
Delays	54	4%	Delay to surgery (ie earlier operation desirable)	12	1%
			Delay in recognising complications	11	1%
			Delay in transfer to surgical unit	7	1%
			Delay starting DVT prophylaxis	5	<1%
			Delay in transfer to surgeon by physicians	3	<1%
			Delay in recognising anastomotic leak	3	<1%
			Delay in transfer to surgeon by General Practitioner	2	<1%
			Delay to ERCP	2	<1%
			Delay in diagnosis	2	<1%
			Delay in transfer to tertiary hospital	2	<1%
			Delay to re-operation	1	<1%
			Delay to starting ventilation	1	<1%
			Delay to operation caused by missed diagnosis	1	<1%
			Operation would have been better deferred or delayed	1	<1%
			Delay in transfer to ICU post operatively	1	<1%
Incorrect/inappropriate therapy	32	3%	Fluid overload	5	<1%
			Fluid balance unsatisfactory	4	<1%
			Wrong surgical approach used	3	<1%
			Decision to operate	3	<1%
			Better to have done different operation or procedure	2	<1%
			Operation would have been better delayed	2	<1%
			Duration of operation too long	2	<1%
			Wrong operation performed	2	<1%
			Operating following recent cessation of antiplatelet drug	2	<1%
			Post operative fluid overload	1	<1%
			Over transfusion of blood	1	<1%
			Post operative fluid balance unsatisfactory	1	<1%
			Unsatisfactory management of coagulopathy	1	<1%
			Incorrect/inappropriate therapy	1	<1%
			Post operative care unsatisfactory	1	<1%
Better to have had more extensive surgery	1	<1%			
Failure to use facilities	21	2%	Failure to use DVT prophylaxis	14	1%
			Failure to use HDU	2	<1%
			Failure to use HDU post operatively	2	<1%
			Failure to use ICU, post operatively	1	<1%
			Failure to obtain a post mortem	1	<1%
			Failure to use a drug for treatment or prophylaxis	1	<1%
Related to - open surgery	20	2%	Related to open surgery	9	1%
			Post operative bleeding after open surgery	4	<1%
			Air embolism after surgery	1	<1%
			Fistula from colon after open surgery	1	<1%
			Failed arterial reconstruction after open surgery	1	<1%
			Ureteric complication of open surgery	1	<1%
			Anastomotic leak after open surgery	1	<1%
			Small bowel complication of open surgery	1	<1%
Injury to spleen during open surgery	1	<1%			

**Contd - Areas of Concern – assessors’ opinion** (Some cases may be associated with more than one event, audited cases 2002 to 2004 (n=1205))

Summary event	n	%	Details	n	%
Staff problems	17	1%	Surgeon too junior	9	1%
			Failure of junior surgeon to seek advice	3	<1%
			Anaesthetist should have been involved in preparation	2	<1%
			Surgeon operating without specialty	1	<1%
			Problems with appropriate staffing	1	<1%
			Shortage of emergency theatre staff	1	<1%
Communication failures	17	1%	Poor documentation	4	<1%
			Poor communication between physician and surgeon	4	<1%
			No protocol for DVT prophylaxis	2	<1%
			Failure to communicate with senior staff	2	<1%
			Poor documentation on fluid charts	1	<1%
			Failure of communication - unspecified	1	<1%
			Poor documentation on medication chart	1	<1%
			Poor communication from transferring to receiving hospital	1	<1%
Failure of communication due to poor case notes	1	<1%			
Diagnosis-related problems	11	1%	Diagnosis missed by medical unit	6	<1%
			Diagnosis missed by surgeons	5	<1%
General complications	11	1%	Aspiration pneumonia	9	1%
			Post operative intracranial haematoma	1	<1%
			Wound infection	1	<1%
Assessment problems	10	1%	Pre operative assessment inadequate	8	1%
			Inadequate pre operative assessment of cancer staging	1	<1%
			Failure to investigate or assess patient fully	1	<1%
Drug-related problems	6	<1%	Under anticoagulation	2	<1%
			Drugs related complication	1	<1%
			Anticoagulation causing post operative bleeding	1	<1%
			Over anticoagulation	1	<1%
			Overdose of narcotics	1	<1%
Transfer problems	5	<1%	Transfer should not have occurred	2	<1%
			Problems during transfer	1	<1%
			Transfer necessary due to bed shortage	1	<1%
			Transfer necessary to obtain ITU bed	1	<1%
Resuscitation problems	2	<1%	Resuscitation inadequate	1	<1%
			Fluid and electrolyte resuscitation inadequate	1	<1%
Patient factors	2	<1%	Injury caused by fall in hospital	1	<1%
Related to - radiological surgery	2	<1%	Arterial bleeding after radiological operation	1	<1%
			Operation induced acute pancreatitis after radiological op	1	<1%
Related to - laparoscopic surgery	1	<1%	Post operative bleed after laparoscopic operation	1	<1%
Problems with blood/ blood products	1	<1%	Blood products complication	1	<1%
Monitoring problems	1	<1%	CVP insertion failed	1	<1%

## APPENDIX 4

**Adverse events – assessors' opinion** (Some cases may be associated with more than one event, audited cases 2002 to 2004 (n=1205))

Summary event	n	%	Details	n	%
Related to - open surgery	58	5%	Anastomotic leak after open surgery	21	2%
			Post operative bleeding after open surgery	9	1%
			Related to open surgery	7	1%
			Infection of hip prosthesis	4	<1%
			Wound infection after open surgery	2	<1%
			CVA following open surgery	1	<1%
			Perforation of stomach during open surgery	1	<1%
			Perforation of small bowel during open surgery	1	<1%
			Sepsis peritonitis related to jejunostomy	1	<1%
			Splenic complication of open surgery	1	<1%
			Bowel infarction after open vascular operation	1	<1%
			Extension of ischaemia after open surgery	1	<1%
			Blood clot dislodged	1	<1%
			Division of thoracic duct during open surgery	1	<1%
			Dislocated hip prosthesis	1	<1%
			Wound dehiscence after open surgery	1	<1%
			Intra operative bleeding during open surgery	1	<1%
			Vascular injury to stomach following open surgery	1	<1%
			Small bowel complication of open surgery	1	<1%
			Perforation of colon after open surgery	1	<1%
General complications	23	2%	Aspiration pneumonia	7	1%
			Pulmonary embolus	4	<1%
			Septicaemia cause unspecified	4	<1%
			Wound infection	2	<1%
			CVA	1	<1%
			Peri operative cerebral ischaemia or infarction	1	<1%
			Abdominal Abscess	1	<1%
			Wound skin necrosis	1	<1%
			Sepsis related to an intravenous line	1	<1%
			Acute perforated duodenal ulcer	1	<1%
			Delays	17	1%
Delay in transfer to surgical unit	2	<1%			
Delay in transfer to surgeon by physicians	2	<1%			
Delay to surgery (ie earlier operation desirable)	2	<1%			
Delay to operation caused by missed diagnosis	2	<1%			
Delay to blood transfusion	1	<1%			
Earlier operation desirable no theatre available	1	<1%			
Delay in recognising a bleeding complication	1	<1%			
Delay in diagnosis	1	<1%			
Delay in transferring patient to ICU	1	<1%			
Delay starting antibiotics	1	<1%			
Patient factors	11	1%	Injury caused by fall in hospital	10	1%
			Patient refused treatment	1	<1%

**Contd - Adverse events – assessors' opinion** (Some cases may be associated with more than one event, audited cases 2002 to 2004 (n=1205))

Summary event	n	%	Details	n	%
Related to - endoscopic surgery	8	1%	Perforation of duodenum during endoscopic operation	3	<1%
			Related to endoscopic surgery	1	<1%
			Injury to duodenum during endoscopic operation	1	<1%
			Operation induced acute pancreatitis after endoscopic operation	1	<1%
			Bladder complication of endoscopic operation	1	<1%
			Duodenal complication related to endoscopic operation	1	<1%
Incorrect/inappropriate therapy	8	1%	Operation should not have been done or was unnecessary	3	<1%
			Post operative fluid overload	2	<1%
			Wrong operation performed	1	<1%
			Post operative fluid balance unsatisfactory	1	<1%
			Tracheostomy problems	1	<1%
Drug-related problems	8	1%	Anticoagulation causing post operative bleeding	2	<1%
			Reaction to drugs	1	<1%
			Wrong drug used	1	<1%
			Wrong dose of drug used	1	<1%
			Over anticoagulation	1	<1%
			Over anticoagulation before admission	1	<1%
			Under anticoagulation	1	<1%
Related to - radiological surgery	3	<1%	Heart complication of radiological operation	1	<1%
			Arterial bleeding after radiological operation	1	<1%
			Distal arterial embolism after radiological procedure	1	<1%
Diagnosis-related problems	3	<1%	Diagnosis missed by surgeons	1	<1%
			Diagnosis missed by referring hospital	1	<1%
			Diagnosis missed by radiologist	1	<1%
Staff problems	2	<1%	Fatigue of surgeon operating	1	<1%
			Surgeon too junior	1	<1%
Communication failures	2	<1%	Poor communication in Emergency Department	1	<1%
			Communication failures	1	<1%
Related to - laparoscopic surgery	2	<1%	Perforation of small bowel during laparoscopic operation	1	<1%
			Anastomotic leak related to laparoscopic operation	1	<1%
Failure to use facilities	2	<1%	Failure to use DVT prophylaxis	2	<1%
Assessment problems	1	<1%	Failure to investigate or assess patient fully	1	<1%
Anaesthesia-related problems	1	<1%	Premature extubation	1	<1%
Equipment-related problems	1	<1%	Failure of equipment	1	<1%