

WAASM

Annual Report

2004

**WESTERN
AUSTRALIAN
AUDIT OF
SURGICAL
MORTALITY**

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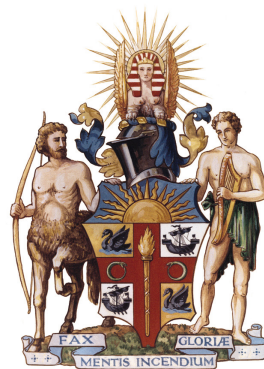
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Western Australian Audit of Surgical Mortality

Royal Australasian College of Surgeons



Annual Report 2004



Department of Health
Government of Western Australia



THE UNIVERSITY OF
WESTERN AUSTRALIA

CHAIRMAN'S REPORT

The central aim of the Western Australian Audit of Surgical Mortality (WAASM) is to improve quality of care through data collection, education and feedback. This second annual report suggests WAASM is influencing surgeons and hospitals and that they are addressing some of the issues previously raised.

Since WAASM was established, the overall proportion of deaths associated with a deficiency of care has progressively fallen. There has been a particular decrease in some areas that WAASM previously targeted, such as the failure to provide adequate prophylaxis for deep vein thrombosis. In a survey of consultants, over 70% of surgeons acknowledged that WAASM had influenced their practice. In a similar survey of hospitals, 47% of administrators reported that they were aware of changes in practice secondary to WAASM.

All this provides compelling evidence to suggest that WAASM's external peer review process can, and is, influencing both surgeons and hospitals. WAASM is thus achieving its central aim. The performance overview shows that WAASM has achieved many of the goals set last year.

Attention will undoubtedly be focused on the small number of deaths caused by adverse events. These deaths are a tragedy for the patient, their family and friends but it must be emphasised that they are extremely rare events. The importance of the systemic overview that WAASM offers becomes clearer when it is appreciated that one third of adverse events were not caused by the surgical team responsible for the patient, but a problem elsewhere in the health care system.

Many of the problems WAASM identifies have a systemic basis. This Annual Report confirms

that poor fluid balance management appears to be an unrecognised problem and was noted in 11% of audited cases since November 2003. This figure undoubtedly underestimates the magnitude of the problem. With an increasingly elderly and frail patient population the importance of careful fluid balance management is obvious. It is unlikely that fluid balance problems are confined to surgical patients, and demonstrates yet again how problems identified by WAASM's systemic process may extend well beyond the surgeons themselves.

This is but one example that demonstrates how surgical adverse events can be identified by detailed external peer review such as WAASM. It is unlikely that general adverse event reporting would detect such a subtle, but important, deficiency of care. Only a surgeon, after detailed review of the circumstances, can do this. Likewise, only a surgeon can determine whether there was a technical failure (a high proportion associated with elective admissions) or whether there was undue delay (a high proportion associated with emergency admissions). Surgeons rightly demand that their assessors have appropriate surgical insight. This in turn places an obligation on surgeons to support and fully participate in any detailed review process that has been established in the manner that they believe is essential if they are to be assessed appropriately.

WAASM would like to improve the participation rate of surgeons in the audit. The WA Department of Health's medical indemnity scheme specifies that medical practitioners will participate in clinical governance, including clinical audit. Two thirds of hospital administrators indicated they want WAASM to

be mandatory. Full participation in WAASM was one of the key points emphasised by the WA Health Consumers' Council in their response to last year's Annual Report on WAASM.¹

To date, no WA hospital has made participation in WAASM part of its credentialling and governance requirements. The Douglas Report into events at the King Edward Memorial Hospital (KEMH)² included the recommendations that "significant adverse events ... are to be reviewed by an appropriately qualified clinician, preferably from outside the state" and that "... incidents and 'near misses' are appropriately reviewed outside the directorate in which they occurred". It is not unreasonable for the public and patients to expect that WA hospitals should adopt the recommendations in the Douglas report that have a wider application than the KEMH. WAASM participation should be included in hospital credentialling and clinical governance processes.

WA surgeons should be under no illusions that they will be under increasing pressure to participate in WAASM. Peer review is no longer optional, it is a professional responsibility. If surgeons do not voluntarily participate in clinical audit, it is likely to become mandatory. If this occurs it is inevitable WA surgeons will lose some

control of the process. This would be regrettable, unnecessary and preventable.

Such is the national interest in WAASM that an all day conference organised by the Royal Australasian College of Surgeons in February 2004 attracted over 70 delegates from around Australia and New Zealand. The following day the College Council endorsed in principle the introduction of a bi-national surgical mortality audit across both countries. Since then other States have commenced their own audits using the WAASM methodology and software. Ensuring consistency and uniformity of data collection and analysis will be one of the important future challenges. The RACS views its bi-national mortality audit as an important part of its CPD process. WAASM is one of its few approved audits.

WAASM is dependent on the contributions of many, and thanks all surgeons who participate. The case-note reviews, particularly, are at the heart of WAASM's independent, peer review process. These reports are of a uniformly high quality and give WAASM its authority. WAASM fully recognises the work entailed in producing these case note reviews and acknowledges with thanks the contribution of the reviewers.

**R J Aitken
Chairman**

ABBREVIATIONS

95% CI	95% confidence interval
99% CI	99% confidence interval
ASA Grade	American Society of Anesthesiologists Grade
AST	Advanced Surgical Trainee
BST	Basic Surgical Trainee
CNR	Case Note Review
CPD	Continuing Professional Development
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
GI	Gastrointestinal
HDU	High Dependency Unit
ICU	Intensive Care Unit
KEMH	King Edward Memorial Hospital
NCEPOD	National Confidential Enquiry into Patient Outcome and Death
NHS	National Health Service
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
UK	United Kingdom
UWA	University of Western Australia
WA	Western Australia
WAASM	Western Australian Audit of Surgical Mortality
WADH	Western Australian Department of Health
WAHCC	Western Australian Health Consumers' Council

Conventions

Data are reported on completed peer-reviews of surgical deaths recorded by WAASM for the time period 1 January 2002 to 30 June 2004.

Suboptimal care associated with audited cases are the opinion of an independent, external surgical assessor.

Analysis is done on data for the years of 2002, 2003 and 1 Jan to 30 June 2004.

Numbers in parentheses (n=) represent the denominator of the data being presented. Not all data are complete, therefore denominators will vary.

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I. EXECUTIVE SUMMARY & RECOMMENDATIONS

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 The principle aim of WAASM is to improve the safety and quality of surgical care through the feedback of information to surgeons.

Audited deaths

Data contained in this report covers the period from 1 January 2002 to 30 June 2004 and includes 1647 notified deaths. 896 (54%) cases had completed the audit process at the time of analysis. 20 (2%) terminal care cases were excluded from the analysis. We report on 876 cases, and also compare yearly data.

96% of surgeons in WA who had one or more deaths completed at least one proforma. Not all surgeons complete all their proformas and 60% of proformas were returned during this period. WAASM hopes to introduce some specialty specific proformas in 2005 to facilitate completion of the audit process.

Demographics

There was no difference in the mean age of patients admitted in 2002 (76 yrs) and 2003 (77 yrs) ($p=0.346$, independent t-test). 91% of patients ($n=745$) had one or more significant comorbidity that increased the risk of death.

Use of ICU and HDU

WAASM reported a decrease in cases where assessors thought HDU should have been used (16% in 2002 compared with 9% in 2003). However, it is likely that WAASM figures underestimate the true demand.

Deficiencies of Care

The previous definition of adverse events was extended to include areas for consideration and areas of concern. In addition, WAASM now collects data on the preventability and the source of the events. For reporting, we have grouped adverse events and areas of concern into deficiencies of care (DoC).

- 179 (20%) cases ($n=876$) were associated with DoC.
- In 45 (5%) cases assessors thought that an adverse event caused the death of a patient.
- In 15 (2%) cases assessors thought that the adverse event that caused the death of a patient was preventable.

There was a significant decrease in the proportion of cases associated with DoC from 2002 (26%) to 2003 (16%) ($p=0.001$ Pearson chi squared test). Some of the change may be due to changes in the reporting system of adverse events.

Admissions

The most common diagnosis for hospital admission in audited cases was fractured neck of femur (17% of audited cases, $n=876$).

There was a decreasing trend in the occurrence of deficiencies of care in both elective and emergency admissions.

Elective admissions were associated with a significantly higher proportion of DoC (32%, $n=207$) than emergency admissions (17%, $n=669$) ($p<0.0001$, Pearson chi squared test).

A significantly higher proportion of cases admitted to public hospitals were associated with DoC (22%, $n=679$) compared with cases admitted to private hospitals (15%, $n=197$) ($p=0.024$ Pearson chi squared test). However

when areas of consideration were included in the calculation (28% v 25% respectively) there was no difference.

Transfers

Approximately one quarter of patients were transferred from one centre to another. In general the transfer process was of high quality with only four cases having a DoC associated with the transfer process.

Operative and Non-Operative Deaths

- The proportion of deaths where no operation was performed increased significantly from 17% in 2002 to 23% in 2003 ($p=0.042$ Pearson chi squared test).
- Cases that underwent one or more operation ($n=694$) were associated with a significantly higher proportion of DoC (24%) than those cases where no operation was performed (7%, $n=182$) ($p<0.0001$ Pearson chi squared test).
- There was a significant increase in the proportion of DoC associated with cases as the number of operations increased. ($p<0.0001$ Cochrane-Armitage 2-sided trend test).

Grade of Surgeon – Teaching Hospitals

The consultant surgeon was the primary surgeon in less than 50% of audited deaths from admission to teaching hospitals for emergency surgical procedures.

The proportion of operations in which the consultant was the primary surgeon did not increase if these patients had a second or third operation. However, WAASM does not have complete data on the grade of surgeon assisting in these operations.

DVT Prophylaxis

Additional data have been collected on DVT prophylaxis.

- Over 40% of respondents to the WAASM surgeon survey indicated that they had changed their practise with regard to DVT prophylaxis.
- There was a significant upward linear trend over time (January 2002 to June 2004) where assessors reported that the use of DVT prophylaxis was appropriate ($p=0.0014$, Cochrane-Armitage trend test). This evidence strongly suggests that practise has changed with regard to the management of DVT prophylaxis.

Fluid Balance

WAASM noted many documented cases where there were problems with fluid balance. Additional information has been collected since November 2003 and in 198 audited cases recorded in this time, 21 (11%) were associated with problems with fluid management. WAASM will audit this further and report later in 2005.

Post Mortems

A hospital post-mortem was performed in 16 (2%) surgical deaths ($n=876$).

- 20% (7 of 35) of surgeons who had read the post-mortem report indicated it had given them additional information regarding the patient.
- 9% (69 of 768) of surgeons indicated that they would have preferred a post-mortem where none had been conducted.

Funnel Plots

Funnel plots of the WAASM data indicate that clinical care in WA is of a high standard and there are no outliers significantly different from the overall average performance.

However, data are incomplete, as not all surgeons return all of their proformas and therefore these graphs are only an indication of performance.

WAASM Surgeon Survey

In June 2004 WAASM mailed questionnaires to all surgeons in WA. The aim of this survey was to ascertain whether the audit was useful to surgeons, to establish if it had influenced their practice in any way, and to elicit information that would improve the audit or address any dissatisfaction surgeons might have.

- 73% of surgeons responded to the survey (n=315).
- 70% of respondents had read the WAASM 2003 annual report.
- 73% indicated that they had changed their practise in at least one way.
- 85% were in favour of WAASM continuing.
- 58% thought WAASM should remain voluntary.

WAASM Hospital Survey

Following the evaluation of surgeons, WAASM sent out a survey form to hospital administration and clinical governance units to ascertain their response to the audit.

- 79% of forms were returned (n=70).
- 87% had read the information provided by WAASM.
- 47% were aware of changes to hospital practise as a result of WAASM.
- 85% thought WAASM should continue.
- 63% felt that WAASM should be made mandatory.

WA Health Consumers' Council

The WAHCC met in October 2004 to review WAASM and general conclusions included:

- WAASM should be part of core business in all health services.
- WAASM provides assurance to the community that there are state-wide initiatives to address the safety of health care.

Future Developments

- WAASM plans to collaborate with other studies and projects to compare outcomes.
- Encourage participation amongst surgeons with the development of specialty specific proformas.
- Data analysis to explore deficiencies of care associated with elective and emergency admissions.
- Further audit on the issue of fluid balance.
- Explore the possible use of TMS data.
- Assist in the development of similar audits in other states and territories.

KEY POINTS

- Surgeons are encouraged to complete a higher proportion of proformas.
- The definition of adverse events was extended and defined in terms of preventability and where the event occurred.
- 20% of audited deaths were associated with deficient care.
- In 2% of audited cases assessors thought a preventable adverse event had caused the death of a patient.
- There was a significant decrease in the proportion of audited cases associated with deficiencies of care from 2002 (26%) to 2003 (16%).
- Elective admissions were associated with a significantly higher proportion of deficient care (32%) than emergency admissions (17%).
- The more operations a patient had the more likely they were to experience deficient care.
- The consultant surgeon was the primary surgeon in less than 50% of audited deaths where patients were admitted for emergency surgical procedures in teaching hospitals.
- The consultant surgeon should be actively involved when patients are returned to theatre.
- Evidence strongly suggests practise with regard to DVT prophylaxis has improved.
- Problems with fluid balance management was reported in 11% of audited cases.
- The proportion of post-mortem examinations was low.
- Missing data are hindering confirmation of the existence of problems. WAASM will explore links with TMS data.
- 73% of surgeons reported that they had changed their practise as a result of WAASM.
- A high proportion of both surgeons and hospital administrative staff had read information that WAASM distributes.
- WA Health Consumers' Council advocated that WAASM should be a part of core business in all health services.

RECOMMENDATIONS

To be undertaken by WAASM

- A detailed analysis of the problems with fluid balance.
- An analysis of data to explore deficiencies of care associated with elective and emergency operations.
- Contribute to discussion on anti-coagulation in the peri-operative surgical patient.
- To spread first-line assessment to a wider group of surgeons.
- Encourage and increase participation.
- Integrate with the Theatre Management System of public hospitals.

- Develop specialty specific proformas.

To be undertaken by surgeons in WA

- Greater participation.
- Higher completion of proformas.
- Greater supervision of patients being returned to theatre.

To be undertaken by hospitals, WADH and others

- To recognise WAASM's role in clinical governance.
- To make participation in WAASM part of credentialling and accreditation.

2. PERFORMANCE OVERVIEW

The first WAASM annual report⁴ included 13 recommendations (*Table 1*) and 11 future development goals (*Table 2*). An important measure of WAASM's success is whether these have been achieved or addressed.

Recommendations

Five of the 13 recommendations were wholly within the control of WAASM (*Table 1, 4,5,6,11,13*). Of these, four have been fully addressed, with a failure to address in greater detail the various reasons for delays to surgery.

The remaining eight recommendations required changes by either the surgeons themselves or hospitals. Four of the eight required surgeons to change their practice, and this was achieved in two. The two outstanding matters were a failure of surgeons to increase (rather than maintain) their participation rate and greater consultant involvement when patients were returned to theatre. These issues are discussed in detail in this annual report.

The remaining four recommendations required co-operation and/or changes by other organisations. None of these have been addressed in any meaningful sense.

Table 1: Recommendations from WAASM 2003 annual report⁴

Recommendation	Outcome
1. Participation to increase	Participation only maintained
2. DVT prophylaxis to be improved	Much improved
3. ICU and HDU use to be improved	Improved
4. Address reasons for delays	Not done
5. Fluid management to be investigated further	More detailed data collected - confirms this is a major issue that needs to be addressed
6. Post mortem education	Half day symposium held with WA Health Consumers' Council
7. Consultant supervision to be increased when patients return to theatre	Unchanged
8. Typed operation report	Unchanged
9. Futile surgery	Proportion of futile surgery reduced
10. Access to State medical record systems, such as the Theatre Management System	Achieved at one public hospital
11. Specialty proformas to be introduced	Partly achieved
12. Greater integration with Anaesthetic Mortality Audit	No progress to date. This will be a symposium topic at joint meeting in August 2005
13. Scottish Audit of Surgical Mortality (SASM)	Close contact maintained

Development goals

Seven of the 11 development goals were wholly within the control of WAASM (Table 2, 1,2,3,4,5,6,7). Six were fully achieved, and one partly achieved.

The remaining four recommendations required changes by other organizations or hospitals. Two have been largely achieved, the other two not so. One of these is the greater use of hospital databases and, in particular, access to the public hospital Theatre Management System (TMS).

Access to public hospital TMS data would represent an improvement in the manner in which WAASM both collects and analyses data. It is probably the single most important development that would improve the value of WAASM. By local arrangement WAASM does have partial access to TMS data at one public hospital and this merely serves to emphasise how valuable statewide access would be.

Table 2: Development goals - WAASM 2003 annual report

Development goal	Outcome
1. Change the classification of adverse events	Achieved
2. Improved allocation of deficiencies of care to their source	Achieved
3. Modify general proforma	Achieved
4. Design specialty proformas to simplify data collection	Partly achieved
5. Design second-line assessor form	Achieved
6. Use of statistical control charts for presentation	Achieved
7. Collect additional detail on co-morbidity	Achieved
8. Greater use of hospital-based data	Achieved in one hospital
9. Root Cause Analysis	Achieved
10. Extend the audit to other 'invasive' specialties	Not achieved
11. Extend WAASM nationally	Achieved in principal

Comment

Overall, WAASM has largely achieved the 'in house' recommendations and development goals. WAASM has been less successful in achieving the external targets. Organisational change is not generally quick or easy to achieve and is often

very time consuming. However, some of these external changes are neither complex nor expensive. They require commitment by the relevant organisations.

3. INTRODUCTION

The Western Australian Audit of Surgical Mortality (WAASM) is an external, independent peer review audit of the process of care associated with all surgically related deaths in Western Australia. WAASM methodology is based on the Scottish Audit of Surgical Mortality (SASM)³ and close links are maintained between the two projects. The main aim of WAASM is to improve the safety and quality of clinical care through feedback of information to surgeons.

Research studies have been conducted world wide to measure adverse events and preventable medical error.^{5,6,7,8} There is an ongoing debate with regard to the measurement of error in medicine, where the subjectivity of the reviewer and reporting thresholds influence results.⁹ Studies of the different methodologies across different systems have been shown to account for disparities in reported results.^{10,11} Retrospective collection of information could also underestimate the incidence of error. There is also reluctance to enter information into the medical record that would later be interpreted as negligence.¹² However, it is agreed that deficient care accounts for a high proportion of patient injury and sometimes death. Adverse events also significantly increase length of stay to nearly twice as long as average.^{5,7,13,14} Further studies have been done to ascertain the causes of adverse events to assist in developing strategies to minimise preventable patient injury.^{15,16}

The literature reflects the difficulty in accurately ascertaining how many hospital deaths are attributable to medical error and the proportion of cases associated with deficiencies of care. However, patient safety is a crucial issue and is being addressed as an area of priority by healthcare management.

It is difficult to measure or compare WAASM results against other reported national studies.^{5,6,7,8} One of the reasons for this is the definitions and aims of studies are different. The primary aim of WAASM is to improve the quality of clinical care. The collection and dissemination of information about deficiencies of care will hopefully prevent the recurrence of events and draw attention to system failures. Audit results presented here already reflect changes in practise and improvement in outcomes.

3.1 Aims

WAASM is an independent process of external peer review of all surgically related deaths. The principal aim of WAASM is to improve the quality of healthcare through feedback and education.

3.2 Methods

A detailed description of the background and methods pertaining to WAASM is provided in the previous annual report.⁴ WAASM is based on SASM and has been operating since June 2001. *Diagram 1* illustrates the audit process.

WAASM receives notification of surgically related deaths from hospitals. A proforma is sent to the associated surgeon for completion. On return, this proforma is anonymised and forwarded by WAASM to another surgeon for first-line review. He/she decides if there were deficiencies of care that warrant further review.

If no review is requested, the original surgeon is sent feedback to this effect and the case is closed.

If a case-note review is required, WAASM forwards the completed proforma and case-notes to another surgeon, in the same specialty, but in a geographically different hospital for second-line review.

This review is then sent to the original surgeon and any other relevant clinicians as indicated by the involved surgeon when completing the proforma.

3.3 Database

WAASM has developed a relational database using MS Access 2000. The database contains details of patients, hospitals, medical records departments, consultant surgeons, surgical proformas and codes. All components of the audit process are recorded, stored and managed through the database. WAASM uses adverse event codes developed by SASM to code suboptimal care (*see definition pg 22*).

3.4 Participation

Participation in WAASM is voluntary. Surgeons are sent a form for completion, indicating whether they will participate in the audit and whether they will undertake first and/or second line assessments.

3.5 Feedback

Detailed feedback to inform, educate and affect practise is the core purpose of WAASM. Analysis can be achieved at individual, hospital or grouped level. Feedback is provided in the following ways:

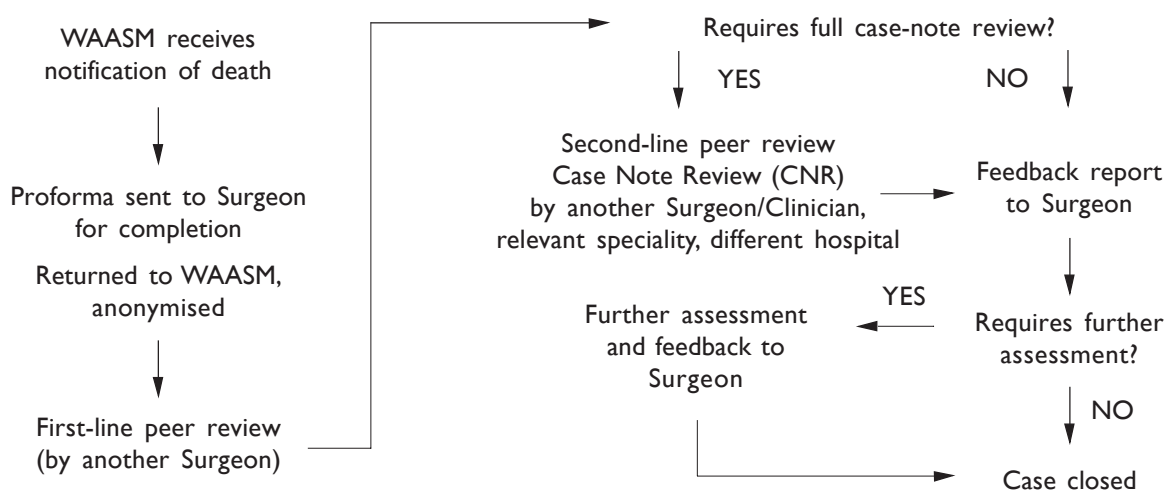
Feedback to individual surgeons

- The individual surgeon receives the peer review assessment provided by the first- or second-line assessor on deaths that occurred under his/her care.

Feedback to all surgeons

- A selection of de-identified summaries of the case note reviews prepared by the second-line assessors are collated and sent to all surgeons.

Diagram 1: The WAASM Methodology



- A bi-annual newsletter is circulated to all surgeons.
- All surgeons are sent a copy of the WAASM Annual Report.

Feedback to hospitals

- WAASM prepares individual hospital reports annually on data relating to the specific hospitals.

4. DATA ANALYSIS

KEY POINTS

Data in this report include 2002, 2003 and the first 6 months of 2004.

96% of surgeons in WA who have had one or more deaths, have submitted at least one proforma.

60% of all proformas were returned.

Over 70% of deaths occur in the three largest teaching hospitals.

Over 90% of patients were admitted with one or more significant co-morbidities.

Over 40% of patients were managed in either a HDU or ICU.

4.1 Annual Report 2004

Data from the pilot phase of 1 June 2001 to 31 October 2001, and up to 30 March 2003, were reported in the WAASM 2003 Annual Report.⁴ This was a comprehensive report describing in detail the background and audit process.

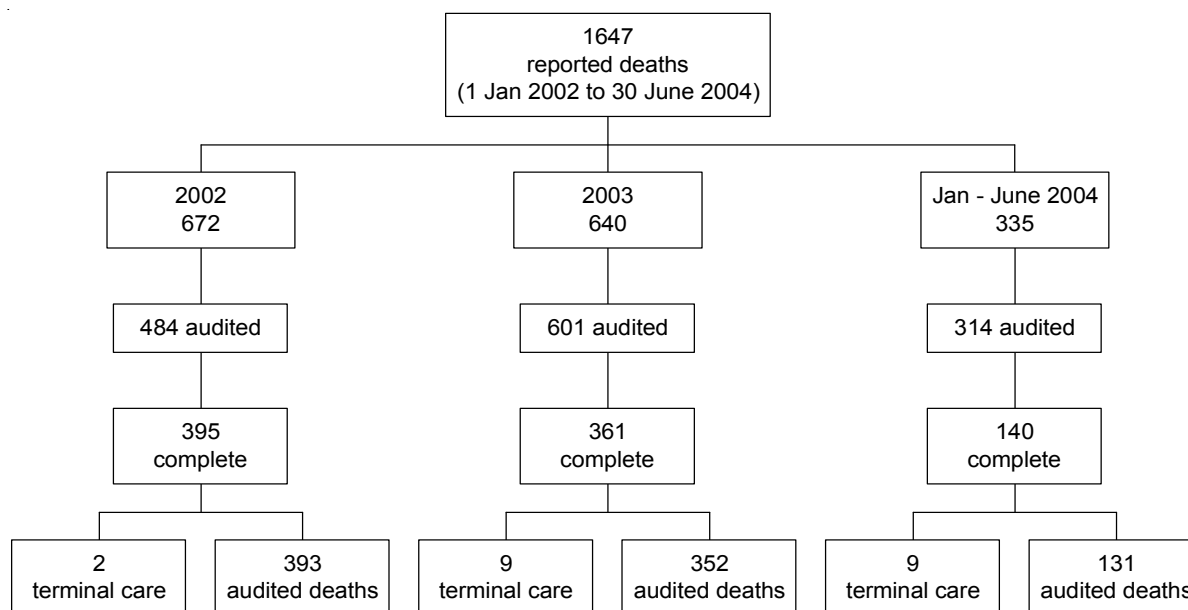
The WAASM Annual report 2004 contains analysis on deaths reported to WAASM between 1 January 2002 and 30 June 2004 (n=1647) (*Diagram 2*). There is some overlap of results previously reported. Future reports will be based on annual data. An interim report will be

compiled in mid 2005 to complete the data for 2004. Thereafter, reports will reflect annual figures and be published mid-year. There is a time lag associated with the completion of the audit process (*see Table 3*) and reports will reflect differing total yearly figures as back data are returned to WAASM. Proformas that are outstanding for more than two years are marked 'no response'. A proportion of cases noted as 'in progress' will become 'no response' cases with time.

Results from analyses have been presented on (*see Diagram 2*):

- 1647 - The total number of notified deaths.
- 876 - The total number of completed cases (audited deaths), excluding terminal care cases.
- Data have also been analysed in yearly or six monthly periods (1 January 2002 to 30 June 2004) to examine trends.

Diagram 2: Deaths audited by WAASM – 1 January 2002 to 30 June 2004



4.2 Participation by Consultants

- Participation in the audit process is voluntary.
- 96% of 202 surgeons in WA who had one or more deaths completed at least one proforma.
- Five (2%) of 202 consultants associated with 1647 deaths indicated they did not wish to participate in the audit.
- Many consultants do not return 100% of their proformas. The proportion of proformas completed and in progress by surgeon is shown in *Figure 1*.
- There is a time lag associated with the audit process where the median time to complete the process is approximately one month (*Table 3*). If a second-line assessment is required, the median time to completion is approximately two months.

Table 3: Median time for consultants to complete proformas and assessments (n=896)
(Jan 2002 to June 2004)

Completion of Task	Median time (days)	Interquartile range (days) [†]
Proformas	22	10 - 50
1 st line assessment	9	2 - 25
2 nd line assessment	32.5	20 - 64

[†]25th and 75th centiles

Figure 1: Number of deaths by consultant and number of proformas completed
 (for surgeons who had 5 or more deaths n=98, Jan 2002 to June 2004)

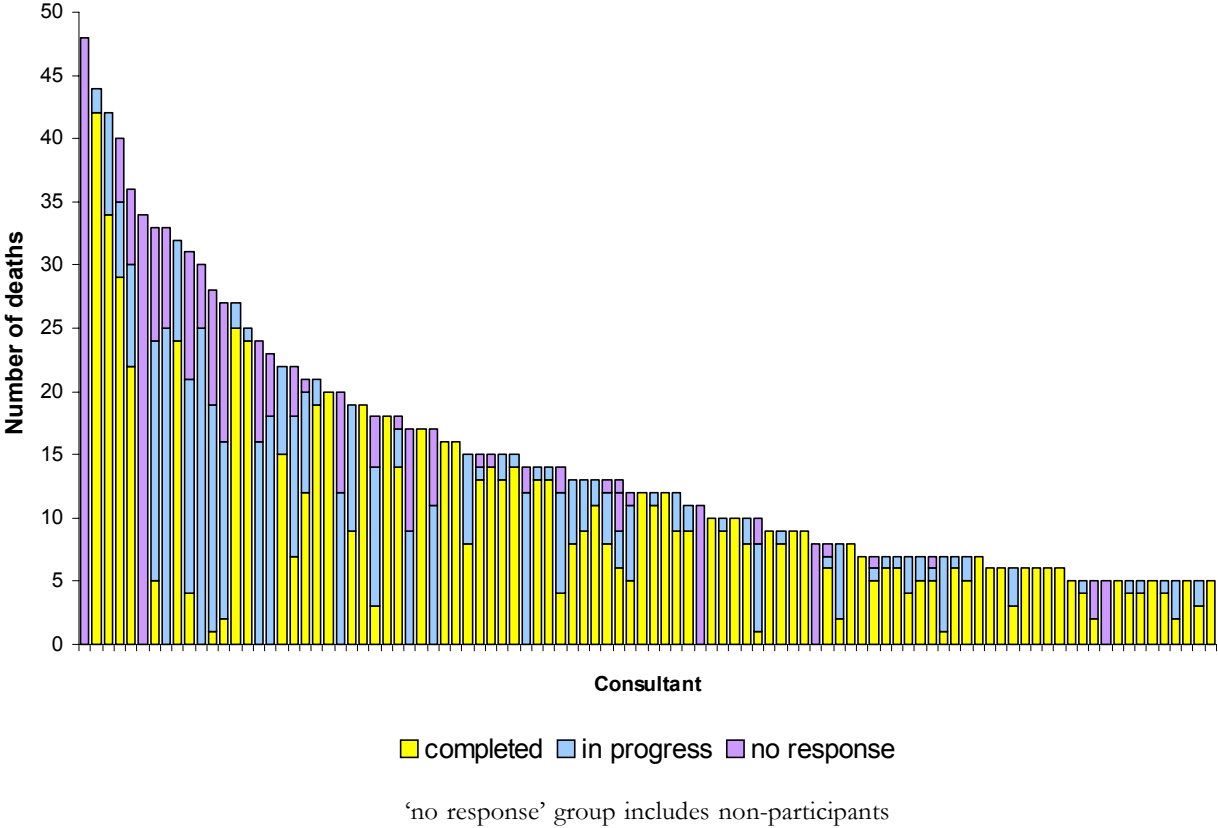


Table 4: Participation by surgeons (2002 and 2003)

	2002 (n=672)	2003 (n=640)
Proformas complete	60%	61%
Non-participants associated with reported deaths	7%	6%

Comments from surgeons questionnaire

“Well done! Keep the ‘voluntary participation’- it will engender a culture of more openness/education rather than ‘the big stick’...”.

“WAASM should have enough teeth to compel all surgeons to participate - for their own good and to prevent inappropriate use of surgical outcomes by others (eg. Govt or the media as happens in the US)”.

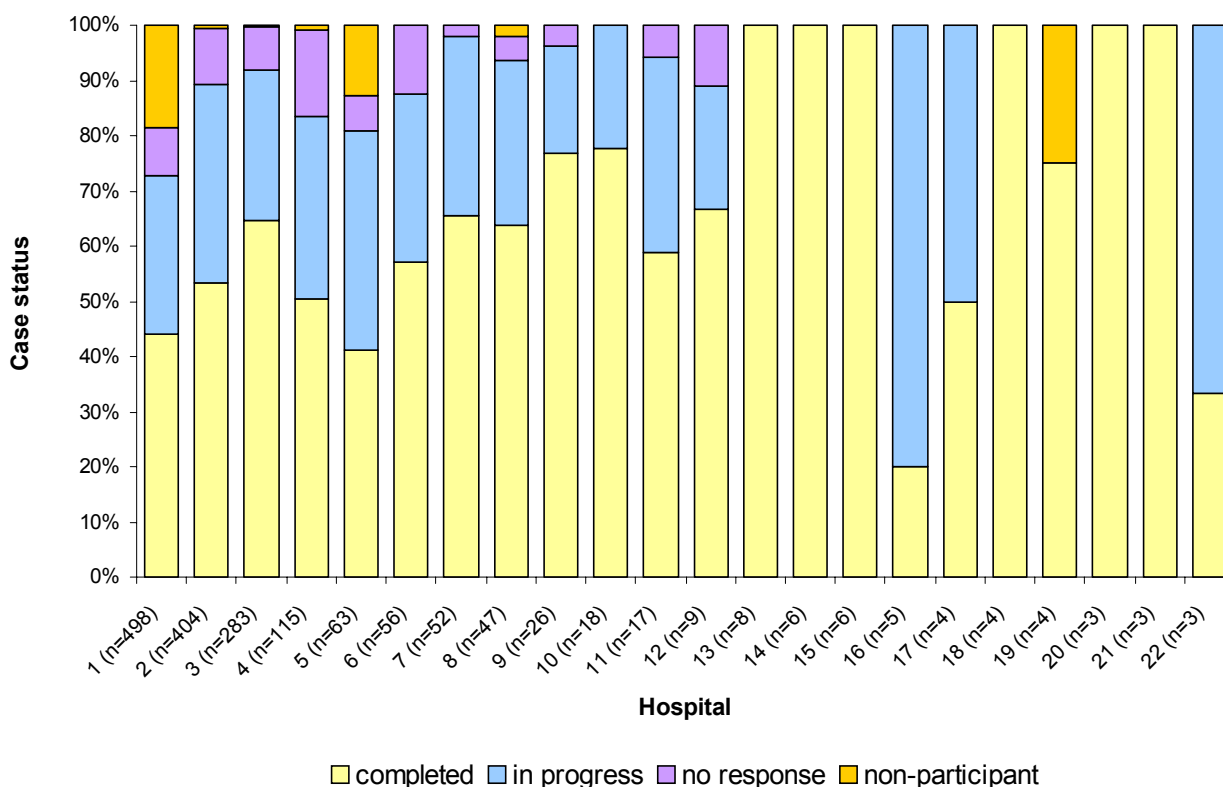
“My impression is that the surgeons with problems are choosing not to participate. It should be mandatory”.

4.3 Participation by Hospital

Hospitals throughout Western Australia range from small district to larger regional hospitals in rural areas and small public and private hospitals and day care centres through to large teaching hospitals in the metropolitan area. Of 64 hospitals listed in the WAASM database, 54 are participating in WAASM, one does not participate, three did not respond, and six do no operative procedures under general anaesthesia.

- Surgical deaths occurred in 32 of the 54 participating hospitals.
- Over 70% of reported deaths occurred in the three largest teaching hospitals.

Figure 2: Participation of surgeons in 22 hospitals where number of reported deaths ≥ 3 (Jan 2002 to June 2004)



Proformas that are outstanding for more than 2 years are marked as 'no response'.

Comments from surgeons questionnaire

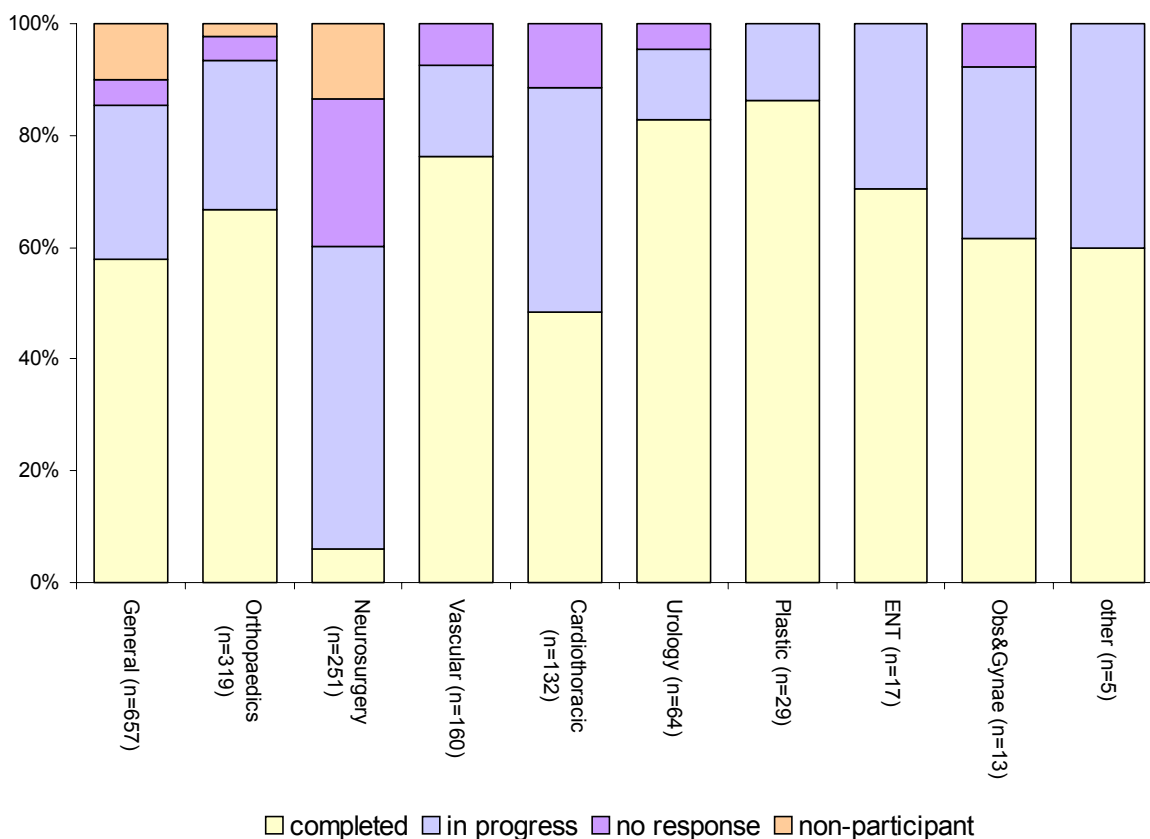
“Does not seem to have much value if it is voluntary”.

“If you mandate WAASM you will get defensive information for those unwilling to participate”.

“Needs some senior hospital administrative support to increase participation without necessarily making it mandatory”.

4.4 Participation in WAASM by Specialty

Figure 3: Participation in WAASM by specialty (n=1647 Jan 2002 to June 2004)



Specific proformas to meet requirements of individual specialties are being discussed and WAASM hopes to introduce these in 2005 to facilitate the audit process.

Comment

Participation in WAASM by surgeons has remained unchanged since the project commenced. Whilst the initial participation proportion was encouraging, its failure to rise is disappointing. Surgeons must recognise that effective participation in quality assurance activities is no longer optional, but a professional requirement. Many WA hospitals do not have

regular surgical mortality meetings and WAASM offers them an opportunity to address this. Survey results showed 58% of responding surgeons thought WAASM should remain voluntary whilst 63% of hospital executive and clinical governance co-ordinators were in favour of WAASM being mandatory (*see Page 57,58*).

4.5 Demographics of Reported Deaths

Age and Sex

Table 5: Demographics of reported deaths by specialty (2002 and 2003)

	2002			2003		
	n	median age*	% male	n	median age*	% male
General	252	77 [68-84]	52	272	79 [69-85]	59
Orthopaedics	140	84 [79-90]	44	117	87 [82-91]	36
Neurosurgery	105	66 [49-76]	58	91	57 [42-71]	58
Vascular	74	79 [75-86]	57	66	79 [74-86]	71
Cardiothoracic	53	73 [67-78]	55	42	74 [66-81]	67
Urology	23	78 [68-83]	74	28	81 [72-87]	82
Plastic	12	59 [42-65]	42	11	41 [30-81]	55
ENT	4	64 [60-66]	100	8	81 [75-92]	75
Obs & Gynaecology	5	67 [46-74]	0	4	83 [64-87]	0
Ophthalmology	1	97	100	1	66	100
Oral maxillo-facial	2	62 [53-71]	0			
Paediatrics	1	0	0			
Total	672	79 [71-85]	60	640	80 [73-87]	56

*[interquartile range]

- There was no significant difference between the *mean age* of audited cases in 2002 (76 yrs) and 2003 (77 yrs) ($p=0.346$ independent samples t-test).

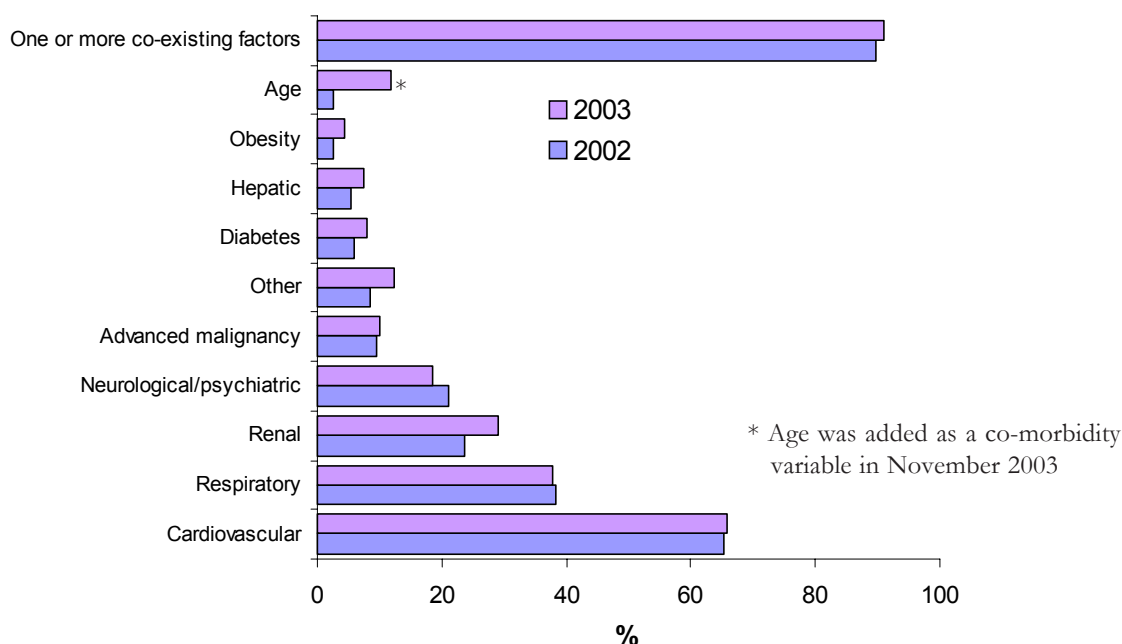
Table 6: Malignancy present in audited cases (2002 and 2003)

	n	Malignancy present	Malignancy contributed to death
2002	393	102 (26%)	58 (15%)
2003	352	98 (28%)	59 (17%)

Co-morbidity and malignancy

- 678/745 (91%) of audited cases had one or more significant co-morbidity.
- The distribution of reported co-morbidity was generally the same for 2002 and 2003 (*Figure 4*).
- Age, obesity and diabetes were added in November 2003 as recorded variables. Where these factors were previously included in the 'other' category of the co-morbidity section of the proforma, they now have been recoded as separate variables in the current data.

Figure 4: Co-morbidity in audited cases (2002 and 2003)



4.6 Use of ICU and HDU

Table 7: Use of ICU and HDU
(assessors' comments 2002 and 2003)

	2002 (n=393)	2003 (n=352)
ICU used	129 (33%)	122 (35%)
HDU used	37 (9%)	29 (8%)
ICU should have been used	7 (2%)	1 (0.3%)
HDU should have been used	64 (16%)	32 (9%)

Comment

The first annual report noted that a number of patients would have benefited from intermediate care. WAASM is aware that some hospitals have opened an HDU or Nurse Observation Specialist Unit. In the absence of a formal HDU, others admit some patients requiring HDU support into ICU. The requirement for HDU facilities is likely to increase.

- The reduction in junior doctors' hours will make continuity of care for critically ill patients important.
- Whether an HDU 'should have been used' can be a subjective assessment. WAASM only records a DoC if there was compelling evidence that an HDU would have been of value. WAASM data therefore, are likely to underestimate the true demand.
- Fluid balance is a major problem (*Section 9.2*). Closer monitoring of fluid balance is possible in the HDU.
- With an increasing elderly population the demand for HDU will increase.

Surgeons need to ensure that appropriate HDU provision is included in the planning stage of the proposed new hospitals.

5. COMPLETED CASES | JAN 2002 TO 30 JUNE 2004

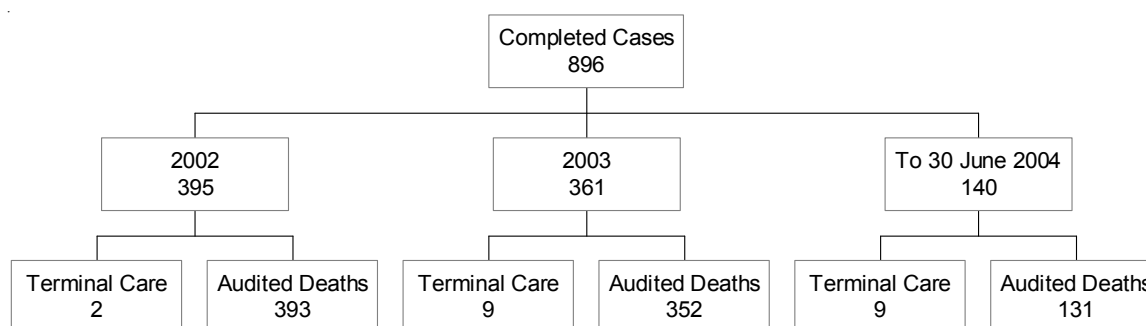
KEY POINTS

The definition of Adverse Events used in the previous report has been extended. In addition, WAASM also collects data on preventability and the source of suboptimal care (SoC).

The proportion of audited cases undergoing case-note review decreased from 25% in 2002 to 20% in 2003.

In 45/876 (5%) cases the assessors thought that an adverse event had caused the death of a patient. In 15/876 (2%) cases assessors thought the adverse event that caused death was preventable.

Diagram 3: Audited cases and terminal care cases



5.1 Terminal Care Cases (n=20)

Terminal care cases are recorded by WAASM, but do not undergo the complete audit process.

- Terminal care cases accounted for 2% (n=896) of completed cases.
- The small proportion of patients admitted to surgical wards for terminal care in Western Australia suggests that palliative care is being appropriately involved at an early stage.

5.2 Suboptimal Care (SoC)

‘The dilemma I face as a surgeon is that the result is mine, although the poor performance may not always be.’¹⁷

When WAASM started in June 2001, SASM generously provided the project with the SASM database. At that time SASM recorded suboptimal care only as adverse events (AE) and did not record contribution to death, preventability or the source of the event.

WAASM has since developed its own database and in November 2003 expanded the definition and classification of adverse events to reflect more fairly and accurately any suboptimal care (SoC) that might occur.

5.3 Definitions and Reporting

An area for CONSIDERATION is where the clinician believes areas of care *could* have been improved or different, but recognises that this may be an area of debate.

An area of CONCERN is where the clinician believes that areas of care *should* have been better.

An ADVERSE EVENT is 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.⁸

When completing the proforma, and first and second-line assessments, surgeons:

- *Assess the impact of the incident on outcome and whether it:*
 - Made no difference to outcome
 - May have contributed to death
 - Caused death of patient who would otherwise be expected to survive
- *Give their opinion as to whether the incident was preventable:*
 - Definitely
 - Probably
 - Probably not
 - Definitely not
- *Indicate who the incident was associated with:*
 - Audited surgical team
 - Another clinical team
 - Hospital
 - Other

We have grouped these events for reporting:

- We refer to all events (consideration, concern, adverse events) by the term **Suboptimal Care (SoC)**.
- We have excluded areas for consideration from most of the analysis. These events usually made no difference to outcome and are an indication that there were different options. **Deficiencies of Care (DoC)**, therefore, refer to areas of concern and adverse events.
- Some cases are associated with more than one incident of deficient care. Where analysis of events is reported by case or by event, 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 (hereafter referred to as ‘assessors’) and are their opinion as to the effect of the incident on the patient’s outcome.
- All reported areas for consideration, areas of concern and adverse events are listed in detail in Appendices I, II and III.

5.4 Case note reviews

Proformas are completed by the surgeon involved. These are anonymously reviewed by a first-line assessor. He/she decides whether the case should go for second-line assessment, case-note review (CNR).

Table 8: Proportion of CNRs by year

	2002	2003
n cases	393 (+9)*	352 (+26)*
CNRs*	25%	20%
* includes CNRs in progress		

Table 9: Number of deaths associated with areas for consideration, of concern and 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	-	15	-	-	15 (4%)
	Concern	-	12 (3%)	29 (7%)	-	41 (10%)
	Adverse event	-	-	38 (10%)	25 (6%)	63 (16%)
	None	274	-	-	-	274 (70%)
	Total	274	27	67	25	393
2003	Consideration	-	26	1	-	27 (8%)
	Concern	-	9 (3%)	19 (5%)	1	29 (8%)
	Adverse event	-	-	15 (4%)	14 (4%)	29 (8%)
	None	267	-	-	-	267 (76%)
	Total	267	35	35	15	352
2004	Consideration	-	11	5	-	16 (12%)
	Concern	-	4 (3%)	3 (2%)	1	8 (6%)
	Adverse event	-	1	2 (2%)	6 (5%)	9 (7%)
	None	98	-	-	-	98 (75%)
	Total	98	16	10	7	131

Hypothetical examples of classification of deficiencies of care

An 80 year old patient with several pre-existing medical co-morbidities dies from sepsis secondary to an anastomotic leak. The leak was an *adverse event*, *contributed* to the death in an unfit patient who might not have survived even without a leak, was *probably* preventable (there was no operative record of a leak test being undertaken, or of the tissue doughnuts being examined), and was attributed to the *surgical team*.

An otherwise fit 50 year old patient dies from sepsis secondary to an anastomotic leak. The leak was an *adverse event*, *caused* the death in an otherwise fit patient who would be expected to survive, was *probably* preventable (there was no operative record of a leak test being undertaken, or of the tissue doughnuts being examined), and was attributed to the *surgical team*.

A 65 year old patient underwent an elective operation. The patient had a myocardial infarct four years earlier, but had not been reviewed recently. The patient was not seen by the anaesthetist until the morning of surgery. The operation was uneventful, but the patient had an MI on the second post-operative day. The patient went to the coronary care unit where an angiogram showed a significant stenosis. This was dilated and without discussion with the surgeon, aspirin and clopidogrel prescribed. The patient bled 12 hours later and had to be returned to theatre. The patient subsequently died. The failure to have the patient adequately reviewed prior to surgery was a *cause for concern*, it *contributed* to the death, was *definitely preventable* and was attributed to the *surgical team*. The failure of the medical team to discuss the use of aspirin and clopidogrel was a communication failure that was a *cause for concern*, it *contributed* to the death, was *definitely preventable* and was attributed to *another clinical team*. The resulting haemorrhage requiring further surgery was an *adverse event*, it *contributed* to the death, was *definitely preventable* and was attributed to *another clinical team*.

5.5 Deficiencies of Care (*adverse events & areas of concern*) Table 9

- 179 of 876 (20%) deaths were associated with deficiencies of care.
- Previously reported adverse events were recoded in November 2003 according to the new classification. The change of reporting will partly account for the significant decrease in the proportion of reported DoC between 2002 (26%) and 2003 (16%) ($p=0.001$)*.
- In 106 (12%) cases assessors noted a DoC that may have contributed to death. In 45 (5%) cases the assessors felt that there was an adverse event that caused death in a patient who would otherwise have been expected to survive.
- In these 45 cases, 15 (2% of 876) adverse events were considered preventable.
- There was no difference in the proportion of cases where assessors felt that an adverse

event had caused death between 2002 (6%) and 2003 (4%), ($p=0.145$)*.

- Overall, the total proportion of areas of consideration, concern or adverse events for 2002 (30%) and 2003 (24%) was not significantly different ($p=0.061$)*.

*Pearson chi squared test

Table 11: Numbers of patients in which deficiencies of care may have contributed to or caused death (most significant event only)

Year (n)	DoC	n	%
2002 (393)	Technical errors - surgical	38	10%
	Delays	15	4%
	General complications	14	4%
	Incorrect/inappropriate therapy	5	1%
	Drug-related problems	4	1%
	Staff problems	3	<1%
	Patient factors	3	<1%
	Diagnosis-related problems	2	<1%
	Resuscitation problems	2	<1%
	Anaesthesia-related problems	1	<1%
	Communication failures	1	<1%
	Failure to use facilities	1	<1%
	Transfer problems	1	<1%
2003 (352)	Technical errors - surgical	17	5%
	General complications	11	3%
	Incorrect/inappropriate therapy	6	2%
	Delays	5	1%
	Diagnosis-related problems	3	<1%
	Patient factors	3	<1%
	Assessment problems	2	<1%
	Drug-related problems	1	<1%
	Problems with blood products	1	<1%
	2004 (131)	Technical errors - surgical	5
Delays		4	3%
Diagnosis-related problems		1	<1%
Incorrect/inappropriate therapy		1	<1%
Patient factors		1	<1%

Table 10: Deficiencies of care that may have contributed to or caused death, were associated with: (most significant event only)

Year		Frequency	%
2002	Audited surgical team	55	60%
	Another clinical team	25	27%
	Hospital	4	4%
	Other	8	9%
	Total	92	100%
2003	Audited surgical team	33	67%
	Another clinical team	8	16%
	Hospital	4	8%
	Other	4	8%
	Total	49	100%
2004	Audited surgical team	8	67%
	Another clinical team	2	17%
	Hospital	2	17%
	Total	12	100%

6. ADMISSIONS

KEY POINTS

Elective admissions were associated with a significantly higher proportion of deficiencies of care than emergency admissions. WAASM will undertake further analysis to explore the nature of these DoC.

Elective admissions were associated with a high proportion of technical errors (36%) and emergency admissions were associated with a high proportion of delays (23%).

There was a decrease in deficiencies of care associated with emergency admissions from 2002 to 2003. These were predominantly associated with a decrease in delays.

There was a significantly higher proportion of deficiencies of care associated with audited cases that were admitted to public hospitals (22%) compared with those admitted to private hospitals (15%). However, when areas for consideration were included, there was no difference.

6.1 Elective and Emergency Admissions

Table 12: Elective and emergency admissions and associated deficiencies of care

	2002		2003		Jan to June 2004		Total	
Audited cases	393		352		131		876	
Admission	Elective	Emergency	Elective	Emergency	Elective	Emergency	Elective	Emergency
n(%) admissions	107(27%)	286(73%)	73(21%)	279(79%)	27(21%)	104(79%)	207(24%)	669(76%)
Proportion DoC [#]	38(36%)	66(23%)	20(27%)	38(14%)	9(33%)	8(8%)	67(32%)	112(17%)
Pearson chi squared test*	p=0.013*		p=0.005*		p<0.0001*		p<0.0001*	

[#] areas of concern or adverse events as noted by assessors

* tests difference between proportion of events associated with emergency and elective procedures in each group

- 67/207 (32%) elective admissions had at least one DoC compared to 112/669 (17%) emergency admissions. This difference was significant (p<0.0001)* and the proportions were significantly different for comparisons in each year (Table 12).
- The risk of having a DoC is 1.9 times higher in elective admissions than emergency admissions (95% CI 1.5 to 2.5).
- There was no significant difference in the proportion of reported DoC for elective admissions between 2002 (36%) and 2003 (27%) (p=0.253)*.
- There was a significant decrease in the proportion of DoC associated with emergency admissions between 2002 (23%) and 2003 (14%) (p=0.004)*.

* Pearson chi squared test

Table 13: Deficiencies of care associated with emergency and elective admissions

(Jan 2002 to June 2004)	Emergency (n=190)	Elective (n=123)
Delays	43 23%	18 15%
Technical errors - open surgery	37 20%	43 35%
General complications	18 10%	13 11%
Incorrect/inappropriate therapy	16 8%	17 14%
Communication failures	15 8%	5 4%
Failure to use facilities	14 7%	7 6%
Staff problems	13 7%	7 6%
Diagnosis-related problems	11 6%	
Patient factors	6 3%	2 2%
Drug-related problems	5 3%	3 2%
Transfer problems	3 2%	1 1%
Resuscitation problems	3 2%	
Assessment problems	3 2%	7 6%
Anaesthesia-related problems	1 <1%	
Problems with blood/blood products	1 <1%	
Monitoring problems	1 <1%	

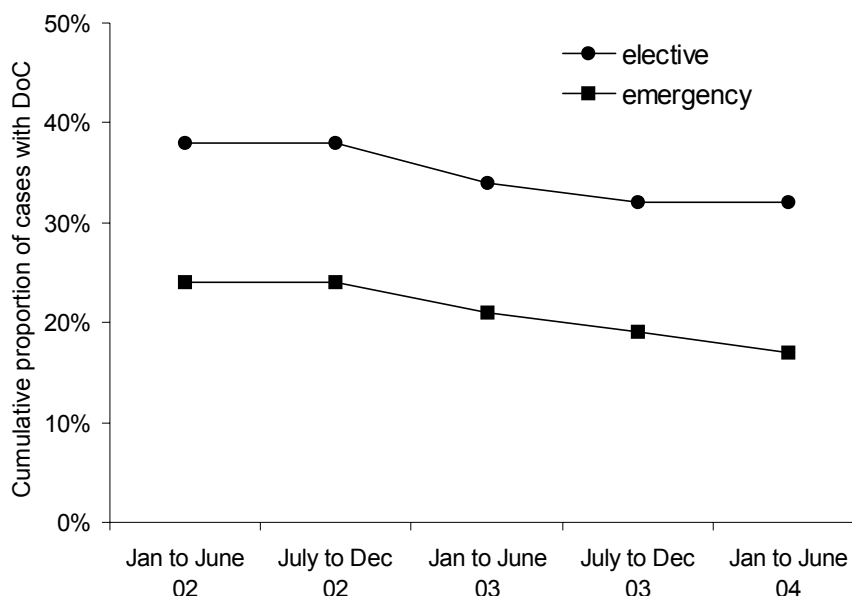
Deficiencies of care were recorded in 112 audited emergency cases. 51 cases had more than one associated event. A total of 190 events were recorded in emergency cases.

Deficiencies of care were recorded in 67 elective cases with 36 cases having more than one associated event. A total of 123 events were recorded in elective cases.

Table 14: Number of cases with the most common deficiencies of care associated with emergency and elective admissions (2002 and 2003)
(some cases had more than one associated deficiency of care) (complete table see Appendix IV)

Elective admissions	2002 (n=107)	2003 (n=73)
Technical errors - surgery	26 24%	14 19%
Incorrect/inappropriate therapy	9 8%	4 5%
Delays	8 7%	2 3%
General complications	5 5%	7 10%
Emergency admissions	2002 (n=286)	2003 (n=279)
Delays	30 10%	8 3%
Technical errors - surgery	22 8%	14 5%
General complications	11 4%	7 3%
Incorrect/inappropriate therapy	9 3%	7 3%

Figure 5: Proportions of emergency and elective admissions associated with deficiencies of care – six monthly cumulative proportions (Jan 2002 to June 2004)



- There appears to be a decreasing trend in the reporting of DoC associated with both emergency and elective admissions.

Table 15: Most common diagnoses on admission (Jan 2002 to June 2004) (complete table Appendix V)

Specialty	n	%	Most common diagnoses*	n	%
General	369	(42%)	Gastrointestinal obstruction	56	(6%)
			Colorectal cancer	48	(5%)
			Cancer other	40	(5%)
			Vascular insufficiency of the intestine	39	(4%)
Orthopaedics	213	(24%)	Fractured neck of femur	145	(17%)
			Other fractures and dislocations	22	(3%)
Vascular	119	(14%)	Aortic aneurysm	42	(5%)
			Peripheral vascular disease	37	(4%)
Cardiothoracic	63	(7%)	Valvular heart disease	17	(2%)
			Cardiopulmonary disease	12	(1%)
			Aortic aneurysm	10	(1%)
Urology	49	(6%)	Cancer - prostate/bladder/other	29	(3%)
Plastic	25	(3%)	Severe burns	14	(2%)
			Cancer	3	(<1%)
Neurosurgery	16	(2%)	Brain haemorrhage	8	(1%)
			Head injury	3	(<1%)
ENT	12	(1%)	Cancer	6	(1%)
Gynaecology	7	(1%)	Cancer	5	(1%)
Ophthalmology	1	(<1%)	Corneal ulcer	1	(<1%)
Paediatrics	1	(<1%)	Congenital problems	1	(<1%)
Oral/Maxillofacial	1	(<1%)	Cancer	1	(<1%)

* not necessarily cause of death

6.2 Private and Public Hospitals

Table 16: Admissions and proportion of deficiencies of care associated with private and public hospitals - by year

Hospital	2002 (n=393)		2003 (n=352)		to 30 June 2004 (n=131)	
	Private	Public	Private	Public	Private	Public
Admissions	82	311	84	268	31	100
Proportion DoC	20%	28%	14%	17%	3%	16%

Table 17: Admissions and proportion of DoCs and all suboptimal care associated with private and public hospitals (Jan 2002 to June 2004)

	Audited cases	Cases with DoC	Cases with suboptimal care
Private	197	29 (15%)	49 (25%)
Public	679	150 (22%) (p=0.024)*	188 (28%) (p=0.434)*

* Pearson chi squared test

- There was a significant difference in the proportion of cases with a DoC between public and private hospitals (p=0.024 Pearson chi squared test).
- When all suboptimal care was considered, there was no significant difference between the private and public hospitals (p=0.434).

Table 18: Deficiencies of care associated with public and private hospitals (Jan 2002 to June 2004)

Area of concern or adverse event	Public (n=679)		Private (n=197)	
Technical errors - open surgery	51	8%	10	5%
Delays	27	4%	3	2%
General complications	19	3%	6	3%
Incorrect/inappropriate therapy	14	2%	1	<1%
Failure to use facilities	8	1%	2	1%
Patient factors	7	1%	1	<1%
Diagnosis-related problems	6	1%		
Staff problems	4	<1%		
Communication failures	3	<1%	1	<1%
Assessment problems	3	<1%		
Drug-related problems	2	<1%	3	2%
Transfer problems	2	<1%	1	<1%
Resuscitation problems	2	<1%		
Anaesthesia-related problems	1	<1%		
Problems with blood/blood products	1	<1%		
Monitoring problems			1	<1%

7. TRANSFERS

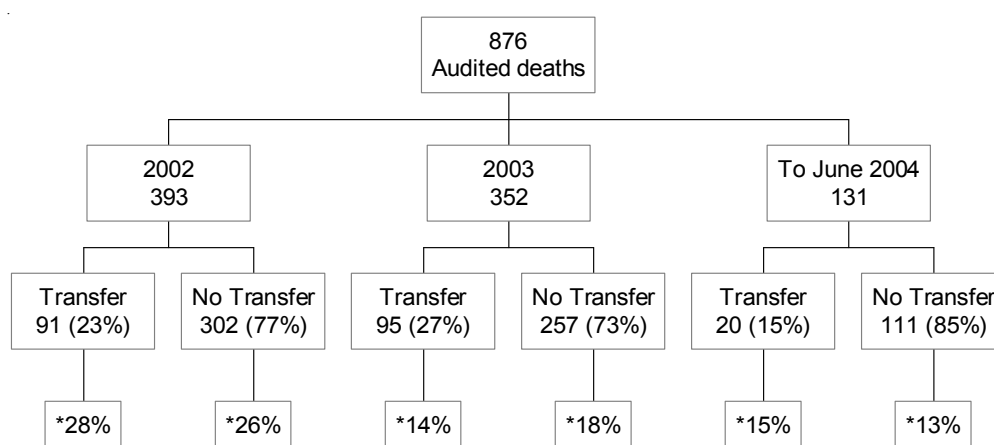
KEY POINTS

Approximately one quarter of patients were transferred from one centre to another. This proportion did not change between 2002 and 2003.

20% of cases that were transferred were associated with a DoC. This proportion decreased significantly from 2002 to 2003 (from 28% to 14%, $p=0.02$).

Four cases had a DoC associated with the transfer process.

Diagram 4: Patients who were transferred (by year and proportion of associated DoCs)



* proportion of deaths associated with DoCs in patients who were transferred or not transferred

- 206 (24%) audited cases were transferred from one centre to another.
- There was no difference in the proportion of cases transferred between 2002 (23%) and 2003 (27%) ($p=0.227^*$).
- 41/206 (20%) cases transferred were associated with deficiencies of care.
- The deficient care was directly associated with the transfer process in four of 206 (2%) cases transferred.
- The proportion of DoC associated with transferred cases (41/206, 20%) was the same as the proportion of DoC associated with cases that were not transferred (138/670, 21%, $p=0.829^*$).
- There was a significant reduction in the proportion of DoC associated with audited cases that were transferred from 28% in 2002 to 14% in 2003 ($p=0.02^*$).

*Pearson chi squared test

7.1 Allocation of Episodes of Suboptimal Care

When patients are transferred from one hospital to another it is possible that an episode of deficient care occurred in the original hospital, but the death occurs in the second hospital under a different consultant surgeon. WAASM records where the deficient care occurs.

- 41 cases that were transferred were associated with DoC. A total of 78 DoC were reported in these deaths.

In 30 (39%) of these DoC, the adverse event or area of concern was associated with a different clinical team (ie not the main surgeon associated with the patient), compared to 13% of events where no transfer occurred. This difference is significant ($p < 0.0001$, Pearson chi squared test, *Table 19*).

Table 19: Number of deficiencies of care and associated area by transfer status (some cases associated with more than one event, Jan 2002 to June 2004)

	Transfers		Not Transferred	
Audited surgical team	37	47%	180	76%
Another clinical team	30	*39%	30	*13%
Hospital	3	4%	18	8%
Other	8	10%	8	3%
Total	78	100%	236	100%

* $p < 0.0001$, Pearson chi squared test

The predominant reasons for transfer of the patient were:

- Development of complications.
- Unable to be treated at the transferring hospital.
- Transferred to a different hospital for admission to ICU.

Hypothetical examples of classification of deficiencies of care

An otherwise fit 50 year old patient dies from a pulmonary embolus. DVT prophylaxis was written up, but the first dose not given until the morning after surgery. The DVT/PE is an *adverse event*, *caused* the death in an otherwise fit patient who would be expected to survive, was *definitely* preventable, and was attributed to the *hospital*.

A 70 year old patient was admitted to the medical ward of a country hospital with angina. She fell in the ward and fractured her hip. She had a dynamic hip screw. Following surgery she had low urinary output, was given successive fluid challenges and subsequently developed pulmonary oedema. She was transferred to a tertiary hospital for ICU care where she died three days later. The fall was an *adverse event*, *contributed* to the death, was *probably* preventable, and was attributed to the *original hospital*. The fluid management was a *cause for concern*, *contributed* to the death, was *probably* preventable and was attributed to the *surgical team* at the original hospital. The second line assessor felt that the risk of post-operative problems in this patient was so great that transfer prior to surgery might have been of benefit. The late transfer was a *cause for consideration*, probably made *no difference* to the outcome, was *possibly* preventable, and was attributed to the *surgical team* at the original hospital.

8. OPERATIVE AND NON-OPERATIVE DEATHS

KEY POINTS

The proportion of deaths where no operation was performed increased significantly from 17% in 2002 to 23% in 2003.

Audited cases undergoing more than one operation were more likely to be associated with deficiencies of care.

Diagram 5: Proportion of audited deaths where the patient did not have an operation

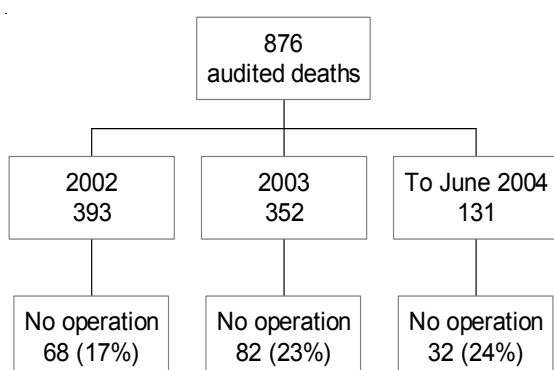


Table 21: Number of patients who had no operations, 1, 2, 3, 4, 5 or 6 operations, by year

n operations	2002	2003	2004	Total
0	68(17%)	82(23%)	32(24%)	182(21%)
1	227(58%)	200(57%)	81(62%)	508(58%)
2	64(16%)	45(13%)	14(11%)	123(14%)
3	33 (8%)	21 (6%)	4 (3%)	58 (7%)
4	1(<1%)	3 (1%)		4(<1%)
6		1(<1%)		1(<1%)
Total	393	352	131	876

Table 20: Audited cases admitted to public & private hospitals where no op was performed (Jan 2002 to June 2004)

	Public (n=679)	Private (n=197)
Elective	124	83
No op	6 (5%)	3 (4%)
Emergency	555	114
no op	158 (28%)	15 (13%)

- 182 (21%) audited cases (n=876) did not have an operation.
- The proportion of non-operative deaths increased significantly from 17% in 2002 to 23% in 2003 (p=0.042 Pearson chi squared test, *Diagram 5*).

- Only a small proportion of elective cases did not have an operation, in both public and private hospitals (*Table 20*).
- Public hospitals received a far greater proportion of emergency admissions than private hospitals (82%, n=555 v 58%, n=114, *Table 20*).
- 28% of audited emergency admissions to public hospitals did not have an operation.
- Cases that underwent one or more operation (n=694) were associated with a significantly higher proportion of deficiencies of care (167; 24%) than the 182 cases where no operation was performed (12; 7%, p<0.0001 Pearson chi squared test) (*Table 22*).

Table 22: Number of operations and DoC* (Jan 2002 to June 2004)

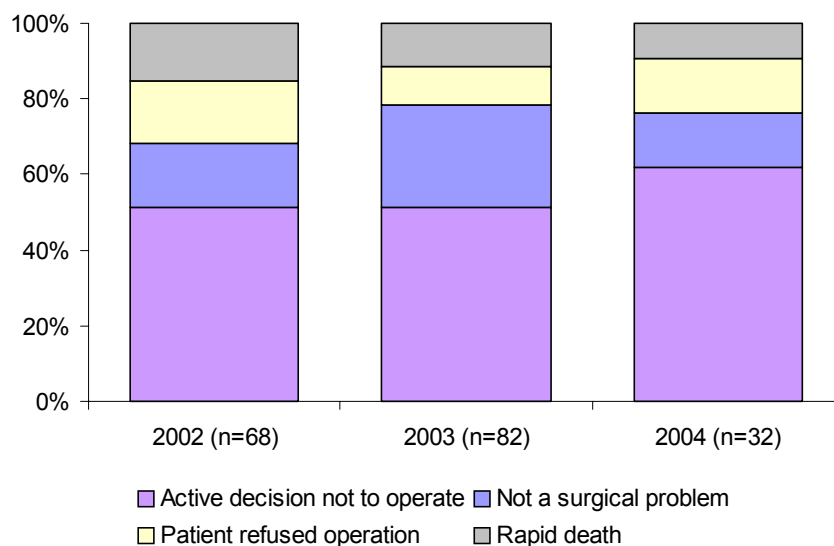
Number of operations	0	1	2	3	4	6	Total
Adverse events	6	32	36	25	1	1	101
Areas of concern	6	55	9	8	0	0	78
Areas for consideration	4	45	6	3	0	0	58
None	166	376	72	22	3	0	639
Total	182	508	123	58	4	1	876

	No ops (n=182)	1 op (n=508)	2 ops (n=123)	3 or more (n=63)	Total (n=876)
No. of cases with DoC	12	87	45	35	179
Proportion of cases	7%	17%	37%	56%	20%

* most severe DoC allocated to the case

- There is a significant increase in the proportion of cases with deficiencies of care as the number of operations increases ($p < 0.0001$ Cochran-Armitage 2-sided trend test).

Figure 6: Reasons for no operation (n=182) (Jan 2002 to June 2004)



Comment

In the previous annual report WAASM noted the number of patients having a futile operation.⁴ This is also of concern to the WA Health Consumers' Council. Current data suggest that the proportion of futile operations is decreasing.

It is not surprising that the proportion of patients with a DoC rises as the number of operations increases. This should be taken into account in relation to the section on grade of surgeon (see Page 35).

8.1 Operation Abandoned

In 52 (7%) of the 694 audited cases that underwent operation, the surgeon reported that the operation was abandoned on finding a terminal situation.

8.2 Pre-Operative View of Risk of Death

Table 23: View of pre-operative risk of death recorded by surgeons and assessors (n=663)
(Jan 2002 to June 2004)

Surgeon	Assessor					Total
	minimal	small	moderate	considerable	expected	
RISK						
minimal	8	5	5	4	3	25 (4%)
small	5	23	22	20	3	73 (11%)
moderate	2	26	72	82	8	190 (29%)
considerable	1	11	77	176	26	291 (44%)
expected	0	3	12	42	27	84 (13%)
Total	16 (2%)	68 (10%)	188 (28%)	324 (49%)	67 (10%)	663

- Over 50% of cases were judged by both assessors and surgeons to have a considerable or expected risk of death.
- Surgeons and assessors were in 'fair agreement' on their view of pre-operative risk of death (Kappa test $k=0.21$, 95% CI 0.16 to 0.27).
- In 25 (4%) operative cases (n=694) assessors recorded the 'decision to operate' as an area for consideration.
- In 2 cases, assessors recorded 'operation should not have been done or was unnecessary' as an area for consideration and in one case as an adverse event.

Comments from surgeons questionnaire

"I see an increasing number of poor risk patients with multiple pathology and little hope in recovery and yet the expectations of family and even fellow doctors and nurses are that I will solve the problem by a brilliant feat of surgery. Perhaps a conference would be helpful sometime on 'drawing the line' or 'when to operate'."

8.3 Grade of Surgeon - Teaching Hospitals

KEY POINTS

The consultant was the primary surgeon in less than 50% of audited deaths where emergency surgical procedures were undertaken in teaching hospitals. WAASM does not have complete information on the grade of surgeon assisting in these operations.

The proportion of operations in which the consultant was the primary surgeon in audited cases in teaching hospitals, did not increase if the patient underwent a second or third operation. This did not change from 2002 to 2003.

Figure 7: Emergency and elective admissions to teaching hospitals and the proportion of consultant surgeons performing the first operative procedure (Jan 2002 to June 2004)

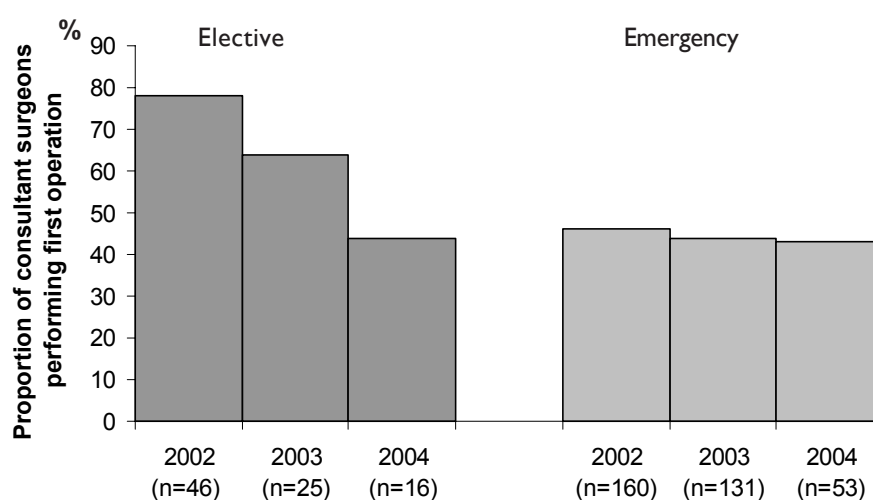
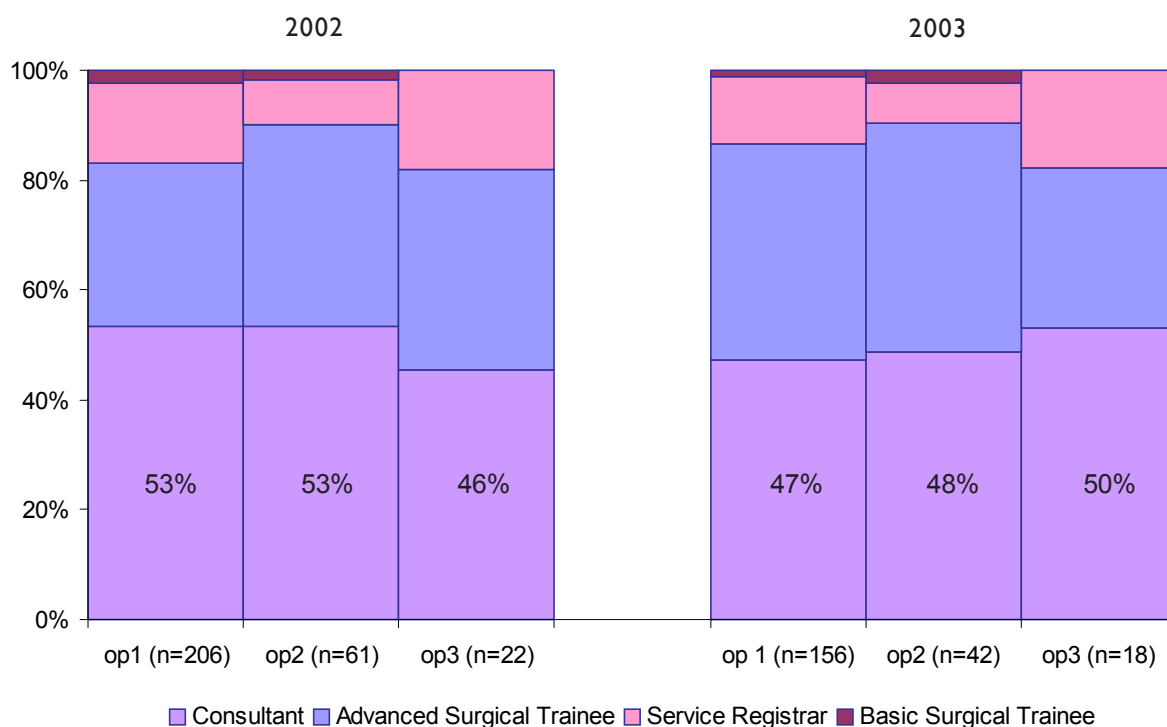


Table 24: Grade of surgeon operating and assisting (elective and emergency operations, teaching hospitals Jan 2002 to June 2004 - first operation)

Operating		Assisting the primary surgeon							None	Missing
		Consultant	AST	SR	BST	GP Surgeon	Other*			
Elective										
Consultant	59	3	30	5	1	2	-	-	18	
Advanced Surgical Trainee	21	6	1	3	0	0	-	-	11	
Service Registrar	7	2	1	-	1	0	-	-	3	
Missing data	3	-	-	-	-	-	-	-	3	
Total	90	11	32	8	2	2	-	-	35	
Emergency										
Consultant	154	8	55	23	5	0	0	1	62	
Advanced Surgical Trainee	130	14	4	9	5	1	10	2	85	
Service Registrar	51	3	7	3	3	0	2	0	33	
Basic Surgical Trainee	8	-	-	1	0	0	0	0	7	
Other*	1	-	-	0	0	0	0	0	1	
Missing data	27	-	-	-	-	-	-	-	27	
Total	371	25	66	36	13	1	12	3	215	

*Includes senior registrar, intern and resident medical officer

Figure 8: Proportion of Grade of Surgeon performing 1st, 2nd and 3rd operation
(teaching hospitals 2002 and 2003)



Comment

These data suggest that trainees are performing a high proportion of second and third operations undertaken in teaching hospitals in this group of cases. A previous section showed that a greater proportion of these cases were associated with deficiencies of care (Table 22). The data do not suggest there has been any significant change.

It is possible that some of the trainees were of sufficient seniority to undertake some of these operations unsupervised. In some cases the consultant may have been present in theatre, but these data were missing from the WAASM proforma. In many cases the outcome may not have changed even if the consultant had been present.

This is an important, but complex issue. The provision of appropriate consultant supervision

of emergency surgery will become increasingly important as future trainees will be less experienced. Organisation issues, such as ensuring compatible theatre and surgeon availability, will have to be addressed. It is of relevance that this issue was noted in both UK mortality studies^{3,18} and in many hospitals was resolved by the provision of day time emergency theatres.

This analysis is hampered by missing data. Much of the missing information could be obtained from the Theatre Management System (TMS). This was one of the recommendations made by WAASM in the previous annual report.

This is an issue for WAASM to investigate further. In the meantime consultants are requested to accurately complete the proformas.

9. PROPHYLAXIS OF THROMBOEMBOLISM & FLUID BALANCE

KEY POINTS

Additional data have been collected on DVT prophylaxis and fluid balance.

There was a significant improvement in the appropriate use of DVT prophylaxis in audited cases.

Over 40% of respondents to the WAASM surgeon survey indicated that they had changed their practise with regard to DVT prophylaxis.

There was a problem with fluid management in 11% of cases (data collected since November 2003).

9.1 Prophylaxis of Thromboembolism

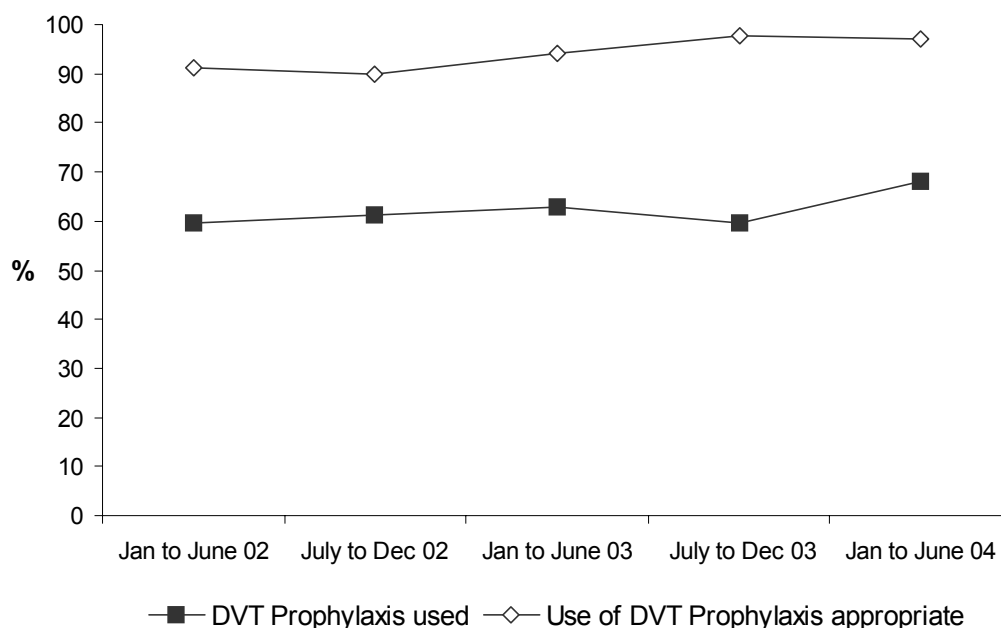
Surgeons indicate whether DVT prophylaxis was used, and if not, the reasons why it was withheld. From November 2003 WAASM has collected additional information on the type of prophylaxis used. At case review, assessors (first or second) are asked to determine whether the decision on the use of DVT prophylaxis was appropriate for the case.

Table 25: 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	60% (n=364)*	91% (n=346)*
2003	61% (n=333)*	96% (n=333)*
2004	68% (n=128)*	97% (n=127)*

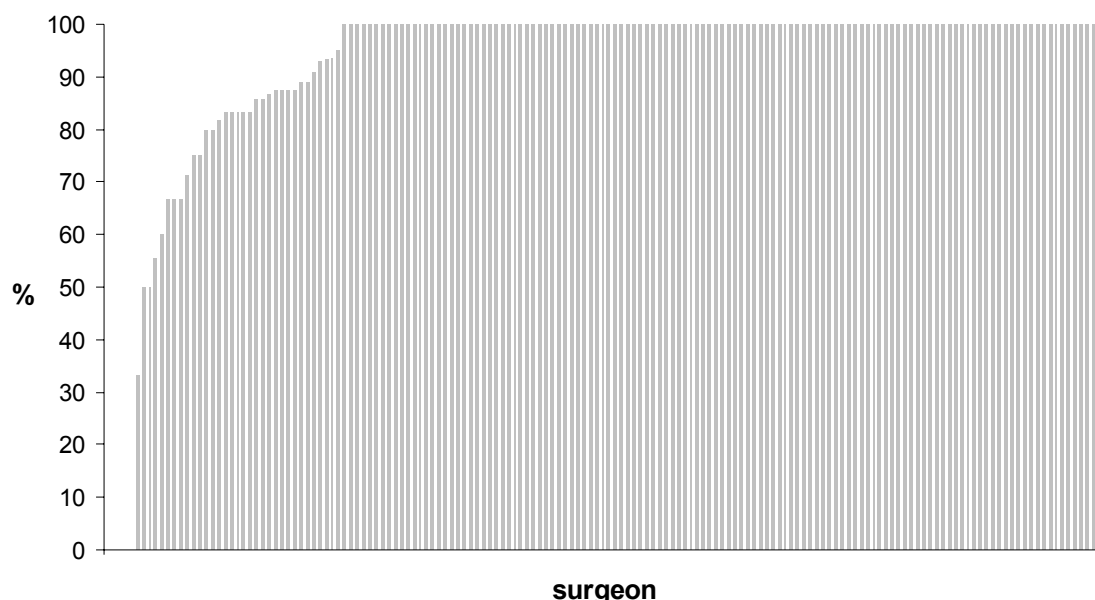
*data incomplete

Figure 9: Proportion of patients receiving DVT prophylaxis and assessors' view that the use of DVT prophylaxis was appropriate (six monthly cohorts)



- There appears to be an increasing proportion of audited cases receiving DVT prophylaxis over this period. However, there was no significant linear trend (2-sided Cochrane-Armitage Trend test $p=0.27$) (Figure 9).
- There was a significant linear trend over time in the proportion of cases in which assessors reported that the use of DVT prophylaxis was appropriate (2-sided Cochrane-Armitage Trend test $p=0.0014$) (Figure 9).
- Over 40% of respondents to the WAASM surgeon survey (Page 42) reported they had changed their practise with regard to DVT prophylaxis.

Figure 10: Percentage of cases per surgeon where assessors noted that DVT prophylaxis was appropriate (Jan 2002 to June 2004)



Comment

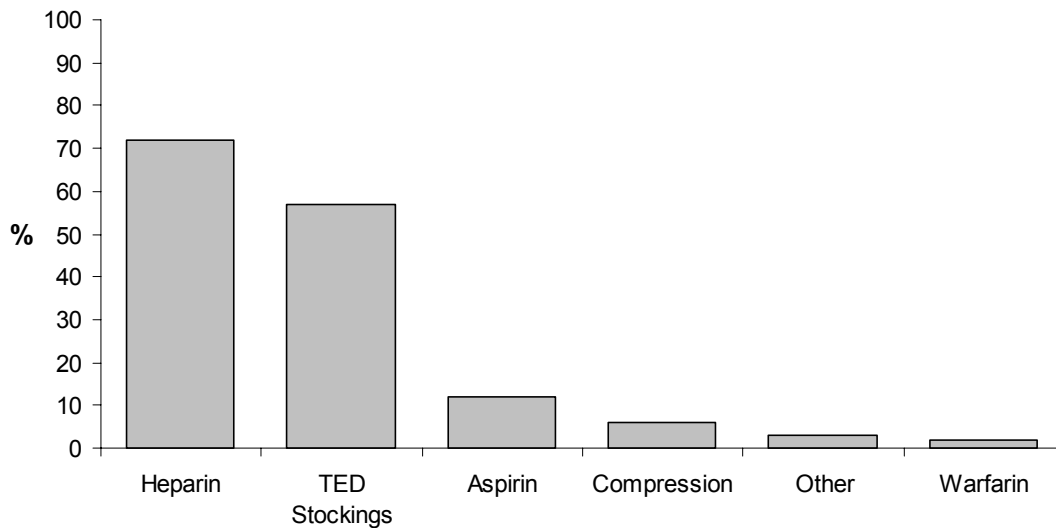
DVT prophylaxis is an area that WAASM has specifically targeted over the last three years. The evidence strongly suggests that practice is

changing. There is still no uniform method of recording the administration of either pharmacological or other prophylaxis in hospitals.

Surgeons comments regarding changes to their practise, hospital procedures or colleagues' practise, relating to DVT prophylaxis

- “More awareness of and adherence to DVT/PE prophylaxis and protocols”.
- “Improving routine use of DVT prophylaxis”.
- “All major cases wear TEDs or footpumps”.
- “I used WAASM’s report to help argue for the introduction of pneumatic calf compression prophylaxis”.
- “More discussion regarding appropriate DVT prophylaxis”.

Figure 11: Type of DVT prophylaxis received by patients (n=129) (Nov 2003 to June 2004)



Detailed information on DVT prophylaxis has been collected since November 2003.

- 129 (65%) audited cases received DVT prophylaxis during this period (n=198).

9.2 Fluid Balance

In the previous annual report, WAASM noted that many case note reviews had documented problems associated with fluid balance. WAASM included a question on fluid balance in the proforma (November 2003) to ascertain the extent of cases in which fluid balance management was an issue in patient care.

- In 21/198 (11%) audited cases the surgeon indicated that there was a problem with fluid management.

Comment

WAASM has found that problems with fluid balance were associated with 11% of audited deaths since November 2003. WAASM only reviews deaths so this is likely to underestimate the problem.

A typical scenario is that the on-call junior doctor is called after hours or over a weekend to see a patient with low urine output that he/she has not seen before. Fluids are prescribed for the patient, usually normal saline. The WAASM data show that these patients are often given several litres of fluid and that over two to three days the patients are 10 to 15 litres in positive fluid balance. The patient then develops pulmonary

oedema and/or heart failure which leads to hypoxia and to a cascade of problems with inevitable deterioration.

After the technical aspects of surgery, fluid balance is arguably one of the most important components of surgical care. Junior surgeons of the future may have less experience than their predecessors, may not provide continuity of care and patients are becoming more frail and elderly and have greater co-morbidities. This is a potent mix of factors that have the ability to complicate fluid balance management. WA has a problem in this area of management and it is a clinical responsibility to address it.

10. POST MORTEMS

KEY POINTS

A hospital post-mortem was performed in 16/876 (2%) surgical deaths.

20% of surgeons who had read the post-mortem report indicated that it had given them additional information regarding the patient.

9% of surgeons indicated that they would have preferred a post-mortem where none had been conducted.

- 83 (11%) deaths had a post-mortem (n=768)
 - 16 - hospital post-mortem
 - 67 - coroner
- Of deaths that had a post-mortem, only 35/83 (42%) surgeons indicated that they had read the post-mortem report.
- 7/35 (20%) surgeons who had read the post-mortem report indicated that the post-mortem contributed additional information which, if known, may have changed management.
- In 69 (9%) of 768 cases, surgeons indicated that they would have preferred a post-mortem where none had been done.

Table 26: Proportion of cases that had a post-mortem (by year)

Post mortem	2002 (n=348)*	2003 (n=302)*	2004 (n=118)*	Total (n=768)*
Hospital	11 (3%)	4 (1%)	1 (1%)	16 (2%)
Coroner	29 (8%)	34 (11%)	4 (3%)	67 (9%)
None	295 (85%)	254 (84%)	106 (90%)	655 (85%)
Refused	13 (4%)	10 (3%)	7 (6%)	30 (4%)
Unknown	0	12	10	22
Missing data	45	38	3	86
Total cases	393	352	131	876

* % calculated on complete or known data

Comment

In October 2004 WAASM contributed to a public meeting on post-mortems hosted by the WA Health Consumers' Council. The overwhelming feedback was that the public recognise the importance of a post-mortem. Numerous studies have demonstrated that the proportion of post-mortems can be increased if time is taken to meet

and discuss the reasons with the relatives.^{19,20} In particular, patient advocates have been shown to have a potent effect. This may be an option that the teaching hospitals, where 70% of surgical deaths occur, should consider. Surgeons also noted they were not advised of post-mortem results.

II. FUNNEL PLOTS

KEY POINTS

Funnel plots are a clear and succinct way of representing quality of performance.

Funnel plots of the WAASM data indicate that clinical care in WA is of a high standard and there are no outliers significantly different from the overall average performance.

Funnel plots are a type of control chart. The overall event proportion (population proportion) and resulting exact 95% and 99% binomial confidence intervals are plotted on a graph.

Individual event proportions are plotted against number of cases. The exact 95% and 99% binomial confidence intervals indicate possible thresholds for 'alert' and 'alarm' levels. Points located within the region bounded by the control limits represent performance that is not

significantly different from the population proportion.

Funnel plots are a useful way of presenting performance data. They allow for small numbers, and individual performance can be seen in relation to others and in relation to the population proportion. Funnel plots have been modified and used to examine quality and performance issues in healthcare.^{21,22,23,24}

Figure 12: Funnel plot of proportion of deficiencies of care associated with cases per hospital (Jan 2002 to June 2004)

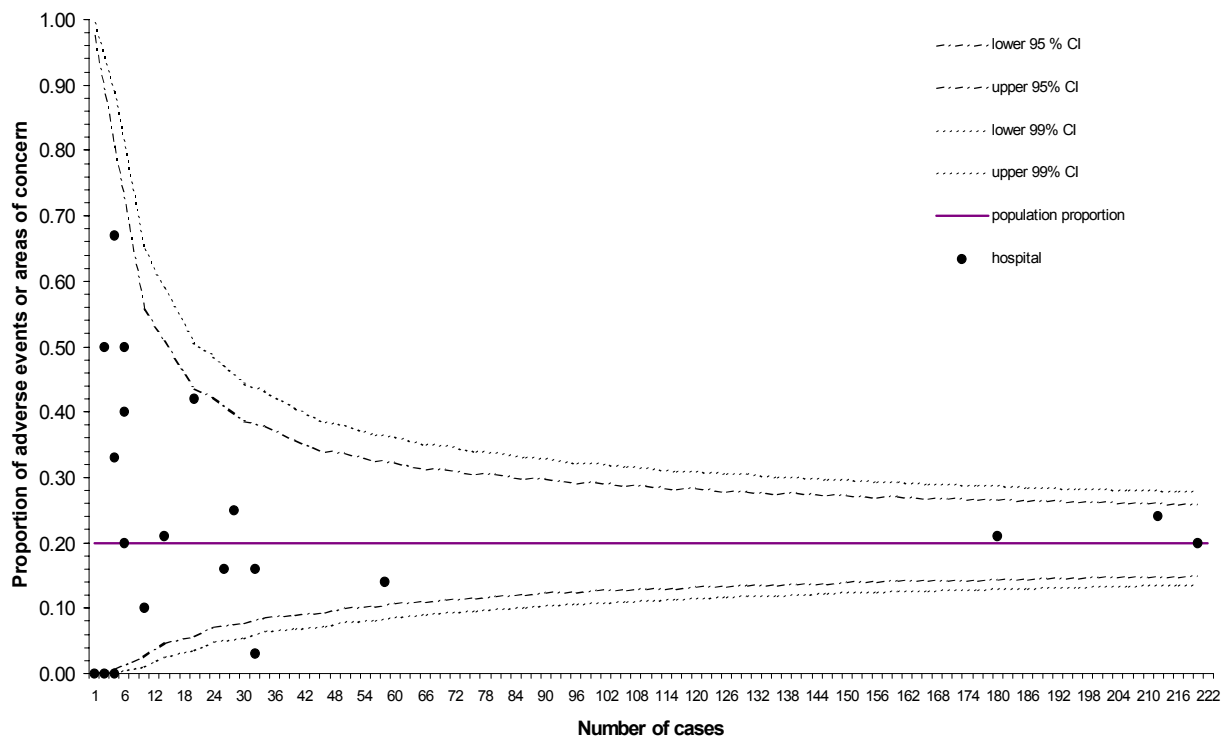
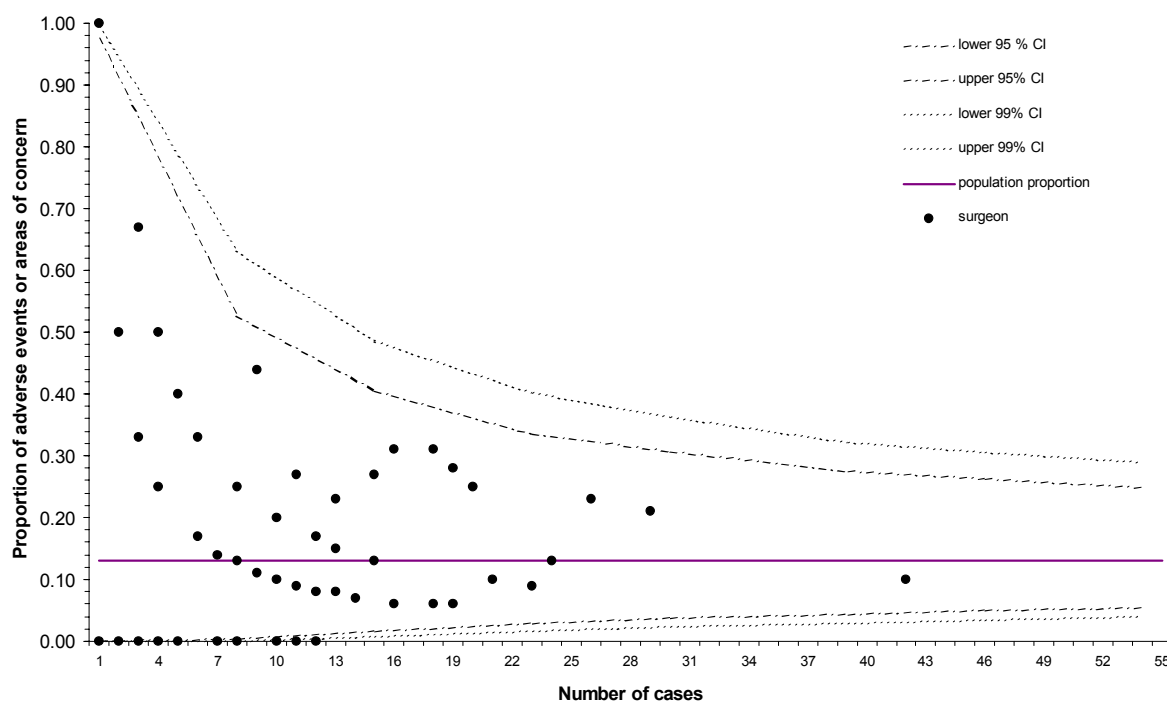


Figure 13: Funnel plot of proportion of deficiencies of care associated with cases by surgical team (Jan 2002 to June 2004)



WAASM data collection allows for the analysis of the source of deficiencies of care.

Figure 12 represents deficiencies of care per audited hospital. Cases are assigned to the hospital where the DoC occurred. This graph thus represents the overall performance of each hospital.

Figure 13 shows DoC associated with the individual audited surgical team. In this analysis, all process or resource related DoC were

excluded, as were DoC that occurred under a different clinical team (eg endoscopic, A&E, clinician, different hospital). This graph thus represents the clinical performance of each consultant.

There are no outliers for hospitals or consultants. Whilst this is reassuring, observers need to recognise the limitations of the data (ie that they are incomplete and that there has been no adjustment for case mix).

Comment

During the last seven years there have been numerous research papers that have studied the value of statistical control charts in the analysis of surgical performance. They can be a very useful and potent method of reporting current performance in comparison with peers.

Whilst the control charts shown here demonstrate how WAASM can use its data, the value of this analysis is greatly diminished by missing data. Not all surgeons participate in the audit, and not all participating surgeons return all their proformas.

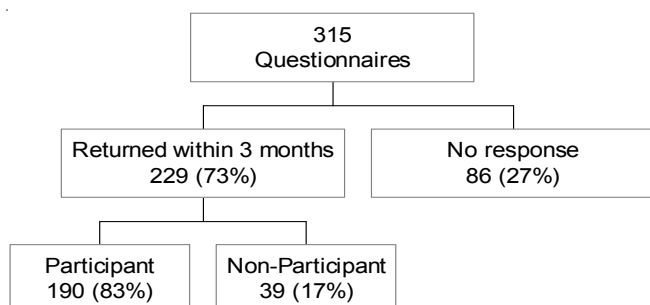
12. WAASM SURGEON SURVEY *(details of results see Appendix VI)*

KEY POINTS

- 73% of surgeons responded to the survey
- 70% of respondents had read the WAASM 2003 Annual Report
- 73% indicated that they had changed their practice in at least one way
- 85% were in favour of WAASM continuing
- 58% thought WAASM should remain voluntary

In June 2004, WAASM in conjunction with a 4th year medical student, mailed questionnaires to all consultant surgeons in Western Australia on the Royal Australasian College of Surgeons mailing list. A reminder letter and further copy of the questionnaire was sent out four weeks later. The survey was anonymous.

Diagram 6: Response to questionnaire



- 24/39 (62%) non-participating surgeons had no deaths or they did no surgery.
- 15/39 (38%) non-participants indicated they were unaware of, or had made an active decision not to participate in WAASM.

The aim of this survey was:

- To ascertain if the audit was useful to surgeons.
- To establish if it had improved or influenced their practise.
- To enquire about the surgeon's attitude towards the audit.
- To elicit information that would improve the audit and address any dissatisfactions surgeons might have.

Comments from surgeons questionnaire

"Not really relevant to ophthalmology - rarely have any deaths".

"Too time consuming because it replicates the hospital audit. I would be 100% compliant if a common process was developed".

"I am totally supportive despite being definitely alarmed each time a packet arrives relating to one of my patients. This is a great tool for peer review".

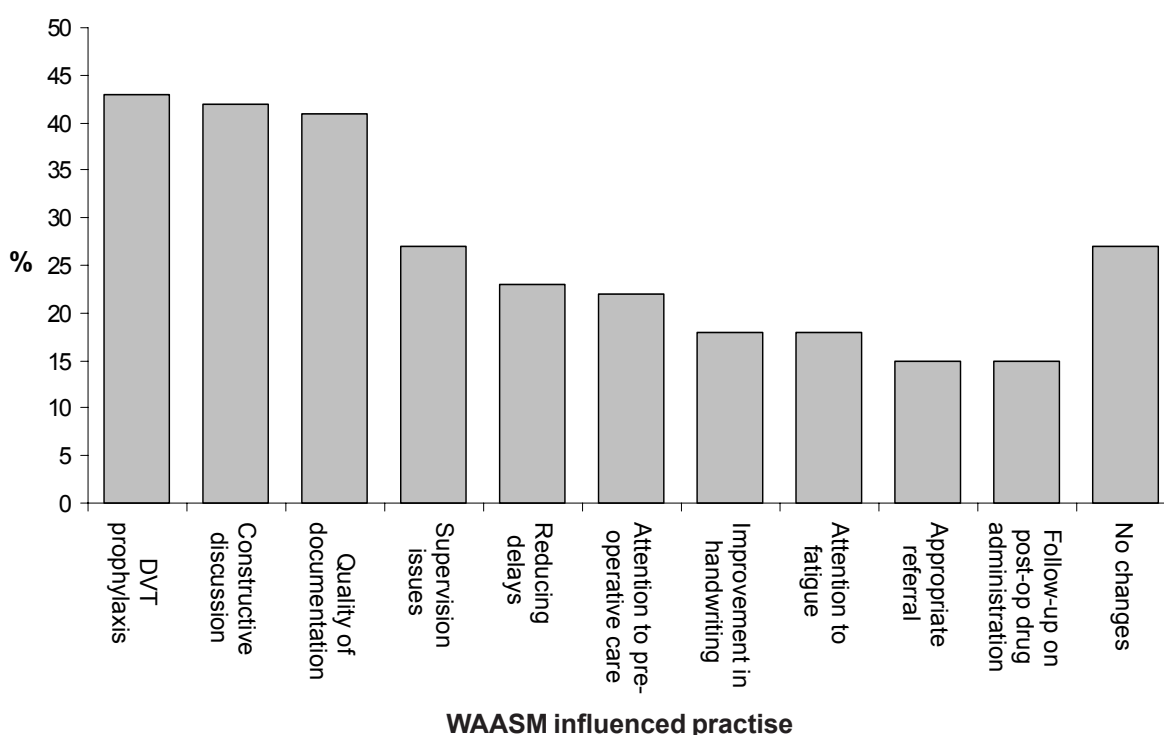
"Too difficult to get case notes back from teaching hospital to complete forms that is why 50% complete".

"This is a very worthwhile endeavour".

12.1 Changes to Practise

- 138 (73%) of 190 participating surgeons indicated that WAASM had influenced their practise in at least one way (*Figure 14*).
- 45/229 (20%) surgeons indicated they were aware of changes in hospital practise as a result of WAASM.
- 22/229 (10%) surgeons indicated they were aware of changes to their colleagues' practise as a result of WAASM.

Figure 14: Areas where surgeons indicated that they had changed their practise (n=190)



Surgeons' comments on changes to practise.

More than half the comments related to DVT prophylaxis (see page 37)

“All of us are more conscious of what we are doing. Perhaps more careful”.

“Greater awareness of clinical governance issues”.

“Better inpatient documentation”.

“Improved documentation and preop discussion of high risk cases”.

“Attention to prescribing and legibility”.

12.2 Case-Note Reviews

Case-note reviews are undertaken on approximately 20% of cases (*see pg 22*). WAASM appreciates the time and effort involved by the surgeons in preparing these case-note reviews. Case-note reviews are integral to the audit process.

Case-note reviews are sent back to the associated surgeon and any other clinical personnel associated with the case as indicated on the surgical proforma.

- 76 (40%) participants had a case-note review prepared on one or more of their cases.

Of surgeons who had a case note review (n=76)

- 80% indicated that they thought it was accurate.
- 64% indicated they found it educational.

Comments made by more than one surgeon

There were things about the case that the reviewer “could not know without discussion with me ...”

Comments failed to reach the primary operating surgeon (before transfer or surgeon on call).

12.3 Preparation of Case Note Reviews

The completion of a case-note review is voluntary, time-consuming and unremunerated. Participating consultants indicate to WAASM whether they are willing to undertake second-line reviews. WAASM manages the process through the WAASM database, randomly allocating reviews to consultants of the same specialty in geographically different hospitals, and limiting the number of reviews done by each surgeon.

105 (55%) participants indicated they had prepared a case-note review.

- 80% of surgeons who had prepared a CNR found it educational.
- 89% found it interesting.
- 89% found it time-consuming.

Comments from surgeons regarding preparing a CNR

“Very time consuming and exhaustive and unpaid”.

“There but for the grace of God go we all”.

“Makes me aware of pitfalls I might otherwise miss”.

“Wonder about the feedback - how accountable is the reviewer”.

“In general I thought that almost all the cases I have reviewed did not need case-note review”.

12.4 Feedback of Information

The main aim of WAASM is to improve clinical care through a process of educational feedback. The main methods are direct feedback to the surgeon about his/her case, case-note reviews and the publication of an annual report. 66% of respondents indicated that they had read the case-note review booklet and 70% of respondents indicated that they had read the 2003 annual report. 85% of respondents indicated that the audit should continue and 58% indicated that it should remain voluntary (*see Appendix VI*).

Comment

73% of participants indicated that participation in WAASM has influenced their practise in at least one way. Their subjective response is supported by data in this report. This elegantly demonstrates that WAASM is being successful in its aim of educating clinicians, and changing practice.

These findings are in keeping with the two UK national mortality audits.^{3,18} The National

Confidential Enquiry into Patient Outcome and Death (NCEPOD) is a peer-review audit of surgical death in England and Wales.¹⁸ An external evaluation of NCEPOD was conducted in 1988 and 77% of the 2195 respondents indicated that NCEPOD had influenced their clinical practise in at least one way.²⁵ The two major reasons for the success of the NCEPOD were:

- “NCEPOD’s work is not seen by doctors as an outside audit imposed by official bodies” and
- “its (NCEPOD) work is based on anonymised data, with no attempt to link events with particular doctors.”²⁶

Data from SASM shows changes in practice have occurred and that the number of deaths associated with deficiencies of care have progressively fallen over the past 5 years.²⁷

Comments from surgeons questionnaire

“Safe hours is a different issue, very important in rural sector and ignored by local management”.

“Care in decision to operate or not to operate”.

“Stimulates improvement in letters to referring doctors and operation records”.

“I think it should make us all more self critical”.

“Discussion of the use of pre- and post-operative antibiotics and anticoagulants outside the recommendations of clinical practice guidelines”.

“If you mandate it you will get defensive information from those unwilling to participate”.

“When will audit be property resourced? Never I suspect!!”

13. WAASM HOSPITAL SURVEY (Details of results see Appendix VII)

Following the evaluation of surgeons, WAASM sent out a survey form to hospital administration and clinical governance units to elicit their response to the audit.

70 forms were mailed:

- 55 (79%) were returned.

Surveys were returned from 33 hospitals:

- 23 (70%) public.
- 9 (27%) private.
- 1 (3%) co-location (public and private wards in the same hospital).

Hospitals were either:

- Located in the Perth metropolitan region (17, 52%) or
- Rural or country hospitals (16, 48%).

“We note a growing interest and more active participation in quality activities amongst medical staff”.

Comment

The utilisation and dissemination of information that WAASM produces is encouraging. Based on feedback, WAASM will modify the next reports in response to hospital requirements to make the information more useful to hospital management and quality co-ordinators.

KEY POINTS

79% of forms were completed

87% had read information provided by WAASM

47% were aware of changes to hospital practise as a result of WAASM

85% thought WAASM should continue

63% felt WAASM should be made mandatory

In 2004 WAASM prepared specific hospital reports for all participating hospitals. WAASM also mailed out the 2003 annual report to all hospitals.

- 48 (87%) respondents (n=55) read the 2003 annual report.
- 42 (76%) read the specific hospital report.
- 28 (51%) felt that WAASM did not duplicate other audits.
- 25 (47%) were aware of changes to hospital practise as a result of WAASM.
- 8 (15%) were aware of changes to consultants' practice.
- 45 (85%) said WAASM should continue.
- 33 (63%) said it should be mandatory.
- 42 (79%) said it should be part of hospital accreditation.

Do you think WAASM involves duplication of effort? - responses

(Coroner's cases, sentinel events reporting, morbidity and mortality meetings, AIMS study)

“Potentially, all the above - actually, no”.

“Difficult to say because of lapses in reporting cases by other systems and cross referencing is difficult”.

“Yes, but I am not worried”.

“Some overlap, but doctors do not report through other systems, therefore if achieved through WAASM then worthwhile”.

“Peer review process is unique”.

“Is approached through a different perspective”.

14. WA HEALTH CONSUMERS' COUNCIL

The WA Health Consumers' Council met in October 2004 to review WAASM. After a detailed debate, which included a presentation from WAASM and a question and answer session, the WAHCC compiled their report.¹

In summary, the general findings were:

- WAASM should be part of core business in all health services.
- Appropriate funding should be provided for the WAASM project to continue and expand.
- There should be greater emphasis on the reporting and monitoring of the implementation of WAASM recommendations.
- There should be links between accreditation, credentialling, clinical governance and participation in WAASM.
- Provides assurance to the community that there are state-wide initiatives to address the safety of health care.

15. FUTURE DEVELOPMENTS

- Collaboration with other studies and projects to compare outcomes.
- Development of specialty specific proformas to avoid duplication of effort.
- Further exploratory analysis of problems associated with fluid balance.
- Explore possibility of extending the audit to non-surgical specialties (eg endoscopic procedures).
- Assist the development and establishing of similar audits in other states and territories in Australia and New Zealand.
- Further development with TMS data.

16. ACKNOWLEDGEMENTS

WAASM gratefully acknowledges the help and support of the many people and institutions who 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 University of Western Australia for managerial support in establishing the project, in particular Associate Professor James Semmens and Professor D'Arcy Holman.
- The Royal Australasian College of Surgeons (RACS) for their support in continuing and maintaining the project.
- The Medical Records Departments and their staff in all of the participating hospitals.
- Staff at InfoHealth for developing an automated reporting system based on Topas.
- Mr Guy Cowley of Management Information Services at Sir Charles Gairdner Hospital for developing an electronic reporting system.

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APPENDIX I: Areas for consideration - assessors' opinion (some cases may be associated with more than 1 event) (n=876 audited cases Jan 2002 to June 2004)

Summary Event	n	Details	%
Incorrect/inappropriate therapy	36 (4%)	Decision to operate	3%
		Wrong operation performed	<1%
		Operation should not have been done/was unnecessary	<1%
Delays	15 (2%)	Fluid balance unsatisfactory	<1%
		Delay to surgery (ie earlier operation desirable)	1%
		Delay in transfer to surgeon by physicians	<1%
		Delay to blood transfusion	<1%
		Delay in recognising complications	<1%
		Delay in investigating the patient	<1%
		Delay in transferring patient to ICU	<1%
		Delay in transfer to HDU	<1%
		Delay starting DVT prophylaxis	<1%
Failure to use facilities	11 (1%)	Failure to use DVT prophylaxis	1%
		Failure to use ICU	<1%
		Failure to use HDU	<1%
		Failure to obtain a post-mortem	<1%
Communication failures	9 (1%)	Failure to use a drug for treatment or prophylaxis	<1%
		Poor documentation	<1%
		Failure of communication - unspecified	<1%
		Failure to communicate with senior staff	<1%
		Failed surgical communication through rotation of staff	<1%
		Poor communication between physician and surgeon	<1%
Technical errors - open surgery	4 (<1%)	Poor communication - transferring to receiving hospital	<1%
		Open surgery, organ related, technical	<1%
		Uncemented prosthesis preferable	<1%
Drug-related problems	4 (<1%)	Peri-op bleeding problems after open surgery	<1%
		Drugs related complication	<1%
General complications	3 (<1%)	Wrong dose of coagulation drug used	<1%
		Respiratory tract	<1%
Assessment problems	3 (<1%)	Miscellaneous complication	<1%
		Pre-operative assessment inadequate	<1%
Staff problems	3 (<1%)	Failure to investigate or assess patient fully	<1%
		Surgeon too junior	<1%
Patient factors	2 (<1%)	Patient refused treatment	<1%
Diagnosis-related problems	2 (<1%)	Diagnosis missed by surgeons	<1%
Monitoring problems	2 (<1%)	Inadequate monitoring	<1%
Resuscitation problems	1 (<1%)	Fluid and electrolyte resuscitation inadequate	<1%

APPENDIX II: Areas of concern - assessors' opinion (some cases may be associated with more than 1 event) (n=876 Jan 2002 to June 2004)

Summary Event	n	Details	%
Delays	41 (5%)	Delay in recognising complications	1%
		Delay to surgery (ie earlier operation desirable)	1%
		Delay starting DVT prophylaxis	1%
		Delay in transfer to surgical unit	<1%
		Delay in transfer to surgeon by General Practitioner	<1%
		Delay in transfer to surgeon by physicians	<1%
		Delay in transfer to tertiary hospital	<1%
		Delay in transferring patient to ICU	<1%
		Delay to starting ventilation	<1%
Incorrect/inappropriate therapy	25 (3%)	Fluid balance unsatisfactory	1%
		Incorrect/inappropriate therapy	1%
		Operation should not have been done/was unnecessary	<1%
		Duration of operation too long	<1%
Failure to use facilities	16 (2%)	Failure to use DVT prophylaxis	1%
		Failure to use HDU	<1%
		Failure to use ICU	<1%
		Failure to use a drug for treatment or prophylaxis	<1%
Staff problems	16 (2%)	Surgeon too junior	1%
		Failure of junior surgeon to seek advice	<1%
		Anaesthetist involvement	<1%
		Problems with appropriate staffing	<1%
		Surgeon operating without specialty	<1%
		Shortage of emergency theatre staff	<1%
Technical errors - open surgery	16 (2%)	Open surgery, organ related, technical	1%
		Peri-op bleeding problems after open surgery	<1%
		Respiratory tract complication of open surgery	<1%
		Upper GI complication of open surgery	<1%
		Lower GI complication of open surgery	<1%
		Other abdominal complication of open surgery	<1%
		Not specified, open surgery	<1%
Communication failures	13 (1%)	Poor documentation	1%
		Poor communication between physician and surgeon	<1%
		Failure to communicate with senior staff	<1%
		Failure of communication - unspecified	<1%
General complications	9 (1%)	Aspiration pneumonia	1%
		Wound infection	<1%
Assessment problems	9 (1%)	Pre-operative assessment inadequate	1%
		Failure to investigate or assess patient fully	<1%
Diagnosis-related problems	8 (1%)	Diagnosis missed by surgeons	<1%
		Diagnosis missed by medical unit	<1%
		Diagnosis missed - unspecified	<1%

APPENDIX II (contd): Areas of concern - assessors' opinion (n=876 Jan 2002 to June 2004)

Summary Event	n	Details	%
Transfer problems	4 (<1%)	Problems during transfer	<1%
		Transfer should not have occurred	<1%
		Transfer necessary to obtain ICU bed	<1%
		Transfer necessary due to bed shortage	<1%
Resuscitation problems	2 (<1%)	Resuscitation inadequate	<1%
		Fluid & electrolyte resuscitation inadequate	<1%
Drug-related problems	2 (<1%)	Under anti-coagulation	<1%
		Overdose of narcotics	<1%
Technical errors - radiological surgery	2 (<1%)	Other abdominal complication of radiological operation	<1%
		Arterial bleeding after radiological operation	<1%
Technical errors - laparoscopic surgery	1 (<1%)	Post-operative bleeding after laparoscopic operation	<1%
Problems with blood	1 (<1%)	Blood products complication	<1%
Monitoring problems	1 (<1%)	Inadequate monitoring	<1%

APPENDIX III : Adverse events - assessors' opinion (some cases may be associated with more than 1 event) (n=876 Jan 2002 to June 2004)

Summary Event	n	Details	%
Technical errors - open surgery	51 (6%)	Anastomotic leak	2%
		Peri-op bleeding problems after open surgery	1%
		Open surgery, organ related, technical	1%
		Injury to organ	<1%
		Other abdominal complication of open surgery	<1%
General complications	21 (2%)	Aspiration pneumonia	1%
		Wound infection	<1%
		Septicaemia	<1%
		Pulmonary embolus	<1%
		Peri-operative cerebral ischaemia	<1%
		Other abdominal complication	<1%
Delays	15 (2%)	Delay to surgery (ie earlier op desirable)	<1%
		Delay in recognising complications	<1%
		Delay in transfer to surgical unit	<1%
		Delay in transfer to surgeon by physicians	<1%
		Delay to blood transfusion	<1%
		Delay in transferring patient to ICU	<1%
		Delay starting medical treatment	<1%
Patient factors	8 (1%)	Injury caused by fall in hospital	1%
Technical errors - Endoscopic surgery	7 (1%)	Injury to duodenum	<1%
		Operation induced acute pancreatitis	<1%
		Urinary complication of endoscopic operation	<1%
Incorrect/inappropriate therapy	6 (1%)	Wrong operation performed	<1%
		Operation should have been done	<1%
		Operation should not have been done	<1%
		Fluid balance unsatisfactory	<1%
Drug-related problems	5 (1%)	Reaction to drugs	<1%
		Wrong drug used	<1%
Staff problems	2 (<1%)	Surgeon too junior	<1%
		Fatigue of staff	<1%
Communication failures	2 (<1%)	Communication failures	<1%
		Poor communication in emergency department	<1%
Diagnosis-related problems	2 (<1%)	Diagnosis missed by surgeons	<1%
		Diagnosis missed by referring hospital	<1%
Technical errors - Radiological surgery	1 (<1%)	Arterial bleeding after radiological operation	<1%
Anaesthesia related problems	1 (<1%)	Premature extubation	<1%
Technical errors - Laparoscopic surgery	1 (<1%)	Perforation of small bowel	<1%

APPENDIX IV: Deficiencies of care associated with emergency and elective admissions
(2002 and 2003 - some cases had more than one associated deficiency of care)

Elective admissions	2002 (n=107)	2003 (n=73)
Technical errors - surgery	26 24%	14 19%
Incorrect/inappropriate therapy	9 8%	4 5%
Delays	8 7%	2 3%
General complications	5 5%	7 10%
Staff problems	5 5%	1 1%
Failure to use facilities	3 3%	2 3%
Drug-related problems	2 2%	0
Communication failures	2 2%	0
Assessment problems	1 1%	3 4%
Transfer problems	0	1 1%
Patient factors	0	1 1%
Total	61 57%	35 48%
<hr/>		
Emergency admissions	2002 (n=286)	2003 (n=279)
Delays	30 10%	8 3%
Technical errors - surgery	22 8%	14 5%
General complications	11 4%	7 3%
Incorrect/inappropriate therapy	9 3%	7 3%
Staff problems	7 2%	3 1%
Communication failures	7 2%	6 2%
Failure to use facilities	6 2%	4 1%
Drug-related problems	3 1%	1 <1%
Diagnosis-related problems	3 1%	0
Patient factors	3 1%	4 1%
Transfer problems	2 1%	0
Resuscitation problems	2 1%	1 <1%
Anaesthesia-related problems	1 <1%	0
Monitoring problems	1 <1%	0
Assessment problems	1 <1%	1 <1%
Problems with blood/blood products	0	1 <1%
Total	108 38%	57 20%

APPENDIX V: List of diagnoses on admission in audited cases (complete list n=876)
(Jan 2002 to June 2004)

Specialty	n (%)	Most common diagnoses (not necessarily cause of death)	n (%)
General	369 (42%)	Gastro-intestinal obstruction	56 (6%)
		Colorectal cancer	48 (5%)
		Cancer - other (eg breast, pancreas, liver, metastatic)	40 (5%)
		Vascular insufficiency of the intestine	39 (4%)
		Gastric or duodenal ulcer (including haemorrhage or perforation)	17 (2%)
		Acute pancreatitis	17 (2%)
		Hernia	15 (2%)
		Other gastrointestinal perforation	13 (1%)
		Diverticular disease (including perforation)	12 (1%)
		Cancer of stomach and oesophagus	12 (1%)
		Multiple injuries	11 (1%)
		Gastro-intestinal haemorrhage	9 (1%)
		Cholecystitis	9 (1%)
		Other	71 (8%)
Orthopaedics	213 (24%)	Fractured neck of femur	145 (17%)
		Other fractures and dislocations	22 (3%)
		Arthritis and bursitis	15 (2%)
		Failure of internal fixation, post-operative complications	11 (1%)
		Other fracture of femur	8 (1%)
		Other	12 (1%)
Vascular	119 (14%)	Aortic aneurysm (with or without rupture)	42 (5%)
		Peripheral vascular disease - other	37 (4%)
		Venous or arterial ulcer of foot or leg	5 (1%)
		Stenosis of artery or valve	5 (1%)
		Other aneurysm	5 (1%)
		Gangrene of foot, hand or limb	4 (<1%)
		Embolism or thrombosis of artery or vein	3 (<1%)
		Vascular insufficiency of intestine	2 (<1%)
		Other	16 (2%)
Cardiothoracic	63 (7%)	Valvular heart disease	17 (2%)
		Cardiopulmonary disease	12 (1%)
		Aortic aneurysm	10 (1%)
		Ischaemic heart disease	6 (1%)
		Endocarditis	4 (<1%)
		Cancer of lung	3 (<1%)
		Congenital heart disease	2 (<1%)
		Other	9 (1%)
Urology	49 (6%)	Cancer - other	15 (2%)
		Cancer of bladder	8 (1%)
		Cancer of prostate	6 (1%)
		Other	20 (2%)

APPENDIX V (contd): List of diagnoses on admission in audited cases (complete list n=876)
(Jan 2002 to June 2004)

Specialty	n (%)	Most common diagnoses (not necessarily cause of death)	n (%)
Plastic	25 (3%)	Severe burns	14 (2%)
		Cancer	3 (<1%)
		Infection or inflammation of skin and soft tissue	2 (<1%)
		Other	6 (1%)
Neurosurgery	16 (2%)	Brain haemorrhage	8 (1%)
		Head injury	3 (<1%)
		Brain cancer	2 (<1%)
		Other	3 (<1%)
ENT	12 (1%)	Cancer	7 (1%)
		Epistaxis	2 (<1%)
		Other	3 (<1%)
Gynaecology	7 (1%)	Cancer - other	3 (<1%)
		Ovarian cancer	2 (<1%)
		Other	2 (<1%)
Paediatrics	1 (<1%)	Congenital problems	1 (<1%)
Ophthalmology	1 (<1%)	Corneal ulcer	1 (<1%)
Oral/ Maxillofacial	1 (<1%)	Cancer	1 (<1%)

APPENDIX VI: Surgeon's Questionnaire, responses by participants and non-participants

	Participants (n=190)	Non-Participants (n=39)	Total (n=229)
Changes to your practise	138 (73%)	2 (5%)	140 (61%)
Changes to hospital practise	44 (23%)	1 (3%)	45 (20%)
Changes to practise of colleagues	21 (11%)	1 (3%)	22 (10%)
Read CNR Booklet (yes)	136 (72%)	16 (41%)	152 (66%)
If had read CNR booklet was it	<i>(n=136)</i>	<i>(n=16)</i>	<i>(n=152)</i>
Interesting	119 (88%)	12 (75%)	131 (86%)
Educational	109 (80%)	11 (69%)	120 (79%)
Pertinent	97 (71%)	6 (38%)	103 (68%)
Read 2003 Annual Report	145 (76%)	15 (38%)	160 (70%)
If read annual report was it	<i>(n=145)</i>	<i>(n=15)</i>	<i>(n=160)</i>
Interesting	130 (90%)	11 (73%)	141 (88%)
Educational	115 (79%)	10 (67%)	125 (78%)
Relevant	109 (75%)	7 (47%)	116 (73%)
Alarming	24 (17%)	2 (13%)	26 (16%)
Unhelpful	9 (6%)	1 (7%)	10 (6%)
Should WAASM continue	<i>(n=187)</i>	<i>(n=31)</i>	<i>(n=218)</i>
Yes	164 (88%)	22 (71%)	186 (85%)
No	6 (3%)	1 (3%)	7 (3%)
Undecided	17 (9%)	8 (26%)	25 (11%)
Should participation be	<i>(n=187)</i>	<i>(n=27)</i>	<i>(n=214)</i>
Voluntary	105 (56%)	18 (67%)	123 (58%)
Mandatory	82 (44%)	9 (33%)	91 (42%)

APPENDIX VII: Hospital Survey

Position of respondents (n=55) within their hospital

Chief executive	4 (7%)
Clinical/medical/surgical director	14 (26%)
Nursing director	10 (19%)
Service director	1 (2%)
Clinical governance/quality unit	19 (35%)
Other †	6 (11%)

† Other includes: acting clinical nurse manager, clinical theatre manager, district manager and senior medical officer.

Should WAASM Continue?	
yes	45 (85%)
undecided	8 (15%)
Should WAASM :	
remain voluntary	19 (37%)
be made mandatory	33 (63%)
Who should mandate it?	
Hospitals	5 (16%)
RACS	4 (13%)
DoH	15 (48%)
Other*	7 (23%)

* Other: MDOs & DoH, RACS & DoH, Accreditation body, Hospital and DoH

Response to WAASM process

48 (87%) respondents had read the annual report. They found it:
34 (71%) interesting
26 (54%) relevant
23 (48%) useful
5 (10%) alarming/surprising
0 unhelpful
42 (76%) had read the specific hospital report, and they found it:
24 (57%) interesting
17 (40%) relevant
19 (45%) useful
6 (14%) too generalised

Should participation be part of hospital accreditation?	
Yes	42 (79%)
No	8 (15%)
Don't Know	3 (6%)

WAASM Staff - 2004

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