



WAASM **Annual Report** **2006**

**WESTERN
AUSTRALIAN
AUDIT OF
SURGICAL
MORTALITY**

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Royal Australasian College of Surgeons
Western Australian Audit of Surgical Mortality
Management Committee

Annual Report

2006

Western
Australian
Audit of
Surgical
Mortality



THE UNIVERSITY OF
WESTERN AUSTRALIA

Abbreviations

95% CI	95% confidence interval
99% CI	99% confidence interval
ANZASM	Australian and New Zealand Audit of Surgical Mortality
CPD	Continuing Professional Development
CNR	Case Note Review
CTEC	Clinical Training and Education Centre at the University of Western Australia
CVA	Cerebrovascular Accident
CT	Computed Tomography
DoC	Deficiencies of Care
DoH	Department of Health
DVT	Deep Vein Thrombosis
ERCP	Endoscopic Retrograde Cholangiopancreatography
ENT	Ear Nose and Throat
GP	General Practitioner
HDU	High Dependency Unit
ICU	Intensive Care Unit
IQR	Interquartile range
MJA	Medical Journal of Australia
PE	Pulmonary Embolism
RACS	Royal Australasian College of Surgeons
SASM	Scottish Audit of Surgical Mortality
SoC	Suboptimal Care
TMS	Theatre Management System
TOPAS	The Open Patient Administration System
UWA	University of Western Australia
WA	Western Australia
WAASM	Western Australian Audit of Surgical Mortality
WADH	Western Australian Department of Health

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Chairman's Report

Surgeons will be familiar with the audit cycle, although the aim is an audit spiral as a cycle will return the participant to the starting point rather than to a higher level. The 2006 Annual Report of the Western Australian Audit of Surgical Mortality (WAASM) covers its first four years. There will be an expectation that it provides data to demonstrate that it has influenced and improved outcome. This Annual Report shows this has happened. The overall proportion of adverse events continues to fall from its already very low level.

Specific individual issues of concern that WAASM has previously identified show clear improvement. None of this should be a surprise as 73% of participants have acknowledged that WAASM has influenced their practice¹.

There are two important messages to the public (our patients). The first is that the majority of patients who die while under the care of a surgeon have faultless care. The second is that Western Australian surgeons have an established and robust process that ensures every death is independently scrutinised and any lessons that can be learnt are disseminated. This is resulting in an improvement in care.

However, the public will not be fully reassured until every surgeon and every death is scrutinised. This was the standard advocated in an editorial in the 'Bundaberg' issue of the Medical Journal of Australia.² The media attention that followed the release of the

WAASM 2004 Annual Report focussed on the issue of individual surgeon participation. The profession has argued strongly for self regulation to continue. Self regulation carries obligations and they include a requirement that all members of the profession participate in the review process.

The Royal Australasian College of Surgeons is well on its way to establishing a national audit of surgical mortality. Its request to remain a self regulating body will receive little sympathy if it cannot organise an audit of something as fundamental as death after surgery. Consideration may have to be given to making full and complete participation in its mortality audit a mandatory part of Continuing Professional Development.

To date the issue of participation in medical audits (of any type) has been directed almost solely at the medical community itself. It is now time for equal attention to be directed to other organisations who should be encouraging participation. As a result of previous WAASM Annual Reports the WA Department of Health introduced a range of strategies to encourage participation in audit and clinical governance generally. These included modifications to the Visiting Medical Practitioner Agreement, to the Medical Indemnity Agreement and in its draft credentialing policy. Hospitals have begun to support participation in WAASM as part of their clinical governance processes. Neither the Health Funds nor the Australian Council

on Healthcare Standards have shown any interest in encouraging hospitals to participate in mortality audits

The principal aim of WAASM is to review the outcome of patients who die while under the care of a surgeon. Surgeons recognise that they have a pivotal and personal role in the care of their patients. However, increasingly surgeons are part of a team and some aspects of care are not under their direct control. It is important that deficiencies of care related to a failure of the health service, rather than of the individual surgical team, are identified as such, and any issues addressed.

The ability of WAASM to consider important wider issues should not be overlooked. For example, WAASM has previously noted that some patients appear to have futile surgery. In each year the proportion of cases where there was a positive decision not to undertake

surgery, or to limit treatment has increased, while the number of cases where an operation was started, only to be abandoned when it became clear surgery had nothing to offer, has fallen. With an increasingly ageing population it is important that the limitations of surgery are recognised by clinicians, patients and their relatives. Recently, the WA Attorney General, who is also the Minister of Health, has encouraged debate over the role of living wills. The greater use of living wills would greatly assist surgeons.

At the core of WAASM are the independent, external second line reviews. With few exceptions these peer reviews are detailed, insightful, but above all offer a balanced assessment of cases that are frequently complex. WAASM is very mindful that they take considerable time. WAASM acknowledges with thanks the contribution of these reviewers.

James Aitken
WAASM Chairman

Executive Summary

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 is funded by the WA Department of Health and managed by the Royal Australasian College of Surgeons (RACS). In 2005 RACS formed the Australian and New Zealand Audit of Surgical Mortality (ANZASM), with the purpose of extending a similar mortality audit to other states, territories and New Zealand. The WAASM has qualified privilege under both State and Commonwealth Legislation.

Audit Participation

Participation in WAASM is voluntary. From 2002 to 2005, 2723 surgically related deaths were reported to WAASM. At the time of analysis, two thirds of these had completed the audit process. There is a time lag associated with the audit process and a further 18% of cases were still in progress. 86% of surgeons completed at least one proforma. Only three of the 236 surgeons associated with the reported deaths indicated that they did not wish to participate in WAASM.

Results

We report on 1610 completed audit deaths reported to WAASM from 2002 to 2005.

- The median age of patients was 79 years and 88% of cases were associated with one or more significant comorbidity that contributed towards death.

- The proportion of emergency admissions in these audited cases increased significantly from 73% in 2002 to 87% in 2005 ($p < 0.0001$ Pearson chi squared test).

Areas for consideration, of concern or adverse events

- 298/1610 (19%) cases were associated with an area of concern or adverse event.
- In 17 (1%) cases assessors thought that a preventable adverse event had caused the death of a patient.
- The proportion of cases associated with deficiencies of care (DoC) has progressively fallen over the past four years.
- There were no surgical teams where performance, measured as the proportion of associated DoC, was significantly different from the overall average performance of all surgical teams.

Elective and emergency admissions

- There were more emergency admissions (1291) than elective admissions (319) in these audited cases.
- Elective admissions were associated with a significantly higher proportion of DoC than emergency admissions (29% v 16%) ($p < 0.0001$ Pearson chi squared test).
- 95% of elective admissions underwent an operative procedure compared to 70% of emergency admissions.

- DoC associated with elective admissions were generally related to the treatment received, whereas emergency admissions were associated with delays to receiving treatment.

Operative and non-operative deaths

- There has been an increase in 2004/2005 in the proportion of surgeons making an 'active decision not to operate'.
- The proportion of audited deaths where no operation was performed increased over this period. Some of this increase can be attributed the increase in neurosurgical cases, but even when these are excluded the increasing trend remains.
- Operative cases were associated with a significantly higher proportion of DoC than non-operative cases (22% v 7%) ($p < 0.0001$ Pearson chi squared test).
- There was an increase in the proportion of DoC associated with cases as the number of operations increased.
- In 87/795 (11%) cases there was an unplanned readmission to theatre.

Grade of surgeon – teaching hospitals

- There has been increase in the proportion of consultant surgeons operating on patients who are returned to theatre.

DVT prophylaxis

- Over 90% of assessors indicated they thought that the decision on DVT prophylaxis was appropriate.
- The proportion of patients who received DVT prophylaxis increased from 61% in 2002 to 69% in 2005 ($p = 0.041$ Pearson chi squared test).

Use of ICU and HDU

- ICU was used in 35% and HDU in 10% of these audited cases.
- The proportion of audited cases where assessors thought that the patient would have benefited from HDU decreased from 16% in 2002 to 4% in 2005.

Post-Mortems

- A hospital or coronial post-mortem was conducted in 146/1590 (9%) surgically related deaths.
- 14/48 (29%) of surgeons who read the post-mortem report indicated that the post-mortem had contributed additional information.
- In 9% of cases where no post-mortem was conducted, surgeons indicated that they would have preferred a post-mortem.

Recommendations

- Increase surgeon participation in WAASM.
- Renew commitment of surgeons to fuller completion of proformas.
- Liaise with the Coroner and hospitals to establish a timely and robust mechanism for the routine return of post-mortem results to the responsible clinician.
- Increased communication with other states and territories where similar audits are in progress.
- Establish inter-state second line assessment, especially for small specialties.
- Greater attention is given to fluid management in the elderly.
- To work with the WA Department of Health to ascertain the feasibility of obtaining denominator data.
- WAASM to provide clinicians with information on their own participation data for onward submission to hospitals for clinical governance and accreditation purposes, and also the RACS for CPD credits.
- WAASM to examine in greater detail the underlying causes for delay, the largest contributor to deficiencies of care in emergency presentations

Performance Overview

Recommendations from the WAASM 2004/05 Report

To be undertaken by WAASM

1. A detailed analysis of problems associated with fluid balance.
2. An analysis of data to explore deficiencies of care associated with elective and emergency admissions.
3. Contribute to discussion on anticoagulation in the peri-operative surgical patient.
4. To spread first-line assessment to a wider group of surgeons.
5. Encourage and increase participation.
6. Integrate with the Theatre Management System of public hospitals.
7. Develop specialty specific proformas.

To be undertaken by surgeons in WA

1. Greater participation.
2. Higher completion of proformas.
3. Greater supervision of patients being returned to theatre.

To be undertaken by hospitals, WADH and others

1. To recognise WAASM's role in clinical governance.
2. To make participation in WAASM part of credentialing and accreditation.

Outcomes

WAASM has prepared a report on information from cases where a problem with fluid balance was reported by the surgeon.

The nature of deficiencies of care associated with emergency and elective admissions are reported in detail in this report (Appendix 3).

A discussion meeting "Anticoagulation in the peri-operative patient" was organised by WAASM.

More surgeons have agreed to be first line assessors.

Participation in WAASM has increased.

Still to be explored.

Neurosurgical specific proformas are successfully being used.

Participation by surgeons has increased.

Completion of proformas increased from 62% in 2002/2003 to 67% in 2004/2005.

The proportion of consultants operating when patients were returned to theatre increased in 2004/2005 (Figure 12).

Hospitals are utilising information highlighted by WAASM

WAASM is recognised by the RACS CPD program and points can be claimed for undertaking second line assessments.

Introduction

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).³ 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.

Project Governance Structure

WAASM is funded by the WA Department of Health. 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. 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 31) to oversee the project. WAASM has protection under both 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).

Description of the Audit Process

Notifications of deaths

WAASM is notified of deaths that occur in hospitals through the open patient administration system (TOPAS). For private and smaller public hospitals that do not use the TOPAS system, WAASM is notified of deaths directly by the medical records departments.

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.

Methods

After notification of a death, WAASM sends the consultant surgeon a proforma for completion. This is returned to WAASM and anonymously assessed by a first line assessor. He/she will determine if the case should undergo a second line assessment (Appendix 1). These second line 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 that might be learnt, 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 and anonymised. Events are not linked to patients, surgeons or hospitals. 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 aggregated anonymised data relating specifically to their hospital.
- In accordance with the Regulations accompanying the health Services (Quality Improvement) Act 1994, the RACS WAASM Management Committee is required to report annually to the public on its activities. These reports are available on the WAASM Website.

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.

Definitions

Assessment outcomes

Surgeons and assessors report deficiencies of care in 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 and assessors determine 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 and assessors give their opinion as to whether the incident was preventable:

- Definitely
- Probably
- Probably not
- Definitely not

The surgeon and assessors indicate who the incident was associated with:

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

Suboptimal care and deficiencies of care

For reporting, events are grouped into suboptimal care or deficiencies of care.

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 assessors. The events and the effect on outcome are the opinion of the assessors.

Audit Participation

Key points

Participation by surgeons in the audit is voluntary and has increased in 2004/2005.

2723 cases were reported to WAASM between 2002 and 2005.

Surgeons returned 1757 (65%) of proformas.

86% of surgeons completed at least one proforma.

61% of reported surgically related deaths at private hospitals and 65% at public hospitals were audited by WAASM.

Table 1: Deaths audited by WAASM – 1 January 2002 to 31 December 2005

	2002	2003	2004	2005	Total
Cases notified to WAASM	672	639	695	717	2723
Proformas complete	421 (63%)	395 (62%)	465 (67%)	476 (66%)	1757 (65%)
Cases complete*	415 (62%)	389 (61%)	449 (65%)	407 (57%)	1660 (61%)
No response	218 (32%)	211 (33%)	0	0	429 (16%)
In progress	0	0	207 (30%)	286 (40%)	493 (18%)
Non participant [#]	39 (6%)	39 (6%)	39 (6%)	22 (3%)	139 (5%)

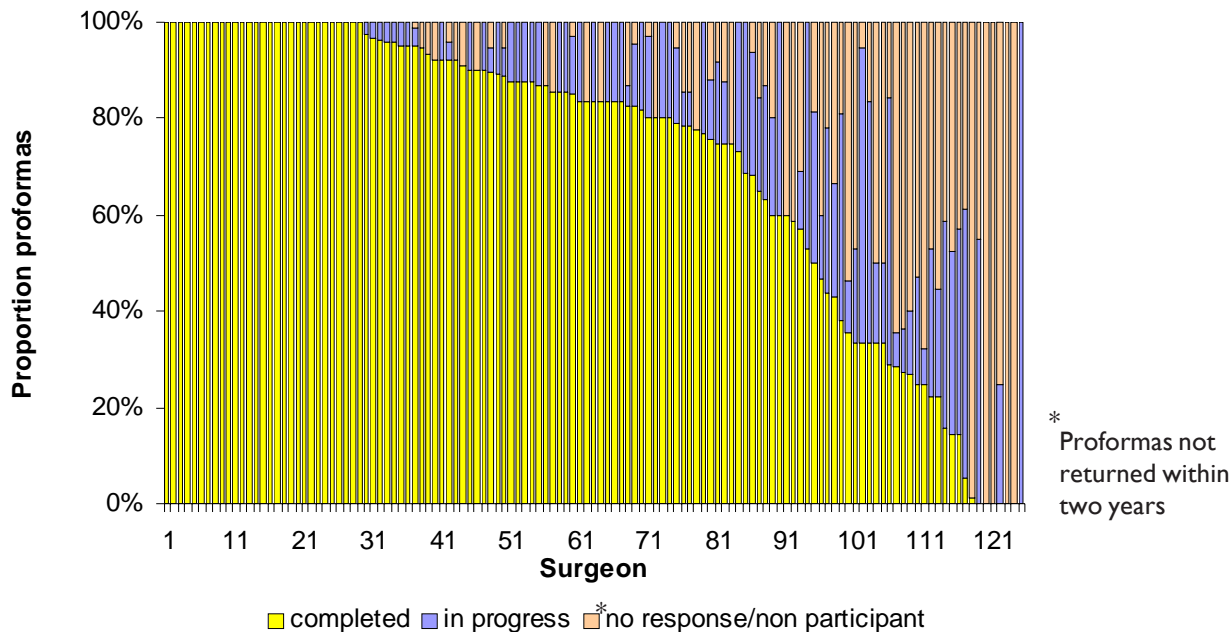
*Assessment(s) complete

[#] Surgeon who has indicated that he/she does not wish to participate in the audit

- Participation is voluntary and surgeons complete and sign a participation form indicating if they wish to participate in the audit process.
- The audit is a multi-step process (Appendix 1) and there is an associated time lag. The median time to receiving the completed proforma and first line assessment is approximately one month.
- If a second line assessment is required, the median time to completion is approximately two months.
- There has been an increase in the numbers of deaths reported to WAASM (Table 1) and an increase in the numbers of proforma returned and completed by consultants (Table 1, Figure 2).

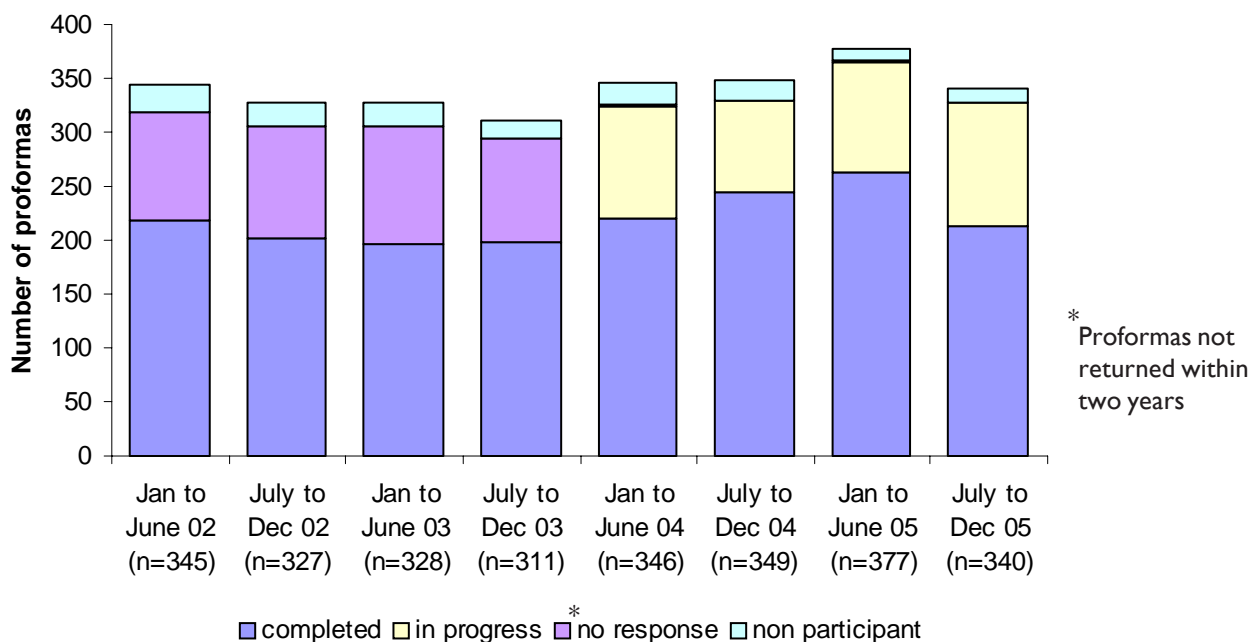
Surgeon Participation

Figure 1: Proportion of proformas completed and returned by surgeon (for surgeons who were sent five or more proformas (n=125) Jan 2002 to Dec 2005)



- There were 236 surgeons associated with the 2723 deaths reported to the WAASM from 2002 to 2005.
- At the time of analysis, only 3 (1%) of these 236 surgeons indicated they did not wish to participate in the WAASM.
- 204/236 (86%) surgeons completed at least one proforma.
- 67% of surgeons completed and returned more than 75% of the proformas sent to them (Figure 1).

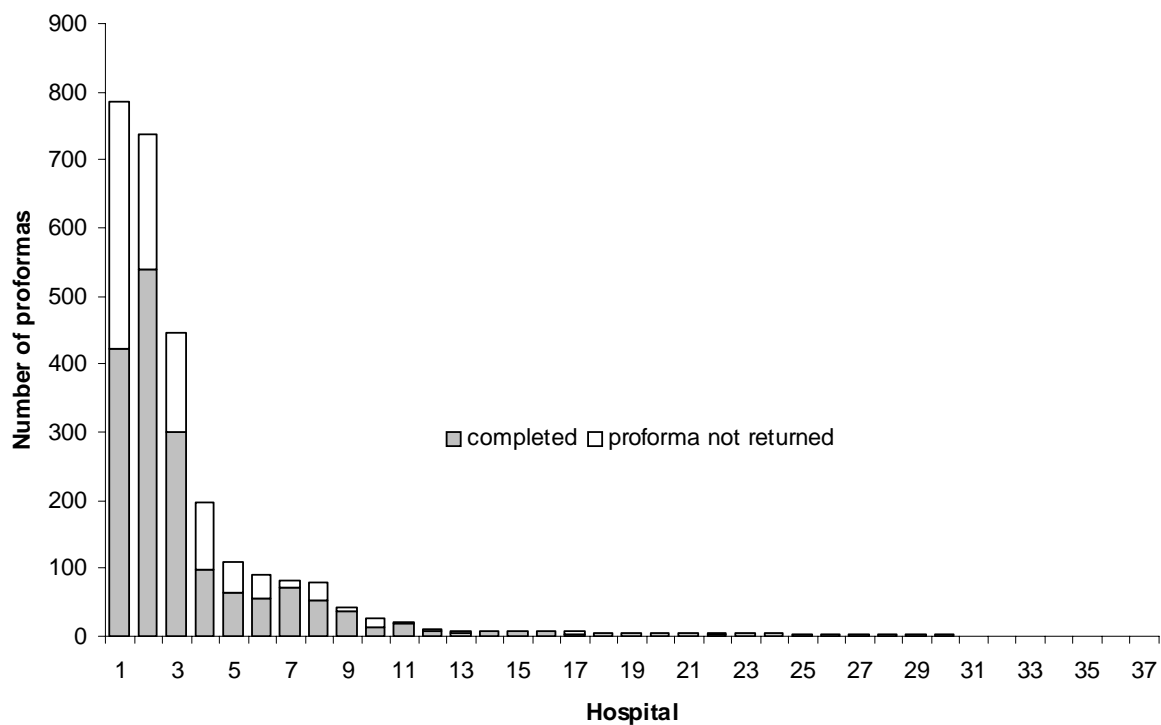
Figure 2: Numbers of proformas completed by surgeons – six monthly cohorts



Participation by Hospital

- From 2002 to 2005, 2723 deaths were reported to WAASM from 37 hospitals.
- Hospitals throughout Western Australia range from small district to larger regional hospitals in rural areas. In the metropolitan area there are small public and private hospitals and large teaching hospitals.

Figure 3: Number of proformas sent to hospitals (2002 to 2005, n=2723)



Comment

Although Figure 2 suggests participation from July to Dec 2005 has fallen there is a lag as late proforma are returned. This is particularly in regard to cases undergoing second line assessment. For the purposes of this report the 'cut off' date to allow time for analysis was February 2006. Additional forms received after this date cannot be included in this analysis, but will be included in future.

Completed Cases 1 Jan 2002 to 31 December 2005

Key Points

There were 1610 completed audited deaths from 2002 to 2005.

50 (3%) cases were terminal care and excluded from the audit process.

The proportion of emergency cases increased from 73% in 2002 to 87% in 2005 ($p < 0.0001$ Pearson Chi squared test).

The median age of audited deaths was 79 years.

1417 (88%) audited cases had one or more significant co-morbidity that contributed towards death.

Table 2: Completed cases included in report (n=1610)

	2002	2003	2004	2005	Total
Proformas returned	421	395	465	476	1757
Assessments completed	415	389	449	407	1660
Excluded terminal care cases	5 (1%)	9 (2%)	15 (3%)	21 (5%)	50 (3%)
Completed cases	410	380	434	386	1610

Patient Sample Demographics

Table 3: Patient descriptive demographics – completed cases (n=1610)

	2002 (n=410)	2003 (n=380)	2004 (n=434)	2005 (n=386)	Total (n=1610)
Males	208 (51%)	224 (59%)	229 (53%)	209 (54%)	870 (54%)
Median age					
Males	76 [67-84]*	78 [69-83]	77 [66-84]	77 [65-83]	77 [67-83]
Females	80 [72-86]	83 [75-89]	81 [73-88]	83 [76-89]	82 [74-88]
All Patients	78 [70-85]	79 [72-87]	79 [68-86]	80 [70-87]	79 [70-86]
% emergency admissions [#]	73%	80%	81%	87%	80%
% public hospital admissions	80%	76%	74%	83%	78%
% non operative deaths	19%	23%	24%	35%	25%

*[Interquartile range]

[#]significant increase from 2002 to 2005 ($p < 0.0001$ Pearson chi squared test)

Co-morbidity

Table 4: Malignancy present in audited cases

	n	Malignancy present	Malignancy contributed towards death
2002	410	105 (26%)	60 (15%)
2003	380	103 (27%)	63 (17%)
2004	434	119 (27%)	88 (20%)
2005	386	91 (24%)	55 (14%)

Figure 4: Age distribution of audited deaths by sex (n=1610)

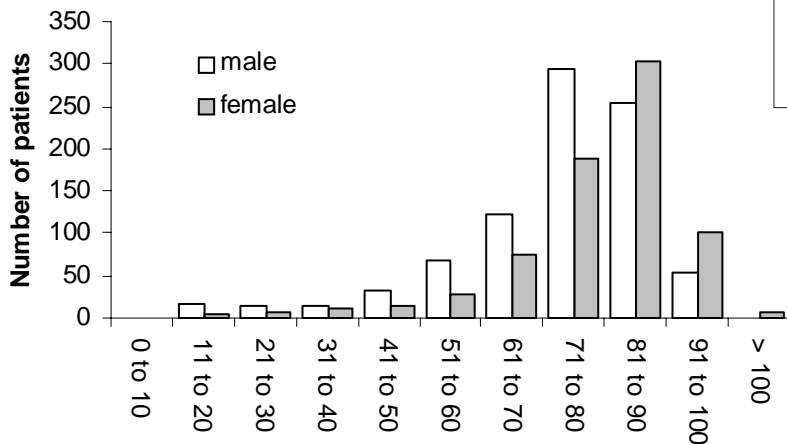
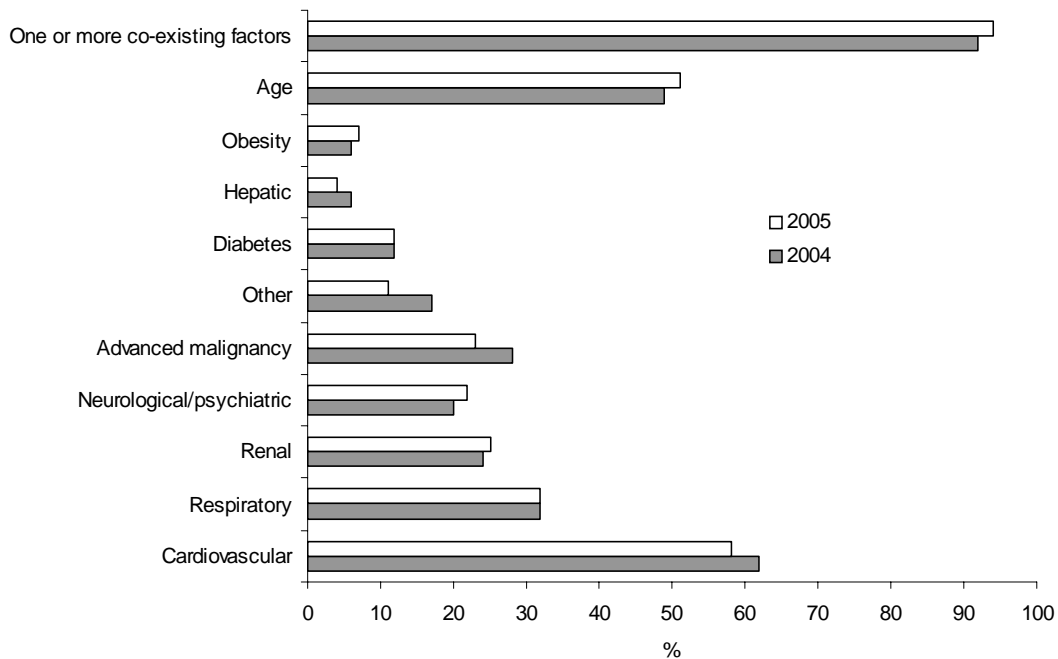


Figure 5: Reported comorbidity in audited cases - 2004 and 2005



- 1417/1610 (88%) of audited cases had one or more significant co-morbidity that contributed towards death.

Results

Areas for Consideration, of Concern and Adverse Events

Key points

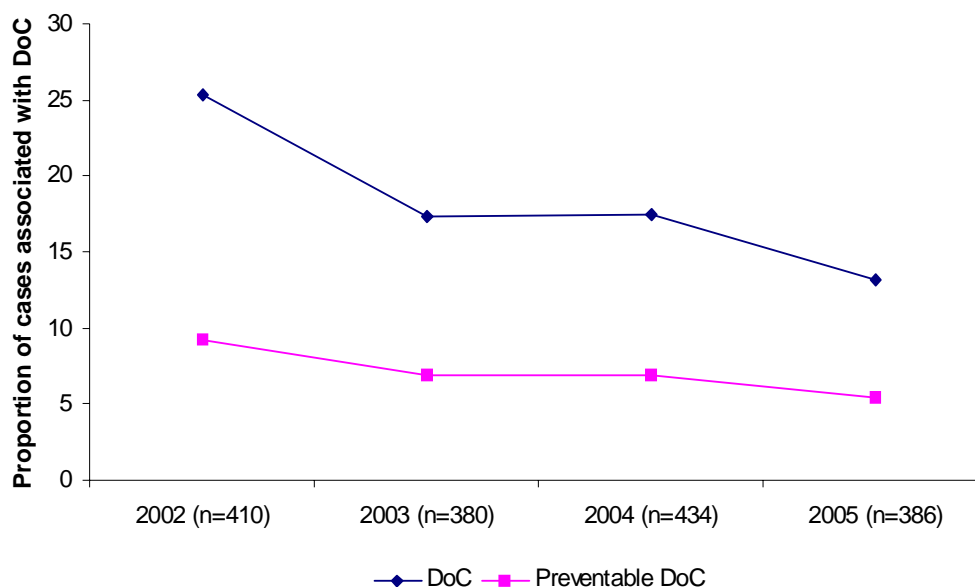
In 1313 (82%) audited cases assessors indicated that there were no deficiencies of care associated with the patient care.

The proportion of audited surgical deaths associated with deficiencies of care decreased over the four years. 298/1610 (19%) cases were associated with a deficiency of care.

In 17 (1%) cases assessors felt that a preventable adverse event had caused the death of a patient.

A funnel plot of surgical performance indicated that there were no surgical teams where performance was significantly different from the overall average performance.

Figure 6: Proportion of audited cases associated with DoC and preventable DoC (2002 to 2005)



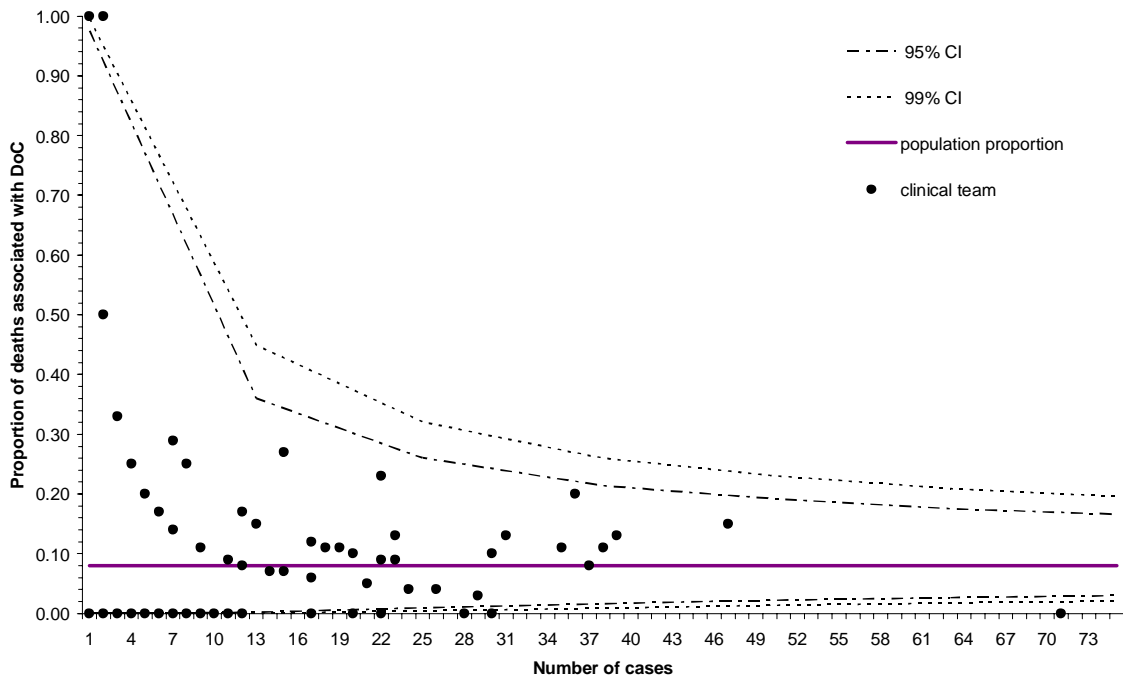
- From 2002 to 2005, 1610 deaths were peer reviewed under the audit process. Assessors reported that 150 (9%) were associated with areas for consideration and 298 (19%) deaths were associated with deficiencies of care (areas of concern and adverse events, Table 5).
- In 63 (4%) cases, assessors thought that the adverse event caused the death of a patient (Appendix 2). Of these 63 cases, assessors considered that 17 (1%) of these events were preventable .
- The proportion of cases associated with DoC decreased from 25% in 2002 to 19% in 2005 (Figure 6).
- The proportion of cases associated with preventable DoC decreased from 9% in 2002 to 5% in 2005 (Figure 6).

Table 5: Numbers of deaths associated with areas for consideration, of concern or adverse events as reported by assessors (most significant event only)

	Area of	None	Made no difference to outcome	May have contributed to death	Caused death	Total
2002	Consideration	0	17	1	0	18 (5%)
	Concern	0	13	29	0	42 (10%)
	Adverse event	0	0	38	24	62 (15%)
	No events	288	0	0	0	288 (70%)
	Total	288	30	68	24	410
2003	Consideration	0	28	4	0	32 (8%)
	Concern	0	9	23	1	33 (9%)
	Adverse event	0	0	16	17	33 (9%)
	No events	282	0	0	0	282 (74%)
	Total	282	37	43	18	380
2004	Consideration	0	52	18	0	70 (16%)
	Concern	0	18	24	1	43 (10%)
	Adverse event	0	3	17	13	33 (8%)
	No events	288	0	0	0	288 (66%)
	Total	288	73	59	14	434
2005	Consideration	0	20	10	0	30 (8%)
	Concern	0	7	19	0	26 (6%)
	Adverse event	0	1	15	9	25 (6%)
	No events	305	0	0	0	305 (80%)
	Total	305	28	44	9	386
Total	Consideration	0	117	33	0	150 (9%)
	Concern	0	47	95	2	144 (9%)
	Adverse event	0	4	86	63	153 (10%)
	No events	1163	0	0	0	1163 (72%)
	Total	1163	168	214	65	1610

Funnel plot of surgical performance

Figure 7: Funnel plot of proportion of deaths associated with preventable DoC for audited clinical teams



- Funnel plots are a type of control chart. The overall event proportion (population proportion) and the resulting exact 95% and 99% binomial confidence intervals (control limits) are plotted on a graph. Of the 1610 audited cases there were 121 (8%) cases associated with DoC which were probably or definitely preventable, and that were associated with the audited clinical team.
- Individual event proportions are plotted against number of cases. Points located within the region bounded by the control limits represent performance that is not significantly different from the population proportion.
- This funnel plot (Figure 7) indicates that there were no surgical teams where performance was significantly different from the overall average performance.

Elective and Emergency Admissions

Key Points

During the audited period 2002 to 2005 there were more emergency admissions (1291/1610 - 80%) than elective admissions (319/1610 - 20%).

The audited elective admissions were associated with a significantly higher proportion of DoC (29%) than emergency admissions (16%) $p < 0.0001$.

95% of elective admissions underwent an operative procedure compared with 70% of emergency admissions.

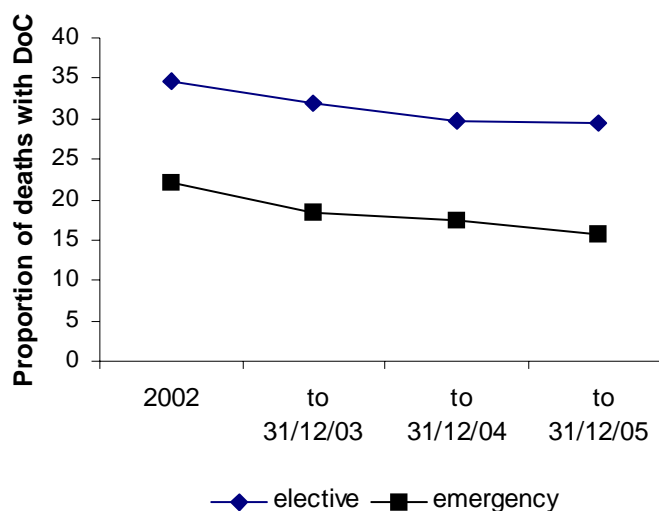
DoC associated with elective admissions were predominantly related to the treatment received whereas emergency admissions were associated with delays to receiving treatment.

- 70% of emergency admissions underwent a surgical procedure compared with 95% of elective admissions (Table 6).

Table 6: Elective and emergency audited cases that underwent an operation

	Admission	Had operation	%	Total
2002	Elective	106	(96%)	110
	Emergency	227	(76%)	300
	Total	333	(81%)	410
2003	Elective	72	(92%)	78
	Emergency	222	(74%)	302
	Total	294	(77%)	380
2004	Elective	77	(94%)	82
	Emergency	255	(72%)	352
	Total	332	(76%)	434
2005	Elective	48	(98%)	49
	Emergency	204	(61%)	337
	Total	252	(65%)	386
Total	Elective	303	(95%)	319
	Emergency	908	(70%)	1291
	Total	1211	(75%)	1610

Figure 8: Cumulative proportion of emergency and elective admissions associated with deficiencies of care



- 1291 (80%) were emergency admissions and 319 (20%) were elective admissions.
- 94/319 (29%) elective admissions were associated with at least one DoC compared to 203/1291 (16%) emergency admissions ($p < 0.0001$, Pearson chi squared test).
- The proportion of DoC associated with both elective and emergency admissions decreased from 2002 to 2005 (Figure 8).

Table 7: DoC associated with emergency admissions (n=1291) and elective admissions (n=319)
See Appendix 3 for details of these DoC

	Emergency (n=314)	Elective (n=168)
Delays	(23%)	(15%)
Related to open surgery	(14%)	(27%)
Incorrect/inappropriate therapy	(11%)	(15%)
Failure to use facilities	(9%)	(6%)
Communication failures	(8%)	(4%)
General complications	(7%)	(12%)
Diagnosis-related problems	(5%)	
Patient factors	(4%)	(2%)
Drug-related problems	(4%)	(3%)
Staff problems	(4%)	(5%)
Transfer problems	(2%)	(1%)
Assessment problems	(2%)	(5%)
Related to radiological surgery	(2%)	
Related to endoscopic surgery	(1%)	(3%)
Resuscitation problems	(1%)	
Related to laparoscopic surgery	(1%)	(2%)
Anaesthesia-related problems	(<1%)	(1%)
Equipment-related problems	(<1%)	
Problems with blood/blood products	(<1%)	
Monitoring problems	(<1%)	

Some cases are associated with more than one DoC. All DoC are included in this analysis. Percentage calculated as a proportion of the total number of DoC.

Comment

In emergency cases, delay remains the single most common DoC. In the majority of these cases the delay occurred when the patient was already under the care of the surgeon. Appendix 3 provides more detail of the nature of events associated with emergency and elective admissions.

Operative and Non-operative Deaths

Key Points

The proportion of audited deaths where no operation was performed increased over the audited period 2002 to 2005.

Cases where an operation was performed (n=1211) were associated with a higher proportion of DoC (22% v 7%) than cases where no operation was performed (n=399) p<0.0001.

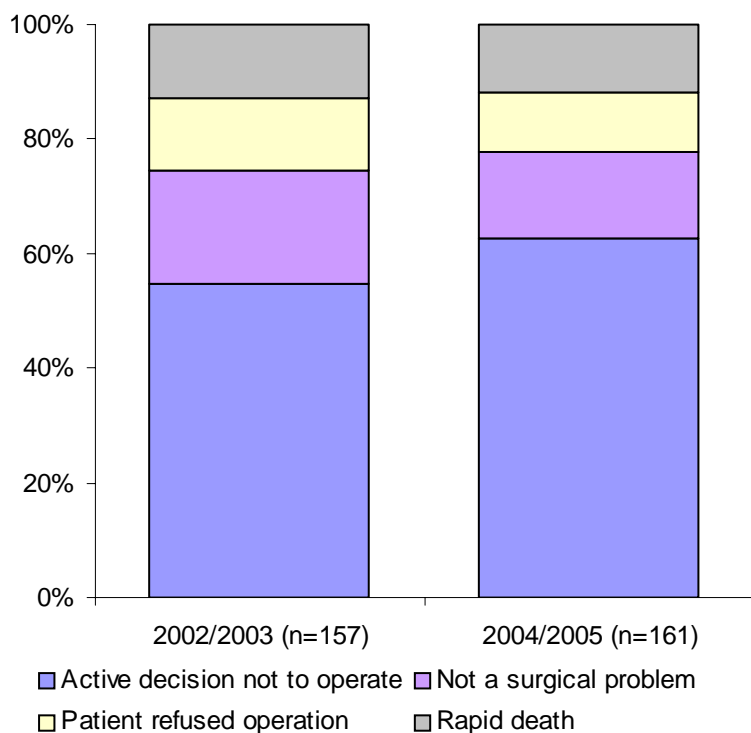
In 2004 and 2005 the proportion of operations in which the consultant was the primary surgeon increased when the patient underwent a second or third operation.

In 87/795 (11%) operative cases there was an unplanned return to theatre.

Table 8: Proportion of cases where no operation was performed 2002 to 2005

	2002	2003	2004	2005	Total
Admissions	410	380	434	386	1610
No operation	77 (19%)	86 (23%)	102 (24%)	134 (35%)	399 (25%)

Figure 9: Reasons for no operation



- WAASM has previously drawn attention to cases where operations should not have taken place and assessors have become more critical of cases where they have queried the decision to operate.
- The proportion of cases where surgeons made an active decision not to operate increased in 2004/2005 (Figure 9).

Operation abandoned

Table 9: Operation was abandoned on finding a terminal situation

	n operations	abandoned
2002	333	19 (6%)
2003	294	22 (8%)
2004	332	11 (3%)
2005	252	11 (4%)
Total	1211	63 (5%)

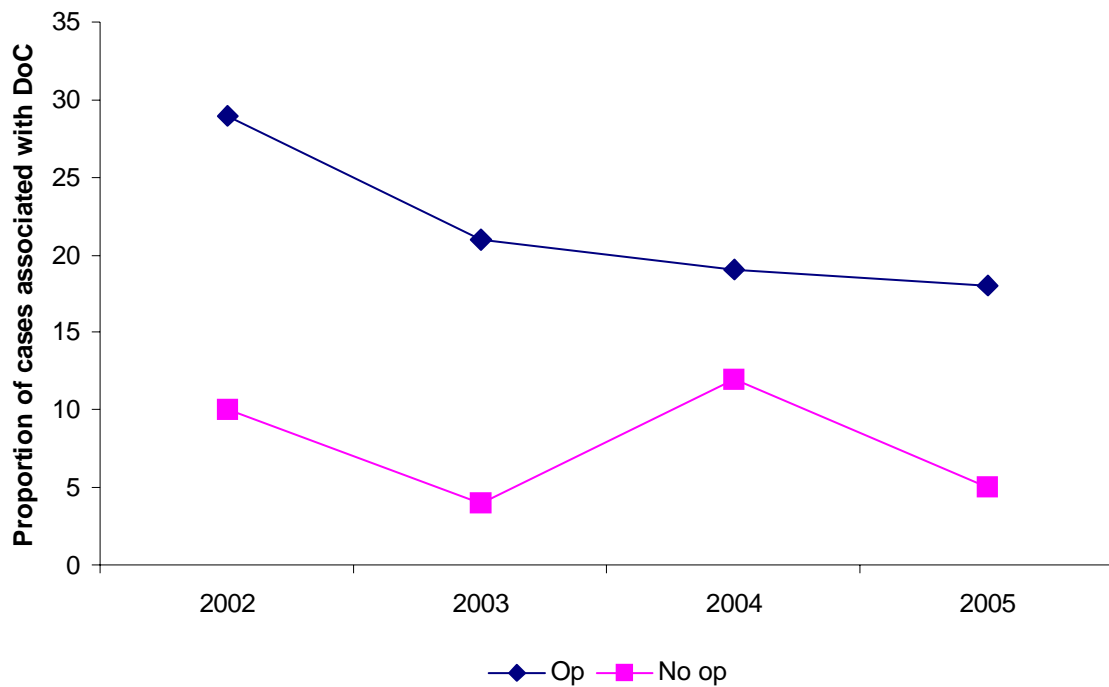
DoC associated with operative and non-operative cases

Table 10: Proportion of DoC associated with operative and non-operative cases

	DoC		Total
	yes	no	
Op	268 (22%)	943 (78%)	1211
No op	29 (7%)	370 (93%)	399
Total	297	1313	1610

- Operative cases were associated with a significantly higher proportion of DoC (22%) when compared to non-operative cases (7%) (Pearson Chi squared test $p < 0.0001$, Table 10)

Figure 10: Proportion of operative and non-operative cases with DoC by year



Operative Cases

Table 11: Surgeon's and assessors' view on pre-operative risk of death in audited cases where an operation was performed

Surgeon	Assessor			Total
	Minimal/small	Moderate	Considerable/expected	
Minimal/small	61	42	52	155 (14%)
Moderate	33	128	169	330 (29%)
Considerable/expected	23	137	491	651 (57%)
Total	117 (10%)	307 (27%)	712 (63%)	1136

Table 12: Timing of operation and associated DoC

	Operations	DoC
Elective	358 (30%)	103 (29%)
Immediate (<2 hrs)	120 (10%)	23 (19%)
Emergency (<24 hrs)	352 (30%)	69 (20%)
Scheduled emergency (>24hrs post admission)	348 (30%)	72 (21%)

Table 13: Number of operations and associated DoC

Number of operations	Number of cases	DoC
0	399	27 (7%)
1	912	155 (17%)
2	193	62 (32%)
3 or more	106	51 (48%)
Total	1610	297 (18%)

- The proportion of cases associated with DoC rises as the number of operations increases.

- Surgeons and assessors are asked for their view on the overall risk of death prior to surgery.
- Surgeons and assessors were in 'fair agreement' on their view of pre-operative risk of death (Kappa test $k=0.27$, 95% CI 0.22 to 0.32).
- The pre-operative risk of death was determined as considerable or expected by 63% of assessors and 57% of surgeons.

Unplanned readmission to theatre

- In November 2003 a question was included in the proforma asking if there was an unplanned return to theatre.
- Of 795 responses, 87 (11%) indicated that there was an unplanned returned to theatre.
- Of these 87 cases, 36 (41%) were associated with DoC.

Grade of surgeon - teaching hospitals

Figure 11: Consultant involvement in primary operation – audited operative cases admitted to teaching hospitals

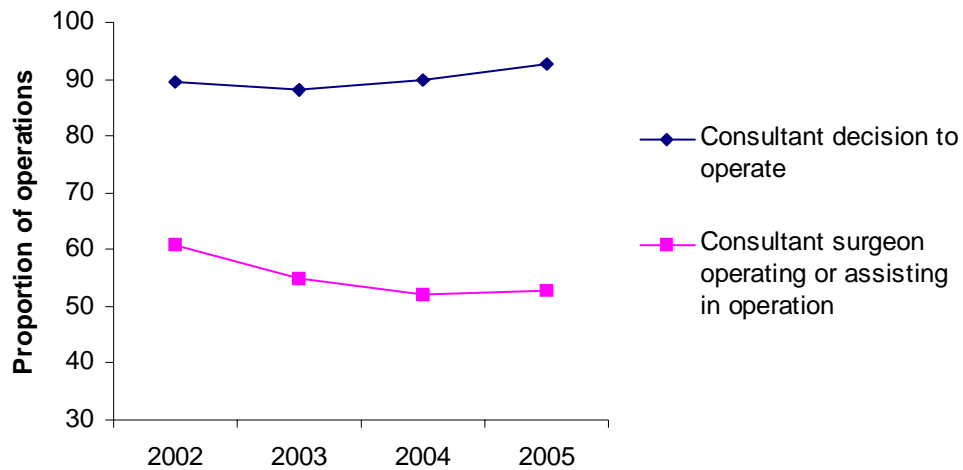
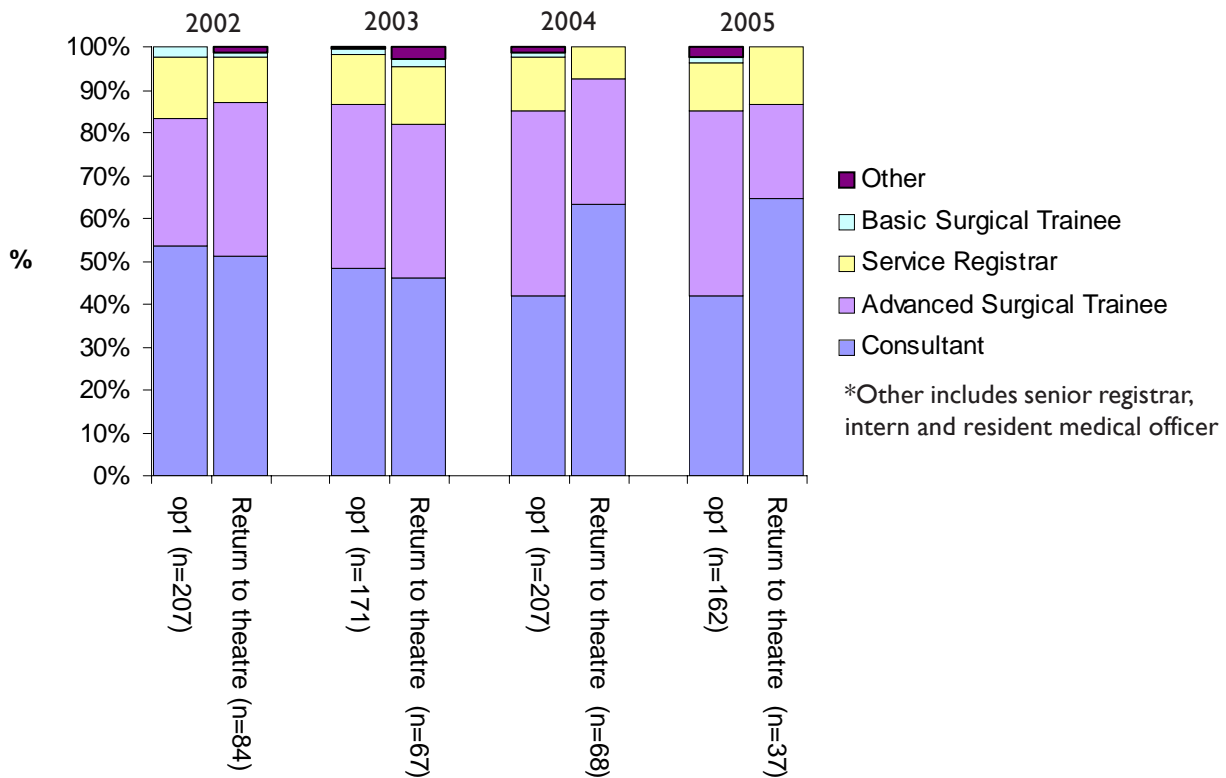


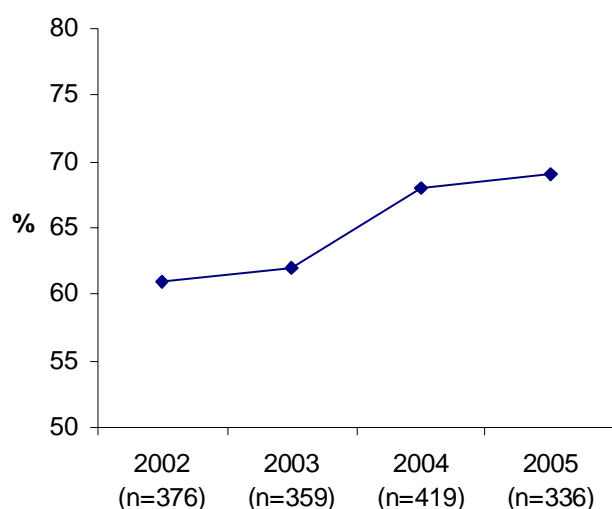
Figure 12: Grade of surgeon performing first and subsequent operations (teaching hospitals 2002 - 2005)



Prophylaxis of Thromboembolism

- Surgeons indicate on the surgical proforma whether DVT prophylaxis was used, and if not, the reasons why it was withheld.

Figure 13: Proportion of patients who received DVT prophylaxis



- At case review, assessors indicate whether they thought that the decision on the use of DVT prophylaxis was appropriate.
- The proportion of patients who received DVT prophylaxis increased from 61% in 2002 to 69% in 2005 ($p=0.041$ Pearson chi squared test, Table 14).

Table 14: Proportion of patients that received DVT prophylaxis and assessors' opinion, by year

Year	Patients receiving DVT prophylaxis	Assessors' opinion - the use of DVT prophylaxis was appropriate
2002	61% (n=376)	89% (n=384)
2003	62% (n=359)	96% (n=371)
2004	68% (n=419)	96% (n=422)
2005	69% (n=336)	94% (n=324)

Use of ICU and HDU

Table 15: Use of ICU and HDU (Assessors' response)

	2002 (n=410)	2003 (n=380)	2004 (n=434)	2005 (n=386)	Total (n=1610)
ICU used	138 (34%)	141 (37%)	167 (38%)	116 (30%)	562 (35%)
HDU used	39 (10%)	36 (10%)	52 (12%)	34 (8%)	161 (10%)
ICU should have been used	9 (2%)	1 (<1%)	14 (3%)	2 (<1%)	26 (2%)
HDU should have been used	66 (16%)	33 (9%)	29 (7%)	16 (4%)	144 (9%)

- ICU was used in 35% and HDU was used in 10% of audited cases. In 87 (5%) cases surgeons reported an unplanned admission to ICU.
- The proportion of audited cases where HDU was not used but assessors thought that the patient would have benefited from HDU, decreased from 16% in 2002 to 4% in 2005.

Fluid Balance

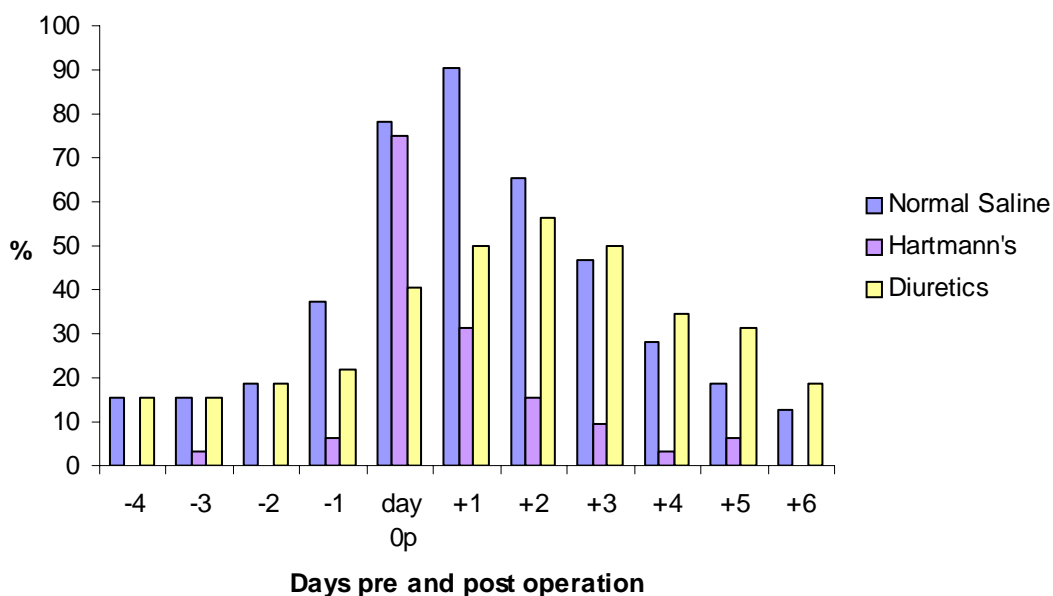
Key Points

WAASM examined 32 case notes where surgeons reported a problem with fluid balance.

The patients were generally old (median age 87 years) and underweight.

A high proportion of patients received high volumes of saline and subsequent diuretics.

Figure 14: Proportion of patients receiving Normal saline, Hartmann's and diuretics pre and post operation (n=32)



- One of the recommendations in the WAASM 2004 Annual Report was that WAASM undertake a broad report on problems associated with fluid balance.
- WAASM recalled 62 case notes from audited deaths where fluid balance was reported as a problem by the surgeon. 51 case notes were received and 32 cases were examined. 19 cases were excluded where the patient did not undergo an operation, they had pre-existing chronic renal failure, they had a length of stay > 45 days or the medical record was incomplete.
- WAASM examined fluid management within the peri-operative period (day -4 pre-operation to day +6 post operatively), the volume and type of intravenous fluids administered to the patient and the administration of diuretics (Figure 14).

Table 16: Demographics of 32 cases examined

Male	8
Female	24
Median age (years)	87 [80 to 91]*
Median days to death from day of op	5 [3 to 9]*
Median weight (kg) n=18	51 [49 to 68]*
Cardiovascular disease	22 (69%)

* IQR

Comment

The common theme was these very elderly patients received significant volumes of sodium containing fluid in the first 24 - 48 post-operative hours. These patients had a relative low body mass and the average infused volume over the first 48 hours was 26% of their body weight. The indication was either poor urine output or low blood pressure. Many had a pre-existing cardiovascular risk factor and then developed pulmonary oedema and/or cardiac failure and had to be administered a diuretic.

WAASM data and reviewers comments suggest that fluid overload may have played a role in other cases which were not 'flagged' by the patient's surgeon. Undoubtedly the cases reported to WAASM represent the tip of problem. With an increasingly aging population this is an issue that clearly demands

greater attention. Two simple steps could be enacted easily. The first would be to identify cases likely to have a post-operative fluid problem so a management strategy can be agreed in advance. The second would be to limit the volume of fluid that can be administered by a intern without discussion with a senior colleague.

It has long been known that patients in the immediate post-operative period have an obligatory sodium and fluid retention. There is now increasing evidence suggesting that sodium and fluid overload is very detrimental to normal physiological cellular function. Preventing this deterioration in physiological function is an important part of the Enhanced Recovery After Surgery protocols being widely introduced in Europe⁴.

Post-Mortems

Key points

Post-mortem rates stayed relatively constant over the audited period 2002 to 2005.

A hospital or coronial post-mortem was performed in 146/1375 (11%) surgical deaths.

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

Table 17: Post-mortems conducted – 2002 to 2005

Post-Mortem	2002 (n=353)*	2003 (n=326)*	2004 (n=388)*	2005 (n=308)*	Total (n=1375)
Hospital	11 (3%)	4 (1%)	6 (2%)	8 (3%)	29 (2%)
Coroner	30 (8%)	35 (11%)	24 (6%)	28 (9%)	117 (9%)
None	299 (85%)	277 (85%)	344 (89%)	262 (85%)	1182 (86%)
Refused	13 (4%)	10 (3%)	14 (4%)	10 (3%)	47 (3%)
Unknown	0	12	36	35	83
Missing data	57	42	10	43	152

* % calculated on complete or known data

- 146 post-mortems were recorded on this group of audited deaths. This represents 11% of 1375 cases where post-mortem data were available.
- Where a post-mortem had been conducted (n = 146), 48 (33%) surgeons indicated that they had read the post-mortem report.
- 14 (29%) surgeons who had read the post-mortem report indicated that the post-mortem contributed additional information.
- In 105 (9%) cases where no post-mortem was performed or the post-mortem was refused (n = 1229), surgeons indicated that they would have preferred a post-mortem.

Comment

The low proportion of post-mortems remains unchanged. Where a post-mortem had been conducted, only a third of surgeons indicated that they had read the post-mortem report. 29% of these surgeons indicated that the post-mortem had provided new information on the case. This is clearly an issue that needs to be addressed.

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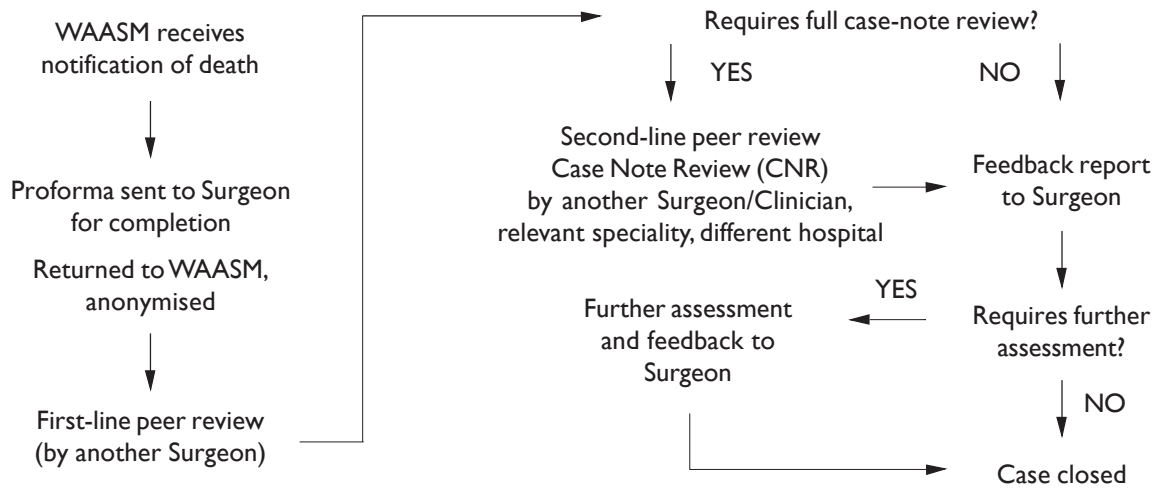
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Appendices

APPENDIX I WAASM methodology



APPENDIX 2 Adverse events which assessors thought caused the death of a patient (63/1610)

Related to open surgery	(2%)
General complications	(1%)
Patient factors	(<1%)
Related to endoscopic surgery	(<1%)
Drug related problems	(<1%)
Failure to use facilities	(<1%)
Related to laparoscopic surgery	(<1%)
Related to radiological surgery	(<1%)
Anaesthesia related problems	(<1%)
Delays	(<1%)
Staff problems	(<1%)
Communication failures	(<1%)

APPENDIX 3 DoC associated with emergency and elective admissions

Some cases are associated with more than one DoC.

All DoC that occurred in all audited cases are totalled in this table.

Proportions of type of DoC are calculated on the total number of DoC associated with emergency admissions (n=314) and elective admissions (n=168).

Emergency (n=314)	Elective (n=168)
<p>Delays (23%)</p> <ul style="list-style-type: none"> Delay to surgery ie earlier operation desirable Delay in transfer to surgical unit Delay in recognising complications Delay in transfer to surgeon by physicians Delay in diagnosis Earlier operation desirable no theatre available Delay to operation caused by missed diagnosis Delay in transfer to tertiary hospital Delay to ERCP Delay to blood transfusion Delay starting DVT prophylaxis Delay in transfer to surgeon by GP Delay in investigating the patient Operation would have been better delayed Delay to surgery whilst obtaining a CT scan Delay to starting ventilation Delay starting antibiotics Delay in transferring patient to ICU Delay in recognising anastomotic leak Delay in recognising a respiratory complication <p>Related to open surgery (14%)</p> <ul style="list-style-type: none"> Anastomotic leak after open surgery Related to open surgery Infection of hip prosthesis Post operative bleeding after open surgery Wound infection after open surgery Small bowel complication of open surgery Perforation of colon after open surgery Ureteric complication of open surgery Splenic complication of open surgery Sepsis peritonitis related to jejunostomy Perforation of stomach during open surgery Perforation of small bowel during open surgery Injury to spleen during open surgery Fistula from colon after open surgery Bowel infarction after open vascular operation Blood clot dislodged Accidental pneumothorax related to open surgery 	<p>Delays (15%)</p> <ul style="list-style-type: none"> Delay in recognising complications Delay starting DVT prophylaxis Delay in recognising a bleeding complication Delay in recognising anastomotic leak Delay in transfer to ICU post operatively Delay in diagnosis Delay to reoperation Delay in transfer to surgeon by physicians Delay starting antibiotics Delay to surgery ie earlier operation desirable <p>Related to open surgery (27%)</p> <ul style="list-style-type: none"> Anastomotic leak after open surgery Related to open surgery Post operative bleeding after open surgery CVA following open surgery Air embolism after surgery Failed arterial reconstruction after open surgery Extension of ischaemia after open surgery Thoracic duct injury during open surgery Division of thoracic duct during open surgery Dislocated hip prosthesis Wound dehiscence after open surgery Intra operative bleeding during open surgery Vascular injury to stomach following open surgery

APPENDIX 3 Contd - DoC associated with emergency and elective admissions

Emergency (n=314)		Elective (n=168)	
Incorrect/inappropriate therapy	(11%)	Incorrect/inappropriate therapy	(15%)
Fluid balance unsatisfactory		Wrong operation performed	
Decision to operate		Decision to operate	
Wrong surgical approach used		Fluid balance unsatisfactory	
Duration of operation too long		Better to have had more extensive surgery	
Better to have done different operation		Post operative fluid balance unsatisfactory	
Wrong operation performed		Post operative fluid overload	
Operation should have been done		Better to have done different op or procedure	
Unsatisfactory management of coagulopathy		Operating following recent cessation of antiplatelet drug	
Tracheostomy problems		Operation would have been better delayed	
Over transfusion of blood		Operation should not have been done or was unnecessary	
Op following recent cessation of anticoagulant drug		Duration of operation too long	
More aggressive treatment of infection needed		Incorrect or inappropriate therapy	
		Post operative care unsatisfactory	
Failure to use facilities	(9%)	Failure to use facilities	(6%)
Failure to use DVT prophylaxis		Failure to use DVT prophylaxis	
Failure to use HDU		Failure to use ICU post operatively	
Failure to use ICU post operatively		Failure to use HDU post operatively	
Failure to use a drug for treatment			
Failure to obtain a post mortem			
HDU not used post operatively. HDU full			
Failure to use antibiotic prophylaxis			
Communication failures	(8%)	Communication failures	(4%)
Failure of communication		Poor documentation	
Poor documentation		Communication failures	
Poor communication between physician & surgeon		Poor communication between physician & surgeon	
No protocol for DVT prophylaxis			
Failure to communicate with senior staff			
Poor communication between hospitals			
Poor documentation on medication chart			
Poor documentation on fluid charts			
Poor communication in emergency department			
Failure of communication due to poor case notes			

APPENDIX 3 Contd - DoC associated with emergency and elective admissions

Emergency (n=314)		Elective (n=168)	
General complications	(7%)	General complications	(12%)
Aspiration pneumonia		Aspiration pneumonia	
Wound infection		Pulmonary embolus	
Septicaemia - cause unspecified		CVA	
Post operative intracranial haematoma		Peri operative intracranial infection	
Pulmonary embolus		Peri operative cerebral ischaemia or infarction	
Sepsis related to an intravenous line		Abdominal abscess	
Acute perforated duodenal ulcer		Post operative pancreatitis	
		Graft infection	
		Wound skin necrosis	
Diagnosis related problems	(5%)		
Diagnosis missed by surgeons			
Diagnosis missed by medical unit			
Diagnosis missed by referring hospital			
Diagnosis missed by radiologist			
Patients factors	(4%)	Patients factors	(2%)
Injury caused by fall in hospital		Injury caused by fall in hospital	
Patient refused treatment		Patient refused treatment	
Drug-related problems	(4%)	Drug-related problems	(3%)
Under anticoagulation		Anticoagulation causing post operative bleeding	
Over anticoagulation		Wrong drug used	
Anticoagulation causing post operative bleeding		Wrong dose of drug used	
Reaction to drugs		Under anticoagulation	
Overdose of narcotics		Allergic skin reaction related to drug treatment	
Over anticoagulation before admission			
Drugs related complication			
Anaphylactic shock related to drug treatment			
Staff problems	(4%)	Staff problems	(5%)
Surgeon too junior		Surgeon too junior	
Failure of junior surgeon to seek advice		Anaesthetist should have been involved in preparation and resuscitation	
Surgeon operating without specialty		Fatigue of surgeon operating	
Shortage of emergency theatre staff		Failure of junior surgeon to seek advice	
Problems with appropriate staffing			
Anaesthetist should have been involved in preparation and resuscitation			
Transfer problems	(2%)	Transfer problems	(<1%)
Transfer should not have occurred		Transfer necessary to obtain ICU bed	
Problems during transfer			
Transfer necessary due to bed shortage			