WAASM

Annual Report 2009

Royal Australian College of Surgeons

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Royal Australasian College of Surgeons

Western Australian Audit of Surgical Mortality (WAASM)

ANNUAL REPORT 2009

THE UNIVERSITY OF WESTERN AUSTRALIA

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CHAIRMAN'S REPORT

During the last year there have been important developments with the mortality audits in both Western Australia and nationally.

The Western Australian Review of Mortality (WARM) commenced in January 2007 and after a two year 'settling in' period has substantially tightened its reporting process. WARM has now been extended to cover all licensed private health facilities. Hospitals must complete the review of all deaths within three months. Further, the Western Australian Department of Health (WADH) requires details of any deaths categorised 4 or 5 under Health Round Table classification so that any systemic issues can be identified. The Western Australian Audit of Surgical Mortality (WAASM) aims to provide similar data to the hospitals. These and other requirements for the Australian and New Zealand Audit of Surgical Mortality (ANZASM) have required the College to approach the Commonwealth for some adjustments to its Qualified Privilege application legislation. These issues have not yet been fully resolved.

As WAASM was well established when WARM commenced, Western Australian surgeons were given the option to participate in one or the other. Western Australian surgeons have overwhelmingly voted to participate in WAASM and in the last year more than 99% of the proformas sent out by WAASM were returned. In previous years there was always a lag as proformas trickled in, but compliance with WARM will greatly reduce this.

Mortality audits are now established in all other Australian states. Although neither the Northern Territory nor the Australian Capital Territory (ACT) is currently contributing to ANZASM, both are in discussion with the College regarding their future participation. This seems likely in the near future.

In February 2009 the College's Surgical Leaders Forum debated whether participation in ANZASM should be a mandatory part of Continuing Professional Development (CPD). This is to be formally considered by Council later in 2009 and it is likely participation will become part of CPD in those states that have established mortality audits.

The important next step is to improve the quality of the data entered into the proformas. WAASM is primarily about education, and surgeons should use the completion of the proforma as an opportunity to critically review the circumstances of the death, especially if it was unexpected. Once again it appears that, in the view of the external assessors, surgeons are significantly under reporting adverse events. While surgeons may argue that there is a subjective element to the assessors' opinion the reality is quite different. An anastomotic leak or pulmonary embolus is clearly an adverse event, yet frequently the surgeon does not record these incidents as such. These data make a compelling case for mandating external peer review when an unexpected death occurs. Such a review needs to be external to the hospital as WAASM is aware of hospitals making the same determination as the surgeon.

Surgeons and hospitals need to recognise that if they fail to note such obvious deficiencies of care, the case for external review becomes much stronger and substantially strengthens the hand of those who believe the medical professional cannot monitor their own performance. Other safety critical industries, such as aviation, railways and construction, have long been required to submit critical incidents to review by independent, external statutory bodies. The medical profession has previously not been monitored in this way, but unless it tightens its processes such external review is inevitable.

During the period of this report WAASM became aware of what appeared to be a statewide excess number of deaths following a Whipple's resection for pancreatic cancer. Professor Ian Hammond, in his capacity as Chairman of the Western Australian Cancer & Palliative Care Network and on behalf of the Chief Medical Officer WADH, convened a number of meetings with all interested parties (WADH, hospitals, surgeons etc.). There was agreement that these operations should preferably be undertaken in a limited number of teaching and private hospitals where appropriate surgical units have the extensive multi-disciplinary support required for such major cancer operations. Immediate implementation is not possible for logistic reasons, but we hope to achieve this by the end of 2009. It was also recommended that there should be a credentialing process for surgeons wishing to perform other specified radical upper gastrointestinal surgical operations. Surgical units would be credentialed according to the level of support required. This process is now underway. Another important conclusion was the importance of denominator data, and discussions are underway with the WADH to determine how this can be obtained when required.

Delay has consistently been shown to be a major contributor to death. This annual report contains a detailed review of these deaths. In approximately half the cases where delay contributed to the death, it was attributed to the surgeon. As a matter of routine these case note reviews are sent to the responsible clinician. This again serves to emphasise the importance of the WAASM holistic approach.

In May 2010 the College Annual Scientific Conference (ASC) will be held in Perth. It is proposed that the first national ANZASM annual report be released at this meeting. At the last ASC held in Western Australia in 2005, the College announced its intention to establish the ANZASM. It is fitting that the College will release its first national annual report in this state. In 2005 public attention was focused on performance that was considered sub-optimal, notably surgeon participation. Doubtless attention will be focused on this again next year, whereas the real message should be that in only five years the College has established a national mortality audit that has a proven record of changing and improving outcomes.

While Western Australian surgeons can take considerable satisfaction in the lead they have taken, it is also important to acknowledge the support provided by the Western Australian Department of Health Office of Quality and Safety. It was they who committed to fund WAASM's conception and supported its fledgling development. It was they who recognised that the lessons learnt in a surgical mortality audit could, and should, be extended to all hospital deaths, and become a mandatory part of safety and quality processes. Whilst taking a keen interest in all aspects of WAASM they have not sought to influence its processes or reporting – not always easy! In these matters they were and remain ahead of their state counterparts. The publication of a national annual report will be elegant testimony and vindication of their initial investment.

James Aitken
WAASM Chairman

ABBREVIATIONS

ACT	Australian Capital Territory
ANZASM	Australian and New Zealand Audit of Surgical Mortality
ASA	American Society of Anesthesiologists
ASC	Australian Scientific Conference
CPD	Continuing Professional Development
DVT	deep vein thrombosis
GI	gastrointestinal
HDU	high dependency unit
ICU	intensive care unit
IQR	interquartile range
NCEPOD	National Confidential Enquiry into Patient Outcome and Death
NICE	National Institute of Clinical Excellence
SASM	Scottish Audit of Surgical Mortality
SPSS	Statistical Package for Social Sciences
TOPAS	The Open Patient Administration System
UWA	University of Western Australia
WAASM	Western Australian Audit of Surgical Mortality
WADH	Western Australian Department of Health
WARM	Western Australian Review of Mortality

EXECUTIVE SUMMARY

Background

WAASM is an external independent peer review of surgical mortality and is funded by the Western Australian Department of Health (WADH) and has protection under federal legislation.

The Western Australian Audit of Surgical Mortality (WAASM) is now in its eighth year, having commenced in June 2001 as a pilot project under the management of the University of Western Australia (UWA). In 2005, the Royal Australasian College of Surgeons (the College) took responsibility for oversight of this project. Subsequently the College established the Australian and New Zealand Audit of Surgical Mortality (ANZASM). Similar mortality audits have been established in Tasmania, South Australia, Queensland and Victoria.

Audit process and reporting conventions

WAASM is notified of all in-hospital deaths. Cases in which a surgeon was involved in the care of the patient are audited. A structured proforma is sent to the surgeon to complete. Returned forms are de-identified and then peer reviewed by another consultant surgeon (first-line assessment).

From 1 January to 31 December 2008, 701 deaths were reported to WAASM with 95% of proforma being returned.

Surgeon participation

Surgeon participation in WAASM has steadily increased from 62% in 2002 to 95% in 2008.

Second-line assessment

The number of second-line assessments (case note reviews) has decreased since 2002, with 12% of cases being referred for second-line review in 2008, down from 23% in 2002. This is largely due to more comprehensive information being provided in the proformas and additional letters and discharge summaries, which are helpful in explaining the rationale underlying the process of care. With this additional information it is often possible to close the WAASM case without further review.

Analysis

This report contains an analysis of cases reported to WAASM from January 2002 to December 2008 that had completed the audit process by 31 March 2009 (n = 3328). Some data is missing due to incomplete information in proformas and where this occurs it is noted in the text.

Comparison of surgeons' and assessors' view of areas of concern and adverse events

As with previous years WAASM has noted that assessors reported almost double the areas of concern or adverse events compared to the level of clinical incidents reported by surgeons.

Patient sample demographics

Of the 3328 cases which have completed the audit process (2002–2008), the median age was 78 years with an interquartile range (IQR) of 67-85 years. Neurosurgical patients had a median age of 61 years (IQR 46-74 years) compared to orthopaedic patients who had a median age of 85 years

(IQR 79-90 years). Ninety per cent of cases had an American Society of Anesthesiologists (ASA) grade of four or more. The majority of cases (94%) had one or more comorbidity. The main causes of death in patients aged 70 years or less were brain haemorrhage, heart failure, malignancy, multiple organ failure and septicaemia. The main cause of death in patients aged over 70 years included heart failure, septicaemia, multiple organ failure, malignancy, pneumonia and respiratory failure.

Areas for consideration, of concern and adverse events

As with previous years, the percentage of deaths that were associated with preventable areas of concern or adverse events was less than 1%.

RECOMMENDATIONS

The recommendations of this report are as follows:

- to review why and where surgeons and assessors rate adverse events differently
- to review deaths after upper gastrointestinal haemorrhage
- to review the reasons underlying technical error, now the largest cause of death
- to review the reasons for returns to theatre.

1 INTRODUCTION

KEY POINTS
■ WAASM is an external independent peer-reviewed audit of the process of care associated with all surgically-related deaths in Western Australia.
■ This annual report covers the period 1 January 2002 to 31 December 2008, as audited on 31 March 2009.
■ WAASM's main role is to feed back information to inform, educate, facilitate change and improve quality of practice.

1.1 Background

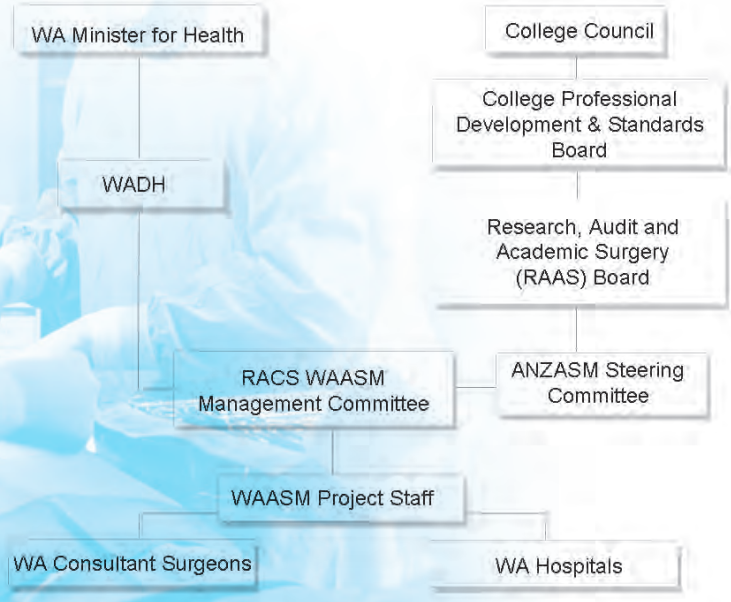
WAASM is an external independent peer-reviewed audit of the process of care associated with all surgically-related deaths in Western Australia.

WAASM commenced in June 2001 as a pilot project under the management of the University of Western Australia. WAASM's methodology is based on the Scottish Audit of Surgical Mortality (SASM). In 2005, management was transferred to the Royal Australasian College of Surgeons (the College). Since then the College established the Australian and New Zealand Audit of Surgical Mortality (ANZASM) and set up similar mortality audits in other states.

1.2 Governance

The ANZASM (including WAASM) is protected under the Commonwealth Privilege Scheme under part VC of the *Health Insurance Act* 1973 (gazetted 6 November 2006).

Figure 1.1: The structure of the Western Australian Audit of Surgical Mortality (WAASM)



2 THE AUDIT PROCESS

2.1 Methodology

Detailed methodology of the WAASM audit process is contained in the 2003 to 2007 WAASM annual reports [1-5], which are also available on the College website (http://www.surgeons.org/Content/NavigationMenu/Research/Audit/WAASM/default.htm).

In brief, WAASM is notified of all in-hospital deaths through either the Open Patient Administration System (TOPAS) or directly via medical records departments. All cases in which a surgeon was involved in the care of the patient are included in the audit, whether or not the patient underwent a surgical procedure.

The consultant surgeon associated with the case is sent a structured proforma for completion. The completed proforma is returned to WAASM where it is de-identified and then assessed by a first-line assessor. This will be a different surgeon but of the same specialty ('peer review'). The first-line assessor will either close the review or advise that the case undergo further assessment, i.e. a 'second-line assessment' or 'case note review'.

Cases may be referred for a second-line assessment if:

- areas of concern or adverse events are thought to have occurred during the clinical care of the patient that warrants further investigation
- a report could usefully draw attention to lessons to be learned, either for clinicians involved in the case or as part of a collated assessment (case note review book) for wider distribution.

Second-line assessors are different consultant surgeons from the same specialty as the surgeon associated with the case, but work in a different hospital to that in which the death occurred.

2.2 Providing feedback

One of the main aims of WAASM is to provide feedback to inform, educate, facilitate change and improve practice.

2.3 Reporting conventions

2.3.1 Reporting clinical incidents

In the structured proforma the surgeon is asked to document whether there were any clinical incidents during the care of the patient. The surgeon is asked to:

- report on the impact of the incident on the outcome, that is, whether the incident:
  - made no difference to outcome
  - may have contributed to death
  - caused the death of a patient who would otherwise have been expected to survive

- give their opinion as to whether the incident was preventable, using the following categories:
  - definitely

- probably
- probably not
- definitely not

- indicate who the incident/event was associated with:
  - audited surgical team
  - another clinical team
  - hospital
  - other.

First- and second-line assessors also complete the same assessment matrix.

2.3.2 Analysis of clinical incidents

WAASM primarily focuses upon areas of concern and adverse events. Data regarding areas for consideration are collected, but they are 'less serious events', and have little impact on the overall care of the patient and so they are generally excluded from the analysis because they make no difference to the outcome.

2.4 Data analysis

WAASM audits all deaths occurring in Western Australian hospitals while under the care of a surgeon. However, terminal care cases are excluded from the full audit process. The 2009 annual report covers deaths reported to WAASM from 1 January 2002 to 31 December 2008 censored on 31 March 2009. Due to the time lag some cases are still under review and will be included in the next annual report. Numbers in previous annual reports may vary from this report because some cases are completed after the censor dates of the previous annual reports.

Data are entered and stored in a Microsoft Office Access (2003) database and analysed using the Statistical Package for Social Sciences (SPSS), version 15.0 and Microsoft Office Excel (2003). Numbers in the parentheses in the text (n) represent the number of cases analysed. As not all data were completed, the total number of cases used in the analyses varies. The total numbers of cases included in the analyses are provided for all tables and figures in the report.

2.5 Performance review

Recommendations were included in the 2008 WAASM report.[6] An important measure of the success of WAASM is whether these recommendations have been addressed or achieved. A list of recommendations and progress against these are listed in Section 5 of this annual report.

3 AUDIT PARTICIPATION & ASSESSMENT

KEY POINTS

Participation in WAASM is voluntary.
There has been a slight increase in the number of reported deaths from 2007 to 2008.
The majority of proformas are being returned to the WAASM office, with less than 1% of proformas not returned in 2008.

3.1 Overview of participation

3.1.1 Deaths reported to WAASM

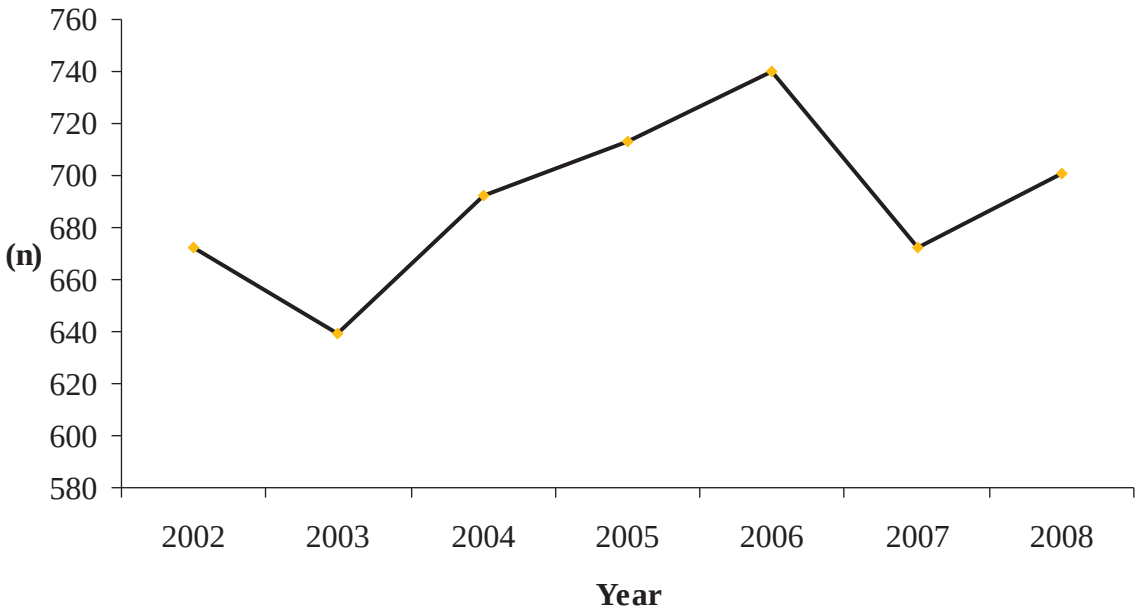
Table 3.1 and Figure 3.1 summarise the data on deaths reported to WAASM from 2002 to 2008. Percentage participation is calculated on the completion and return of the proformas by 31 March 2009. The audit process is complete once the proforma has been assessed by the first- and, if required, the second-line assessor.

Table 3.1: Deaths reported to WAASM between 1 January 2002 and 31 December 2008 (audit status as at 31 March 2009)

	No. of cases (%)							
	2002	2003	2004	2005	2006	2007	2008	Total
Total deaths reported	672	639	692	713	740	672	701	4829
Audit process complete	411 (61)	383 (60)	470 (68)	522 (73)	592 (80)	513 (76)	437 (62)	3328 (69)
Proforma complete, awaiting assessment [a]	0	0	2 (<1)	2 (<1)	15 (2)	87 (13)	210 (30)	316 (6)
Proforma not returned	205 (31)	191 (30)	142 (21)	115 (16)	57 (8)	14 (2)	2 (<1)	726 (15)
Terminal care cases (excluded)	5 (<1)	9 (1)	16 (2)	28 (4)	24 (3)	22 (3)	16 (2)	220 (4)
Closed no information available	4 (<1)	7 (1)	2 (<1)	7 (<1)	4 (<1)	4 (<1)	5 (<1)	33 (<1)
Case associated with non-participant [b]	47 (7)	49 (8)	60 (9)	39 (5)	48 (6)	32 (5)	31 (4)	306 (6)

[a] Case awaiting first- or second-line assessment
[b] Non-participants are surgeons who have indicated that they do not wish to participate in WAASM.

Figure 3.1: Reported number of deaths to WAASM (2002-2008) (n=4829)



Comment

The average number of deaths reported to WAASM is 690 per year. The majority of proformas are returned to the WAASM office, with only 5% of proformas not returned in 2008 (this excludes cases associated with non-participants and cases closed no information available). In addition, there has been a 5% increase in the number of overall cases that have completed the audit process by the censor date (64% in 2008 annual report[6] vs 69% in current report).

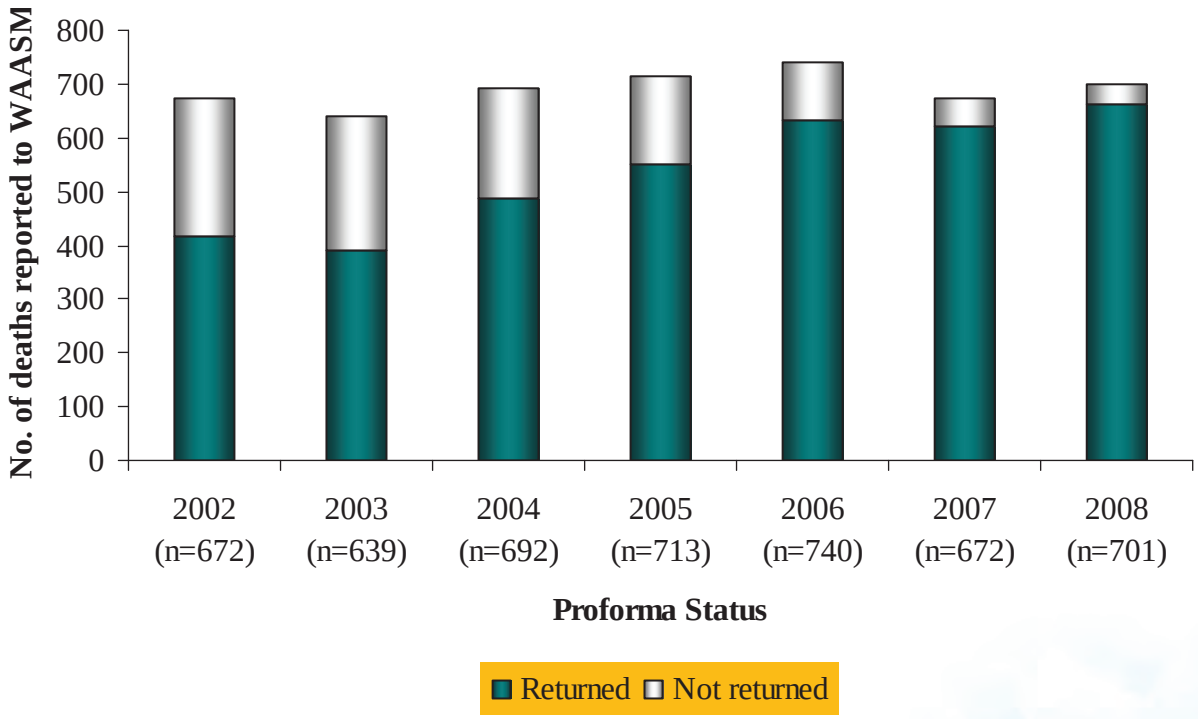
3.2 Participation in WAASM

KEY POINTS

- The percentage of proformas returned has increased by 33% since 2002 (62% in 2002 vs 95% in 2008). This suggests a strong preference for surgeons to report deaths to WAASM rather than WARM, as surgeons have to choose the process through which they will review surgical deaths.
- Surgeon participation in the audit has continued to increase during 2008.
- Over the total audit period surgeons returned 75% of proformas.

Participation in WAASM from 2002 to 2008 is depicted in Figures 3.2 and 3.3, and Table 3.2.

Figure 3.2: Proforma completion rates (2002-2008) (n=4829)



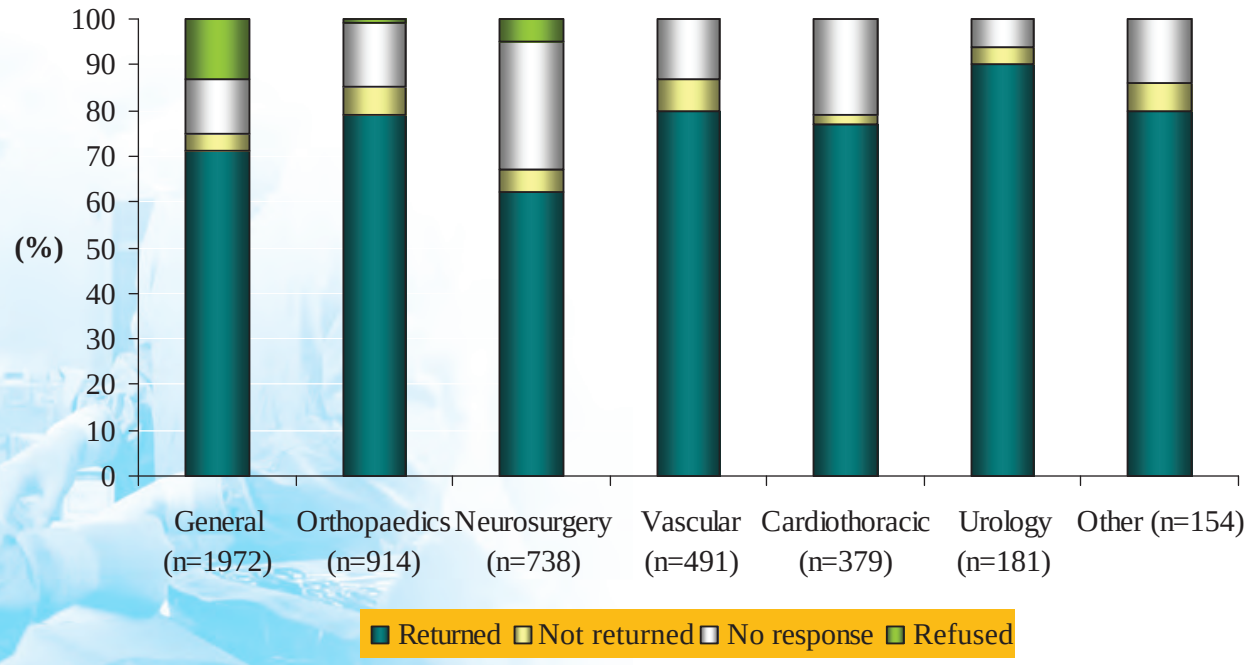
Note: Proformas not returned includes cases 'cases closed no information available' and cases associated with 'non-participants'.

Table 3.2: Surgeon participation

	No. of cases (%)							
	2002	2003	2004	2005	2006	2007	2008	Total
Reported deaths	672	639	692	713	740	672	701	4829
Surgeons associated with reported deaths	146	139	146	141	146	174	183	1075
Proforma returned [a] (%)	425 (63)	408 (64)	504 (73)	585 (82)	644 (87)	561 (83)	474 (68)	3601 (75)
	No. of surgeons associated with 3 or more deaths							
	81	76	75	79	82	84	80	557
Case status completed	51 (63)	48 (63)	51 (69)	62 (78)	69 (83)	70 (84)	58 (73)	409 (74)
Case status in progress	0 (0)	0 (0)	1 (1)	1 (1)	0 (0)	8 (10)	18 (23)	28 (5)
Returned no forms [b]	25 (31)	25 (33)	17 (23)	13 (7)	10 (12)	2 (2)	0 (0)	92 (17)
Non-participants [c]	5 (6)	3 (4)	5 (7)	3 (4)	4 (5)	3 (4)	4 (5)	27 (4)

[a] Includes terminal care cases
[b] Consultant no response
[c] Surgeon refused to participate

Figure 3.3: Proforma status by specialty (2002-2008) (n=4289)



Other = obstetrics & gynaecology, otolaryngology & ophthalmology, paediatrics and plastic surgery.

Comment

Consultant participation has increased by 33% since the inception of WAASM from 62% in 2002 to 95% in 2008. This strongly suggests that surgeons and hospital departments prefer to report any deaths through WAASM rather than WARM (Figure 3.2).

3.3 Hospital participation

KEY POINTS
All hospitals in Western Australia (public and private) participate in the audit (n=38).
80% of audited deaths occurred in public hospitals.
73% of audited deaths occurred in three public hospitals.
25% of cases had been transferred from one hospital to another.

All 38 hospitals in Western Australia take part in the audit process. Figure 3.4 shows the number of reported deaths of patients admitted for surgery in all 38 hospitals and the proforma status (returned versus not returned) for each hospital.

Figure 3.4: Reported deaths of patients admitted for surgery in 38 hospitals in Western Australia

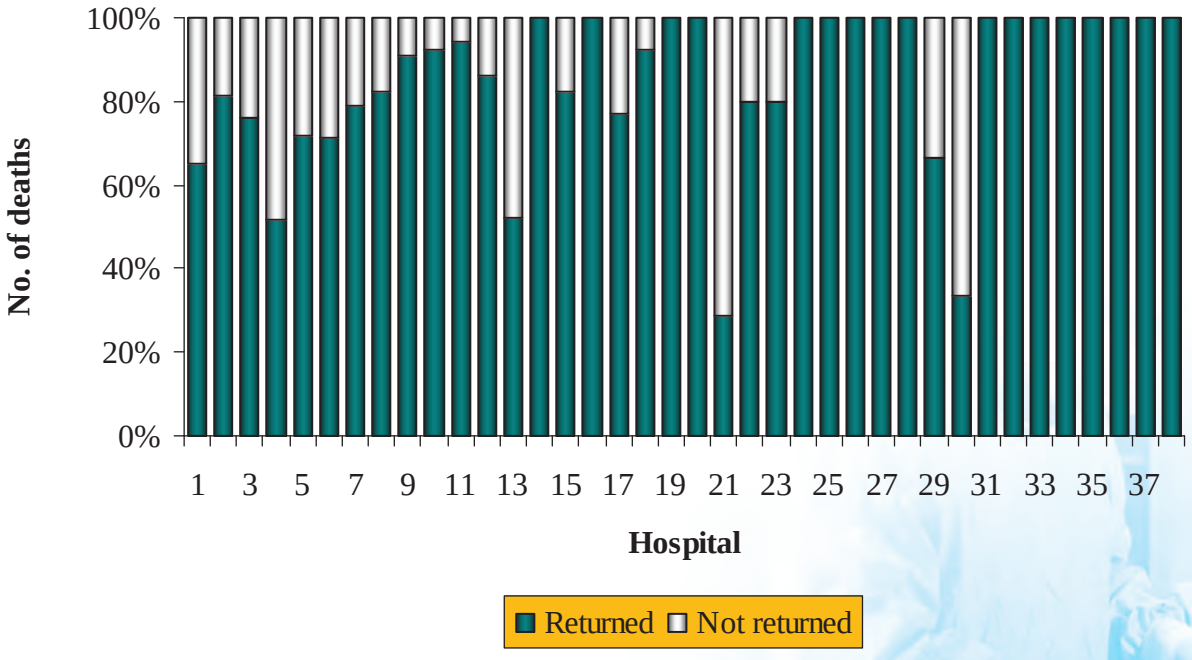


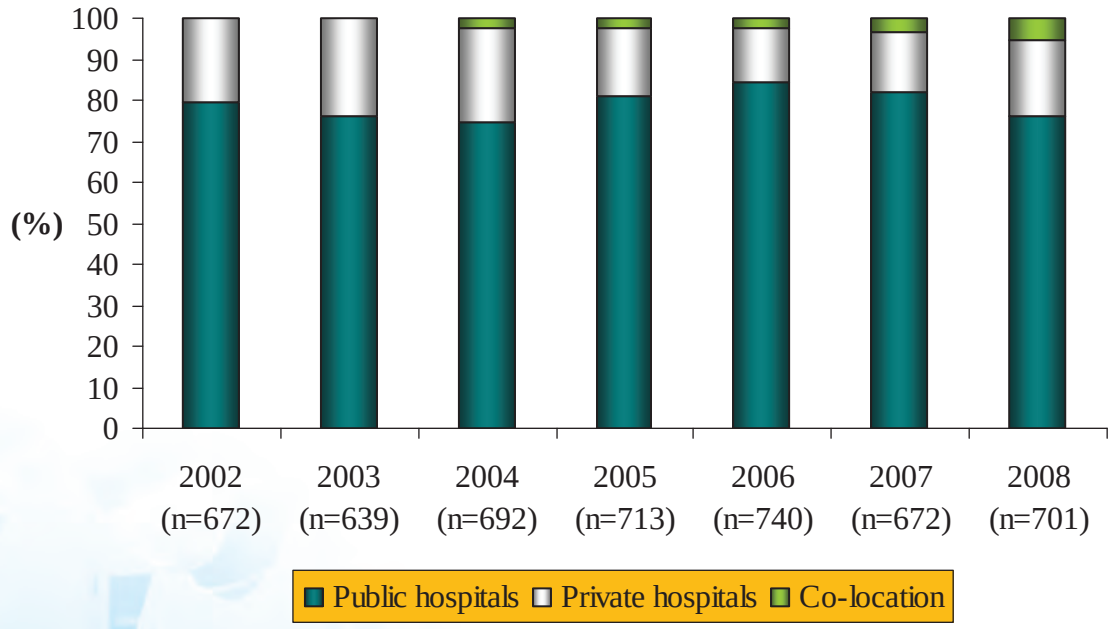
Table 3.3: Cases where the patient was transferred from one hospital to another hospital

	No. of cases (%)							
	2002	2003	2004	2005	2006	2007	2008	Total
Completed cases[a]	402	388	456	459	484	421	375	2985
Patient transferred	93 (23)	104 (27)	110 (24)	107 (23)	130 (27)	99 24)	95 (25)	738 (25)

[a] These data were computed on completed cases (including terminal care case). Neurosurgical cases where the question was not on the neurosurgical proforma have been excluded. There are also missing data (n=463) for these fields. Numbers of completed cases are reflected in Table 3.1

The cases that involve a transfer between hospitals, typically between a regional and metropolitan facility, remained stable between 2002 and 2008.

Figure 3.5: Patients admitted to public or private hospitals in WA (2002–2008) (n=4829)



Note: Co-location refers to a case in which the patient has been in both public and private hospital.

Comment

Eighty per cent of deaths occurred in public hospitals with 73% of deaths occurring in three public hospitals within Western Australia.

3.4 Second-line assessment

KEY POINTS

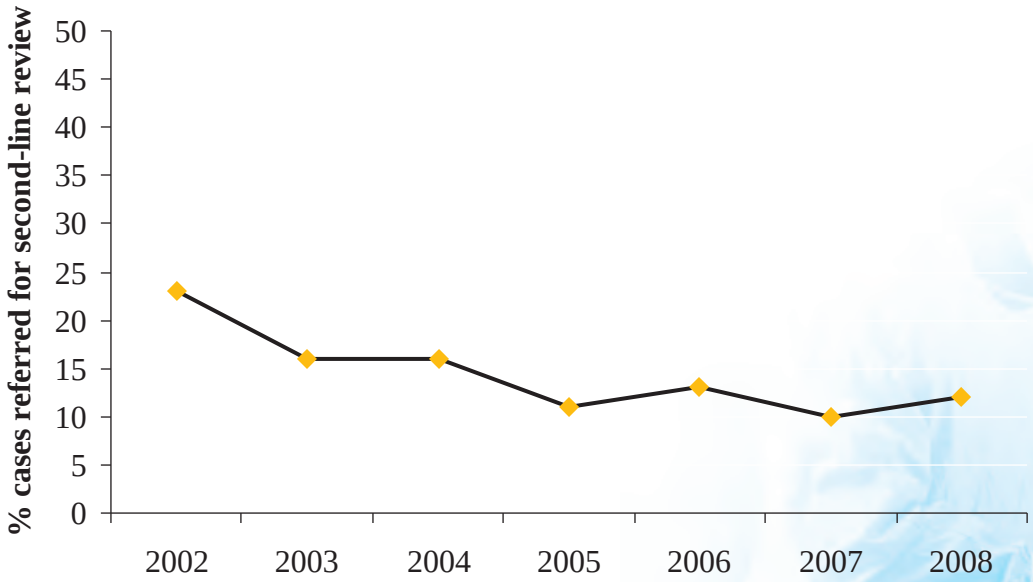
- Request for second-line assessors has decreased during the audit period.

Table 3.4: Cases referred for second-line assessment

No. of cases (%)								
	2002	2003	2004	2005	2006	2007	2008	Total
Completed cases [a] and cases with second-line assessment in progress	411	383	471	523	598	584	463	3433
Cases referred for second-line assessment	95 (23)	62 (16)	74(16)	60 (11)	75 (13)	57 (10)	55 (12)	478 (14)
Proforma returned, first-line assessment in progress	0	0	0	0	2	8	29	39

[a] Terminal care cases were excluded

Figure 3.6: Proportion of cases referred for second-line assessment (2002–2008) (n=478)



Comment

The proportion of cases referred for second-line review has been consistently between 10% and 15% in the last 4 years. The need for a second-line assessment can often be avoided if the consultant completes the WAASM proforma in full and attaches any relevant letters etc. WAASM would again like to encourage all surgeons to fully complete the surgical proformas and provide as much additional detail as possible.

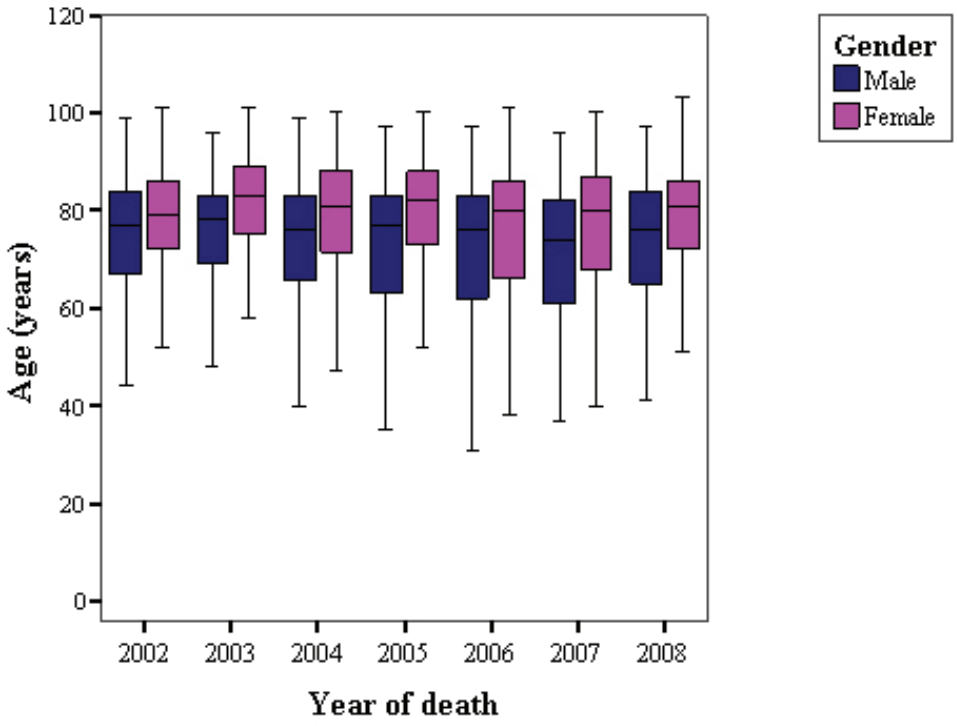
Figure 4.1 shows that the gender trend changes as age increases. Males predominate in the 41-50, 51-60 and 71-80 year ranges, whilst females predominate in the 81-90 and >91 year age range. This was likely due to the longer average life expectance of women.

Figures 4.2 and 4.3 are box and whisker plots, in which:

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

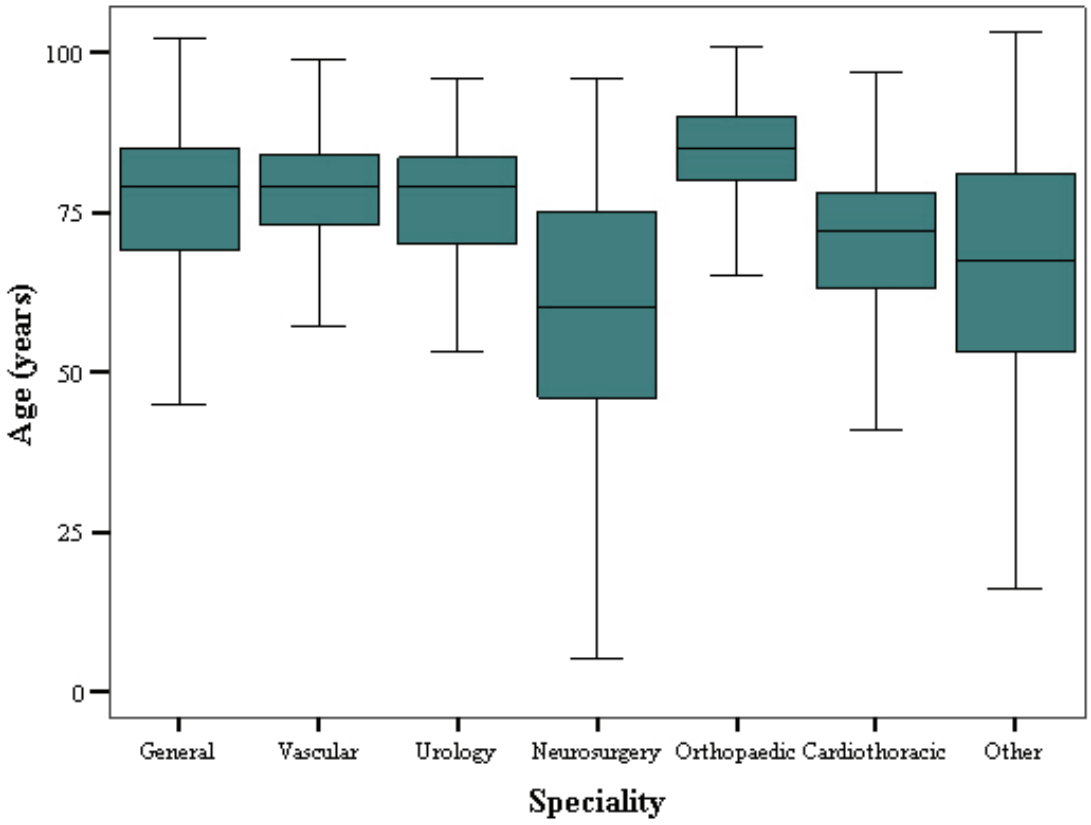
Outliers and extreme values can be displayed at separate points, however in figures 4.2 and 4.3 they have been excluded.

Figure 4.2: Age distribution of audited patients (2002–2008) (n=3328)



Note: Outliers and extreme values are excluded.

Figure 4.3: Age of audited patients by speciality (2002-2008) (n=3328)



Other = obstetrics & gynaecology, ophthalmology & otolaryngology, paediatrics and plastic surgery.

As expected, age of patients varies depending on the speciality, with patients in the neurosurgery category being appreciably younger than the other specialities.

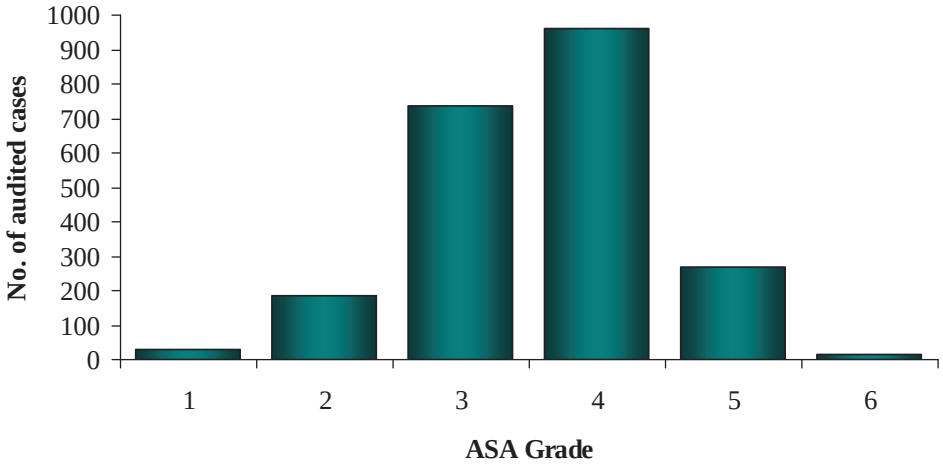
4.1.2 American Society of Anesthesiologists (ASA) grades

The American Society of Anesthesiologists grades are an internationally recognised classification of preoperative physical status (see Tables 4.3 and 4.4).

Table 4.3: ASA Grades

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

Figure 4.4: ASA Grades (2002-2008) (n=2196)



Note: Data missing for 1132 cases.

Comment

Seventy seven per cent of patients have an ASA grade of either 3 or 4, meaning that they were assessed as either having a moderate or severe degree of systemic disease upon admission to hospital.

ASA grade is a simple but important measure of comorbidity and is routinely recorded on the anaesthetic record. The important data point was missing in half the forms returned to WAASM. Surgeons need to address this. It will become a critical issue if any sort of analysis with risk adjustment is undertaken.

4.1.3 Cause of death

The most common causes of death among audited cases are shown in Table 4.4. The most common causes of death in those aged less than 70 years were brain haemorrhage and heart failure; in those older than 70 years the main causes of death were heart failure and septicaemia. Details on cause of death for all patients can be found in Appendix 1.

Table 4.4: Most common causes of death in audited cases (2002–2008) (n=3265)

CAUSE OF DEATH	n	(%)
Cases <70years old (n=928)		
Brain haemorrhage	116	13
Heart failure	103	11
Malignancy	93	10
Multiple organ failure	84	9
Septicaemia	82	9
Severe brain injury	71	8
Cases ≥ 70 years old (n=2337)		
Heart Failure	531	23
Septicaemia	233	10
Multiple organ failure	188	8
Respiratory failure	155	7
Pneumonia	148	6
Malignancy	141	6

Note: data missing for 63 of the 3328 cases.

4.1.4 Comorbidity

Surgeons are asked to indicate if there are any significant comorbidities. Neurosurgeons do not complete this question in their form and are therefore excluded from this analysis (Figure 4.5)

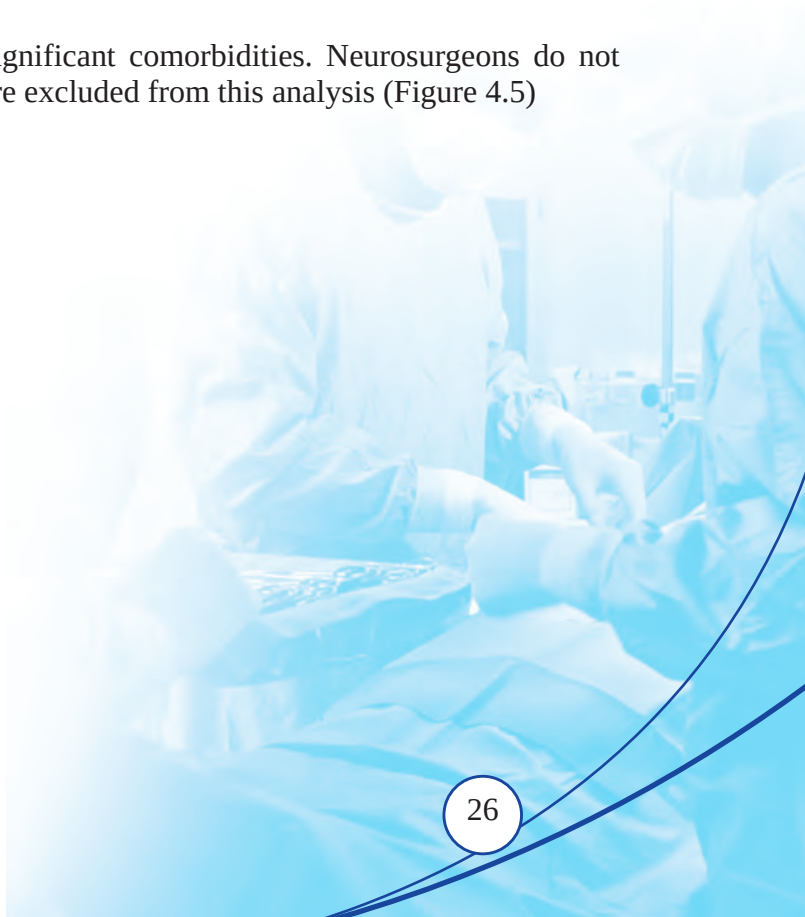
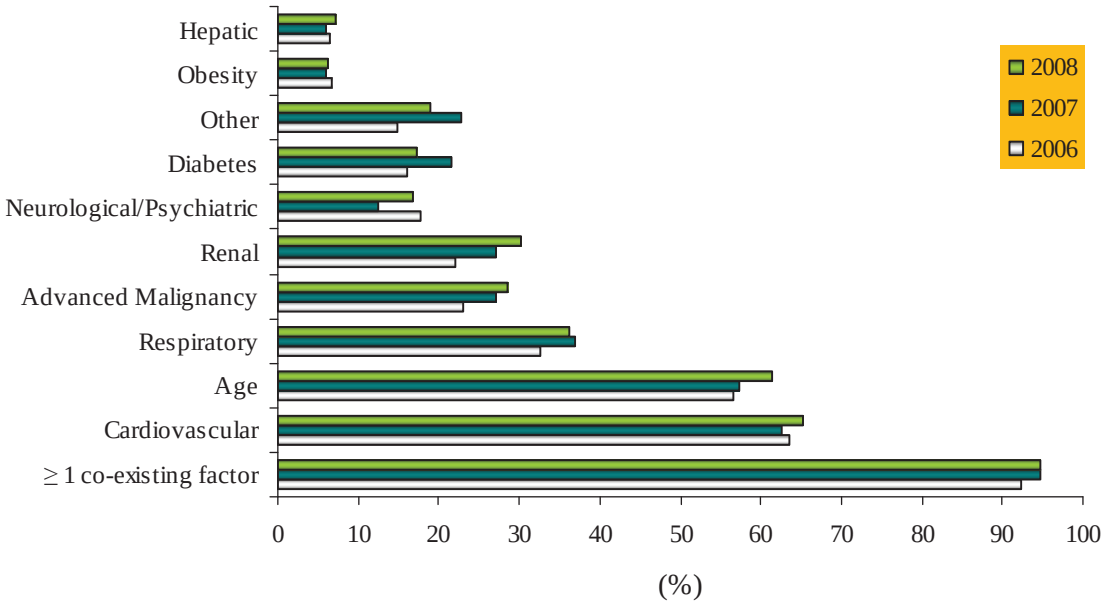


Figure 4.5: Comorbidity status in completed cases 2006, 2007 & 2008



Note: neurosurgical cases excluded.

Comment

Over 90% of patients had more than one co-existing factor for the last three years of the audit. Surgical risk clearly increased based upon the pre-existing patient condition.

4.1.5 High dependency and intensive care units

Table 4.5 shows the use (actual and perceived) of a high dependency or intensive care unit.

Table 4.5: Actual use & assessor opinion of use of a high dependency or intensive care unit

No. of cases (%)		2002 (n=397)	2003 (n=386)	2004 (n=429)	2005 (n=463)	2006 (n=492)	2007 (n=443)	2008 (n=382)
Use of	ICU	158 (40)	162 (42)	166 (39)	176 (38)	200 (41)	167 (38)	127 (33)
	HDU	70 (18)	75 (19)	80 (19)	77 (17)	71 (17)	86 (19)	61 (16)
Assessors opinion on cases where patient was not admitted to either ICU or HDU								
ICU should have been used		11 (3)	8 (2)	19 (4)	14 (3)	16 (3)	13 (3)	8 (2)
HDU should have been used		71 (18)	37 (10)	38 (9)	38 (8)	30 (6)	41 (9)	37 (10)

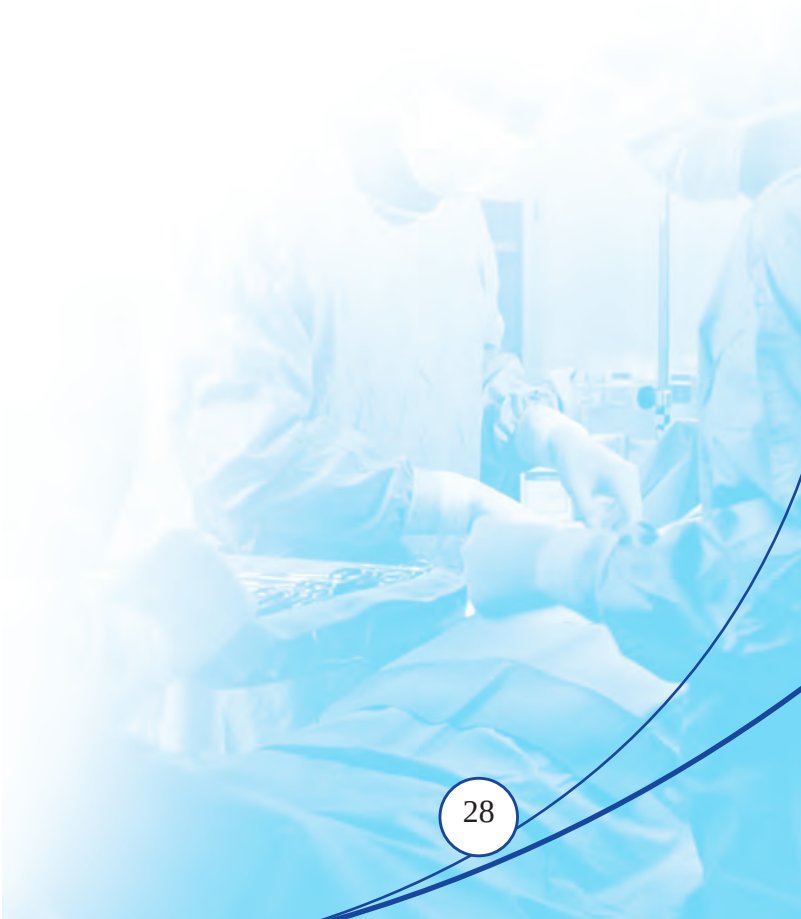
Note: Number of cases based on completed cases and excludes neurological cases. ICU = intensive care unit, HDU = high dependency unit

Comment

Once again WAASM has noted approximately 10% of patients who might have benefited from HDU care were not admitted to such a unit. Doubtless there will be other patients who did not die

who might also have benefited from HDU care. This is an issue for all hospitals, notably private hospitals that are not funded for HDU care.

Patients having an elective aortic aneurysm repair, which has an overall 2% postoperative mortality, are routinely admitted to ICU or HDU. Yet patients over eighty years having a colonic resection, which carries an overall 10% mortality, cannot routinely access an HDU bed.



4.2 Comparison of surgeons' and assessors' views

KEY POINTS

- Assessors reported more areas of concern or adverse events than the associated surgeon.

Incidents reported by the surgeons and assessors were compared (Table 4.6). This system of classifying events was introduced in November 2003; hence data reported is from 2004 to 2008.

Table 4.6: Surgeons' & assessors' views on performance (2004–2008)

Year	Surgeon	Assessor				
		Consideration	Concern	Adverse event	No event	Total
2004	Consideration	22	15	5	23	65
	Concern	5	7	9	4	25
	Adverse event	3	0	6	3	11
	No event	43	23	16	286	368
	Total	73	45	36	316	470
2005	Consideration	14	15	5	15	49
	Concern	3	9	6	5	23
	Adverse event	1	2	6	1	10
	No event	29	22	24	366	441
	Total	47	48	41	387	523
2006	Consideration	14	7	7	15	43
	Concern	3	10	4	9	26
	Adverse event	3	5	9	2	19
	No event	36	25	18	424	503
	Total	56	47	38	450	591
2007	Consideration	8	9	6	20	43
	Concern	4	9	2	5	20
	Adverse event	1	1	9	2	13
	No event	33	13	29	362	437
	Total	46	32	46	389	513
2008	Consideration	12	7	5	10	34
	Concern	1	8	4	1	14
	Adverse event	1	3	5	2	11
	No event	37	10	24	307	378
	Total	51	28	38	320	437

Notes:

1. Data can only be analysed when both surgeon & assessor have completed the proforma.
2. Missing data will account for differences in numbers.

Figure 4.6 compares the proportion of adverse events reported by surgeons and assessors for the same cases. Each year the assessors reported more adverse events than the treating surgeons.

Kappa scores measure the level of agreement or variation between two observers. Kappa scores were obtained for surgeon and assessors view on performance. The levels of agreement (Kappa score) by year can seen in table 4.7.

Figure 4.6: Percentage of adverse events reported by surgeons & assessors

Table 4.7: Level of agreement between surgeons' & assessors' views on performance

Year	Kappa score (95% confidence interval)
2004	0.29 (0.25 – 0.33)
2005	0.32 (0.28 – 0.37)
2006	0.33 (0.29 – 0.37)
2007	0.29 (0.25 – 0.33)
2008	0.32 (0.28 – 0.36)

Interpretation of Kappa scores: <0 = no agreement, 0.0-0.19 = poor agreement, 0.20-0.39=fair agreement, 0.40-0.59 = moderate agreement, 0.60-0.79 = substantial agreement, 0.80-1.00 = almost perfect agreement.

Comment

From previous annual reports, it appears that surgeons under-report events that the assessors believe represent an area of concern or adverse events. For example in 2008, assessors reported thirty-eight adverse events compared to eleven reported by the surgeon.

WAASM data shows this difference has remained unchanged over six years. Although some have argued there is a subjective element to any such determination, this is not the case in many instances. A pulmonary embolus or anastomotic leak is always an adverse event, even if not preventable. Yet surgeons frequently do not record such events as an adverse event.
WAASM will be analysing these cases in greater detail and present a report next year. Meanwhile, these data strongly emphasise the essential role of external independent reviews.

4.3 Clinical events

KEY POINTS

- Assessors considered that preventable adverse events caused death in less than 1% of cases in 2008.

4.3.1 Reported areas for consideration, of concern and adverse events

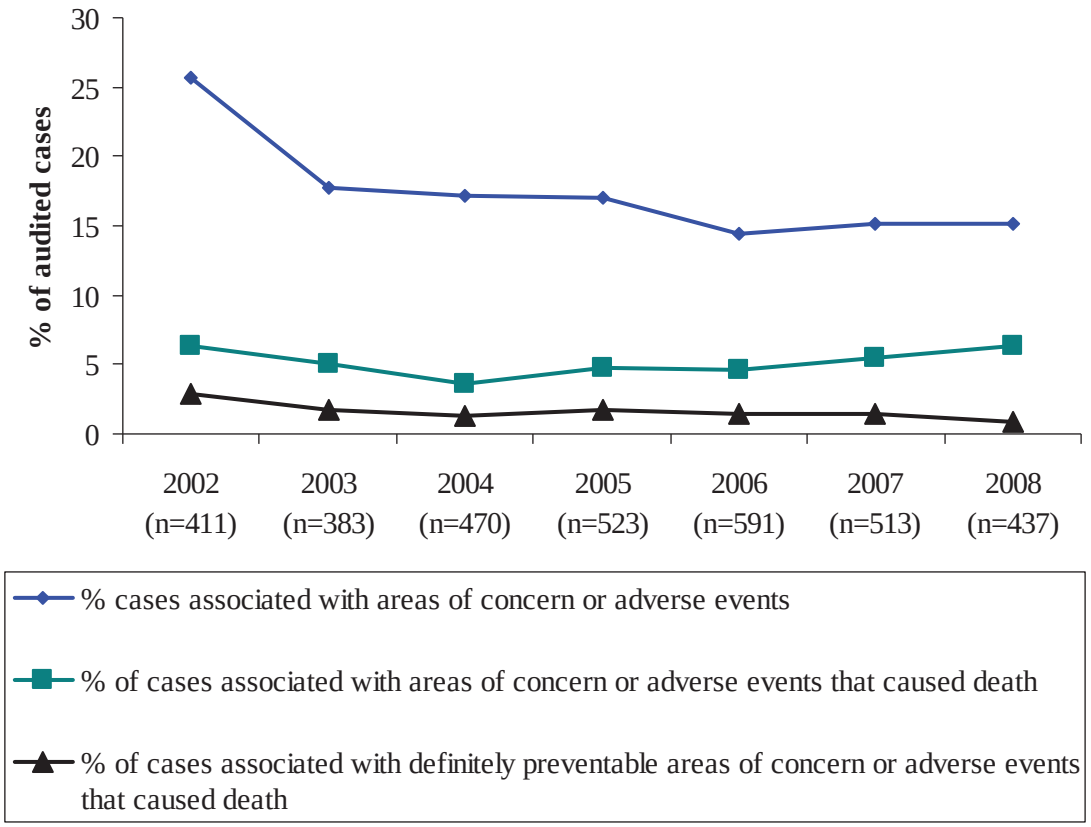
Table 4.8: Audited deaths associated with areas for consideration, of concern, or adverse events as reported by assessors (most significant event only)

No. of cases (%)	2002 (n=411)	2003 (n=383)	2004 (n=470)	2005 (n=523)	2006 (n=591)	2007 (n=513)	2008 (n=437)	Total (n=3328)
Area for consideration	17	32	73	47	56	46	51	322 (10)
Area for concern	42	33	45	48	47	32	28	275 (8)
Adverse event (AE)	64	35	36	41	38	46	38	298 (9)
AE that caused death	26	19	17	25	27	28	28	170 (5)
AE that caused death, considered definitely preventable	12 (3)	7 (2)	6 (1)	9 (2)	9 (2)	7 (1)	4 (<1)	54 (2)

Comment

In 17% of cases, assessors considered that there was an area of concern or adverse event. Over the total audit period (2002 to 2008), in 2% of cases the assessor considered that the adverse event that caused death was preventable (Table 4.8). Figure 4.7 shows the percentage of audited cases associated with adverse events or areas of concern (2002-2008)

Figure 4.7: Cases associated with adverse events or areas of concern (2002-2008)



4.4 Admissions

KEY POINTS

- Over the period 2002-2008, 79% of cases were admitted to public hospitals.
- Of the 2612 cases admitted to public hospitals, 14% were elective admissions. Of the 597 cases admitted to private hospitals, 40% were elective admissions.
- Of the emergency cases admitted to public hospitals, 67% underwent an operation, compared to 86% of emergency cases admitted to private hospitals ($P<0.001$).
- The proportion of area of concern or adverse events associated with cases that underwent operation (elective and emergency admissions) was not significantly different between public and private hospitals ($P=0.110$)[a].
- Considering all hospitals, the proportion of areas of concern or adverse events associated with emergency admissions (14%) was significantly less than the proportion of events associated with elective admissions (30%) ($P<0.001$)[a].

[a] Pearson's Chi-square test

4.4.1 Overview of admissions

The audit data with regards to admission cover:

- the type of hospital (public or private)
- the type of admission (emergency or elective)
- whether the patient underwent an operation (operative or non-operative)

The results presented in this section examine these different areas.

Table 4.9: Emergency and public hospital admissions of audited patients

	2002	2003	2004	2005	2006	2007	2008	Total
Audit process completed	411	383	470	523	591	513	437	3328
% of emergency admissions	73	80	81	81	85	83	83	80
% of public hospital admissions	79	77	75	81	84	82	76	79

Figure 4.8: Emergency and elective admissions in audited patients (2002-2008) (n=3328)

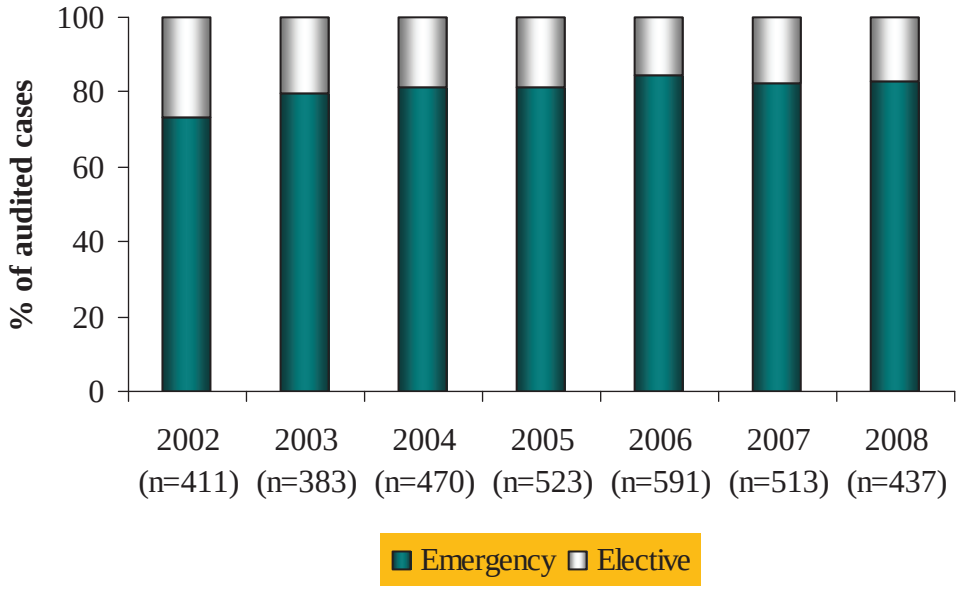
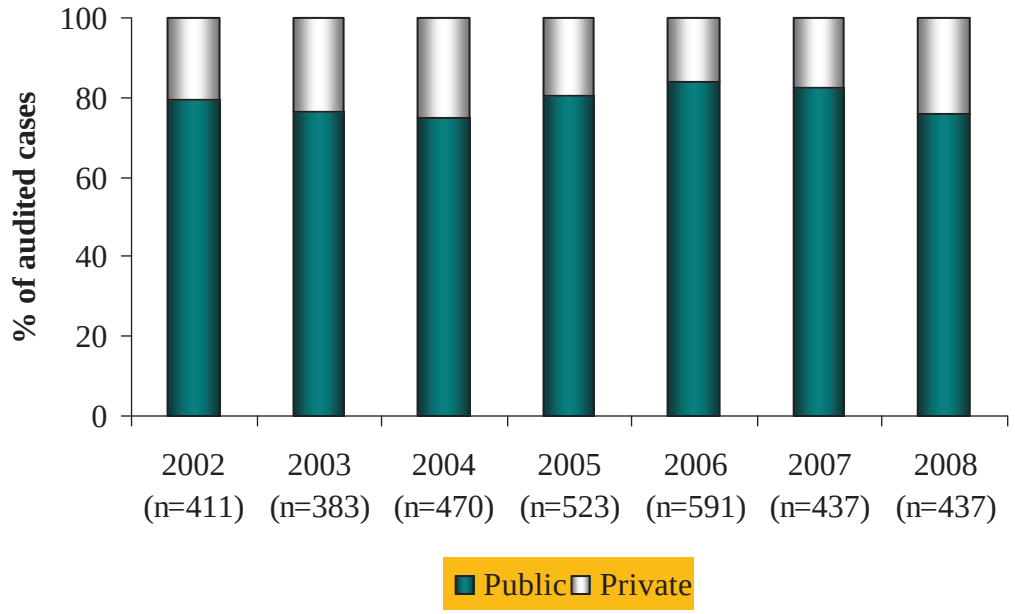


Figure 4.9: Admission of cases to public and private hospitals (n=3328)



4.4.2 Relationship between factors related to admission data

KEY POINTS

- 74% of cases underwent one or more operations.
- 95% of the elective cases underwent an operation. Among elective cases undergoing surgery, the proportion admitted to private hospitals (96%) was not significantly different from the proportion admitted to public hospitals (95%) (*P*=0.808).[a]
- Of the 2668 emergency admissions, 70% underwent an operation. A significantly higher proportion of emergency admissions admitted to private hospitals underwent surgery compared to those admitted as an emergency to public hospitals (*P*<0.001).[a]
- Among emergency admissions undergoing surgery and associated with areas of concern or adverse events, the proportion admitted to private hospitals (16%) was not significantly different from the proportion admitted to public hospitals (21%) (*P*=0.269).[a]
- Among elective cases undergoing surgery and associated with areas of concern or adverse events, the proportion admitted to private hospitals (29%) was not significantly different to the proportion admitted to public hospitals (35%) (*P*=0.220).[a]
- In those cases undergoing surgery, the proportion of elective cases associated with an area of concern or adverse event (29%) was significantly greater than the proportion of emergency cases (16%) (*P*<0.001).[a]

[a] Pearson's Chi-square test

Table 4.10: Elective and emergency admissions to public and private hospitals (all cases, 2002-2008)

No. of cases (%)				
		Elective	**Emergency**	**Total**
(a) All cases - elective & emergency admissions, public & private hospitals	**Private**	249 (42)	348 (58)	597
	Public	360 (14)	2252 (86)	2612
	Co-location	12 (15)	68 (85)	80
	Total	621 (19)	2668 (81)	3289
(b) Cases that underwent an operation – elective & emergency admissions, public & private hospitals	**Private**	238 (96)	299 (86)	537 (90)
	Public	342 (95)	1518 (67)	1860 (71)
	Co-location	12 (100)	41 (60)	53 (66)
	Total	592 (95)	1858 (70)	2450 (74)
(c) Cases that underwent an operation that were associated with an area of concern or adverse event‡	**Private**	70 (29)	47 (16)	117 (22)
	Public	118 (35)	322 (21)	440 (24)
	Co-location	3 (25)	9 (22)	12 (23)
	Total	191 (32)	378 (20)	569 (23)

Note: Co-location refers to a case in which the patient has been in both public and private hospital. Missing data will account for differences in numbers. (Overall 39 cases are missing.)
Percentages relate to the figures given in part (a) of the table (all cases).
‡Percentages relates to the figures given in part (b) of the table.

For example:
Part (b) = Out of 249 private elective cases, 238 (96%) underwent an operation.
Part (c) = Out of 238 private elective cases that underwent an operation, 70 (29%) were associated with an area of concern or adverse event.

Table 4.11: Emergency admissions to private and public hospitals (2002–2008)

No. of cases (%)		
(a) By speciality		
	Emergency admissions to private hospitals (n=348)	**Emergency admission to public hospitals (n=2252)**
Speciality:		
General	158 (45)	832 (37)
Orthopaedics	84 (24)	520 (23)
Urology	31 (9)	50 (2)
Cardiothoracic	28 (8)	120 (5)
Vascular	28 (8)	267 (12)
Neurosurgery	13 (4)	391 (17)
Other	6 (2)	72 (3)
Underwent operation	299 (86)	1518 (67)
(b) Emergency admissions where no operation was performed		
	Emergency admission to private hospital (n=50)	**Emergency admission to public hospital (n=743)**
Reason for no operation:		
Active decision not to operate	26 (52)	338 (45)
Not a surgical problem	7 (14)	95 (13)
Patient refused operation	5 (10)	48 (6)
Rapid death	7 (14)	68 (9)
Missing data	5 (10)	194 (26)

Note: Other includes ENT, ophthalmology, obstetrics & gynaecology, plastic.

Figure 4.10: Percentage of elective admissions that underwent an operation (2002–2008) (n=622)

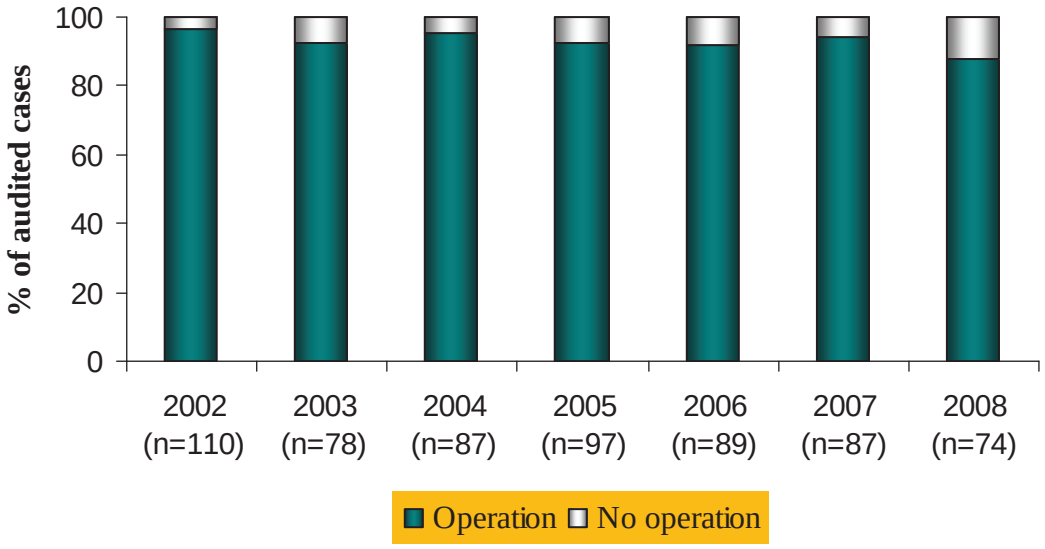


Figure 4.11: Percentage of emergency admissions that underwent an operation (2002–2008) (n=2670)

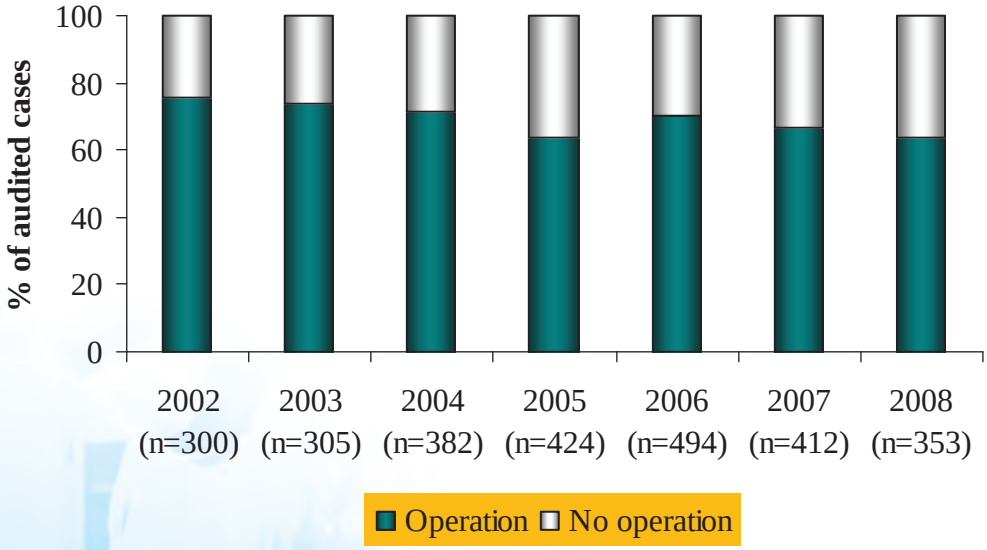


Figure 4.12: Cumulative proportion of operative cases associated with areas of concern or adverse events – elective and emergency admissions (2002–2008) (n=2395)

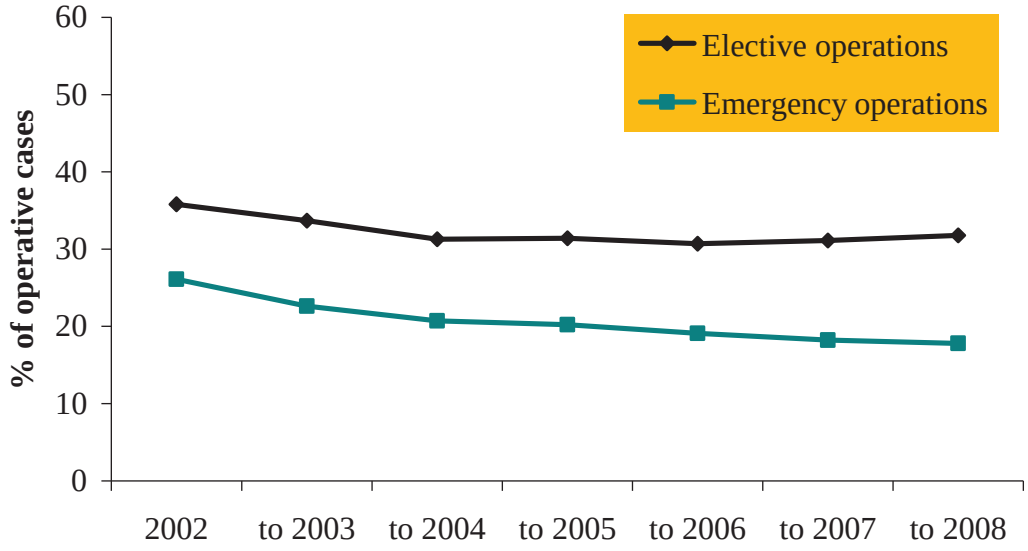
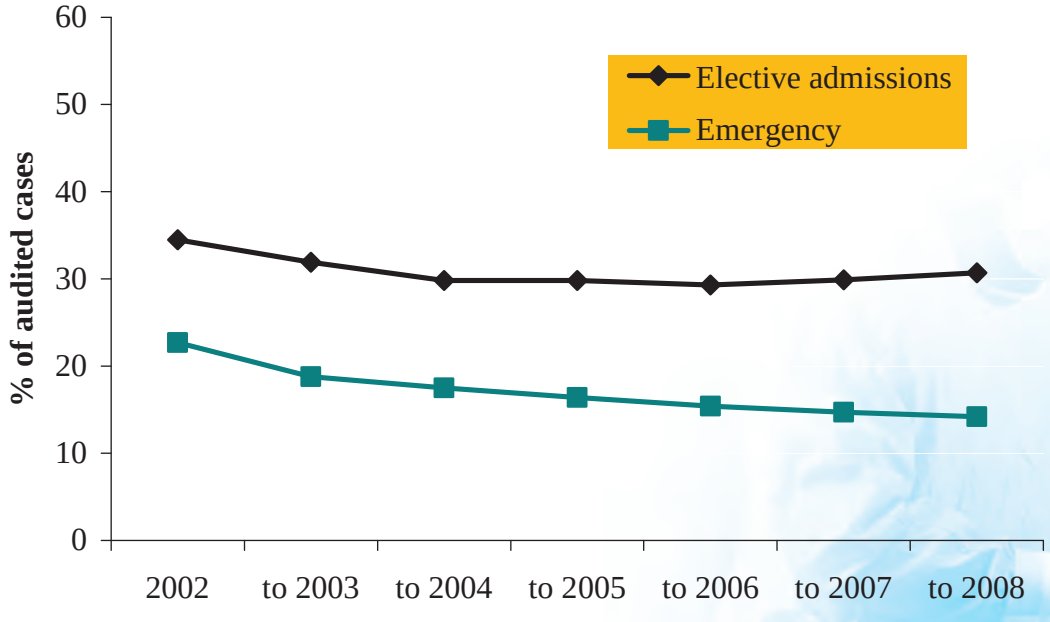


Figure 4.13: Cumulative proportion of all audited emergency and elective admissions associated with areas of concern or adverse events (2002–2008) (n=3292)



4.4.3 Areas of concern or adverse events associated with emergency or elective admission

Table 4.12: Emergency & elective admissions that were associated with areas of concern or adverse events (2002–2008)

	Areas of concern or adverse events Yes	No	(%Total) Total
Elective admission	**191 (6)**	**431 (13)**	**622 (19)**
Emergency admission	**378 (11)**	**2292 (70)**	**2670 (81)**
Total	**569 (17)**	**2723 (83)**	**3292**

Note: Data missing on 36 cases; cross tabulation only on complete data.

Table 4.13: All areas of concern or adverse events associated with elective admissions (2002–2008) (n=622)

Area of concern or adverse event	No.	(%)
Related to open surgery	73	12
Incorrect or inappropriate therapy	71	11
General complications	31	5
Assessment problems	22	4
Failure to use facilities	21	3
Delays	20	3
Drug-related problems	8	1
Related to endoscopic surgery	7	1
Patient factors	7	1
Staff problems	5	<1
Communication failures	5	<1
Anaesthesia-related problems	5	<1
Related to laparoscopic surgery	2	<1
Monitoring problems	2	<1
Diagnosis-related problems	1	<1
Related to radiological surgery	1	<1
TOTAL	281	

Note: Some cases associated with more than one event.

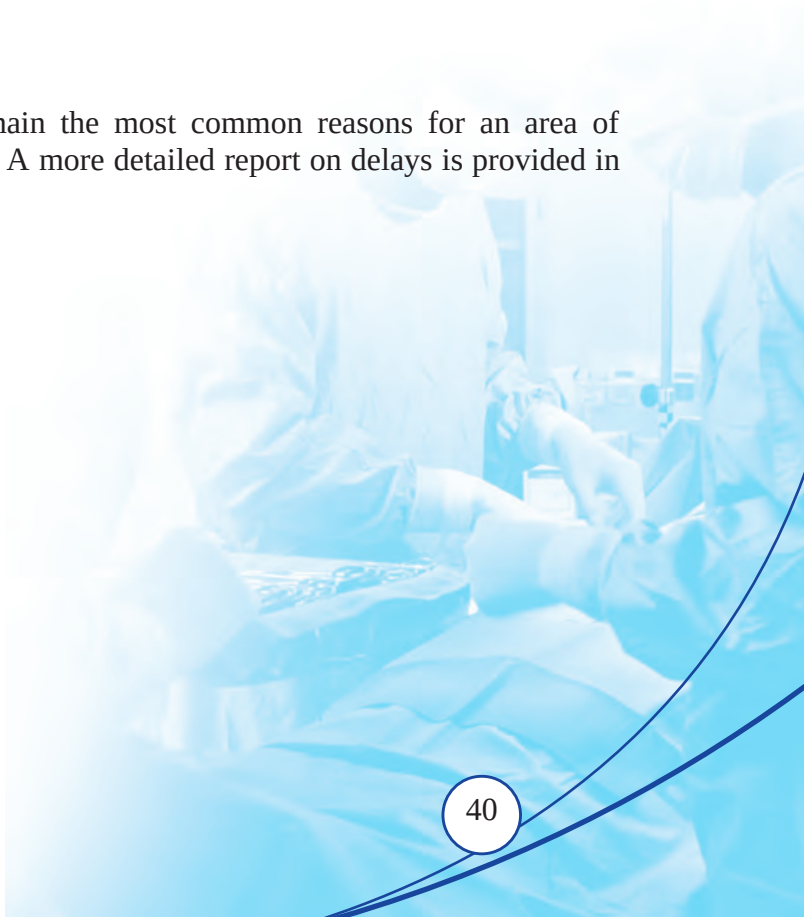
Table 4.14: All areas of concern or adverse events associated with emergency admissions (2002–2008) (n=2670)

Area of concern or adverse event	No.	(%)
Incorrect or inappropriate therapy	164	6
Delays	142	5
Related to open surgery	61	2
Failure to use facilities	55	2
General complications	49	2
Patient factors	31	1
Diagnosis-related problems	25	1
Drug-related problems	24	1
Communication failures	23	<1
Staff problems	10	<1
Assessment problems	10	<1
Related to endoscopic surgery	9	<1
Transfer problems	8	<1
Related to radiological surgery	6	<1
Related to laparoscopic surgery	5	<1
Monitoring problems	5	<1
Anaesthesia-related problems	4	<1
Resuscitation problems	4	<1
Problems with blood/blood products	3	<1
Equipment-related problems	2	<1
TOTAL	640	

Note: Some cases are associated with more than one event.

Comment

Incorrect or inappropriate therapy and delays remain the most common reasons for an area of concern or adverse event in emergency admissions. A more detailed report on delays is provided in Section 4.8 of this report.



4.5 Operative and non-operative cases

KEY POINTS

- 25% of cases did not undergo an operation.
- In 1952 cases where an operation was undertaken, 6% of cases were abandoned.

4.5.1 Operative cases

Data on operative cases appears below.

Table 4.15: Operations performed (2002-2008) (n=3323)

No. of cases (%)	2002 (n=411)	2003 (n=383)	2004 (n=470)	2005 (n=522)	2006 (n=589)	2007 (n=511)	2008 (n=437)	Total (n=3323)
No operation	78 (19)	86 (23)	111 (24)	152 (29)	151 (26)	137 (27)	129 (30)	844 (25)
1 operation	234 (57)	220 (57)	277 (59)	288 (55)	315 (54)	288 (56)	227 (52)	1849 (56)
2 operations	64 (16)	48 (12)	55 (12)	51 (10)	80 (14)	56 (11)	54 (12)	408 (12)
3+ operation	35 (9)	29 (8)	27 (6)	31 (6)	43 (7)	30 (6)	27 (6)	222 (7)

Note: data missing on 5 cases.

Figure 4.14: Number of operations (2002–2008) (n=3323)

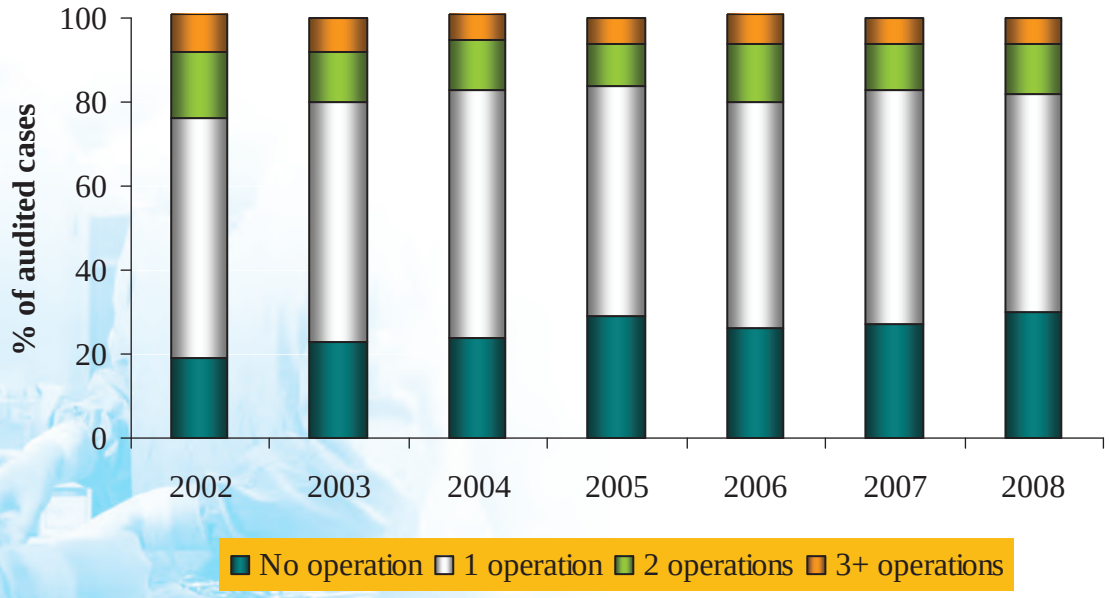
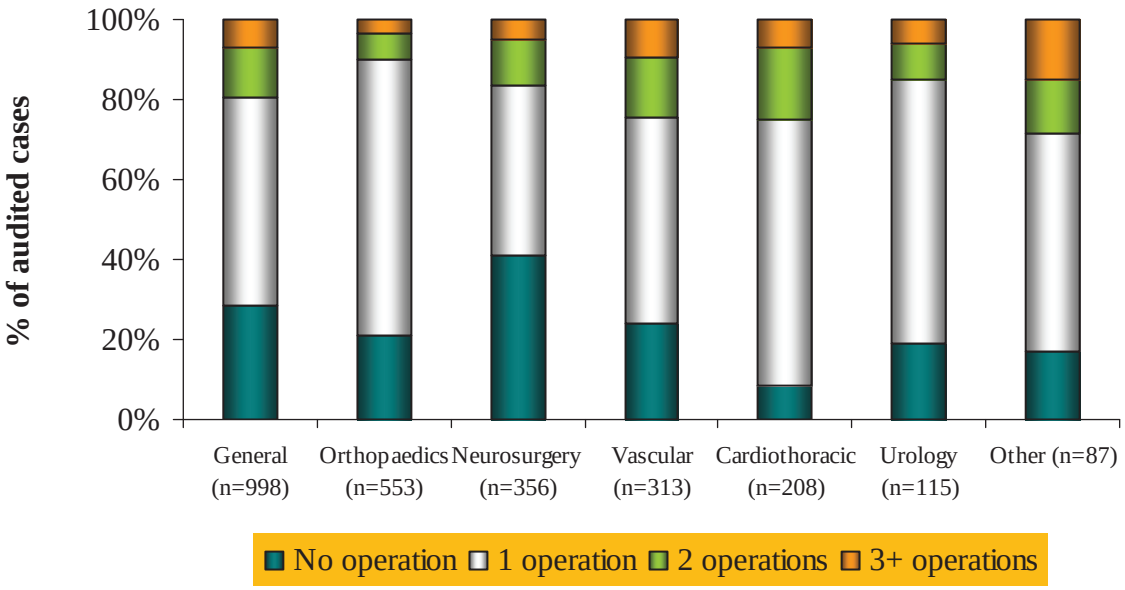


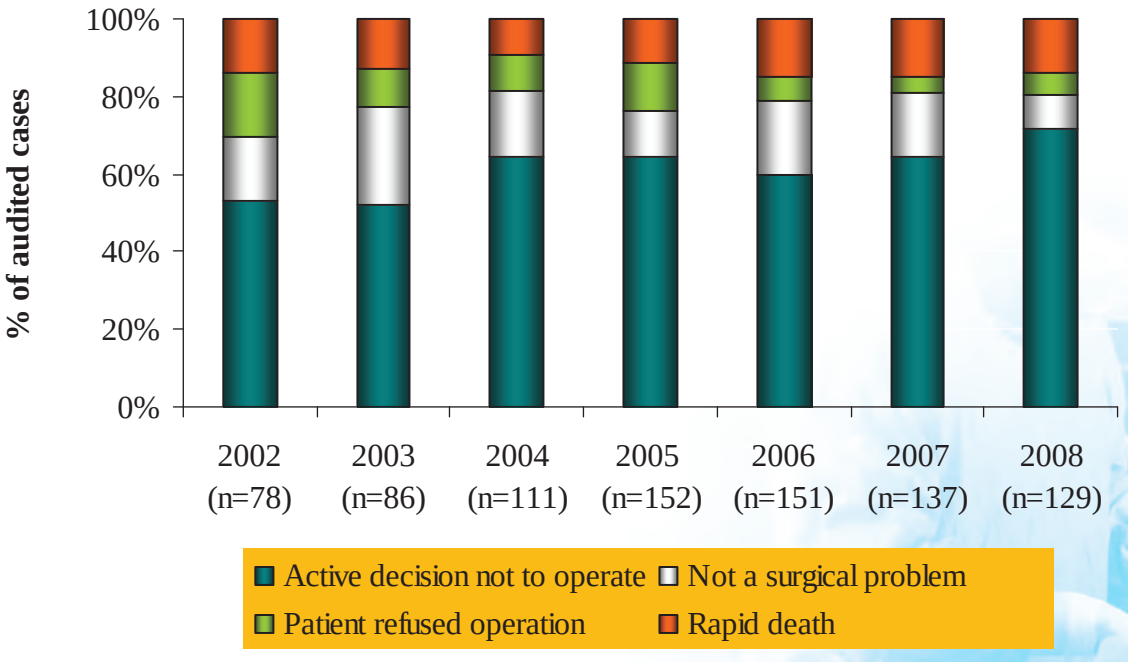
Figure 4.15: Number of operations by speciality (2002–2008) (n=3323)



4.5.2 Non-operative cases

Data on non-operative cases appears below.

Figure 4.16: Reasons for no operation, all specialities (2002–2008) (n=844)



Note: Some cases are associated with more than one reason for no operation.

Figure 4.16 illustrates a growing trend towards an active decision on the part of the surgeon, patient and/or next of kin not to operate.

Table 4.16: Operations abandoned, including patients undergoing one or more surgical procedures (2002–2008)

	2002	2003	2004	2005	2006	2007	2008	Total
1st operation	19	22	11	19	13	14	12	110
2nd operation	6	2	2	4	3	2	2	21
3rd operation	2	3	1	4	0	1	1	12
Total # of abandoned cases	27	27	14	27	16	17	15	143
(%)	(8)	(9)	(4)	(8)	(4)	(5)	(5)	(6)
Total # of operative cases	**333**	**297**	**356**	**356**	**424**	**360**	**294**	**2420**

4.5.3 Risk of death before surgery

Both surgeons and assessors are required to categorise the patient's pre-operative risk of death following an operation(s) (Table 4.17).

Table 4.17: Comparison of views of surgeons & assessors on pre-operative risk of death in cases undergoing an operation

No. of cases (%) Assessors' view of risk	Surgeons' view of risk Minimal/small	Moderate	Considerable/Expected	Total
Minimal/small	113 (5)	55 (2)	41 (2)	209 (9)
Moderate	96 (4)	223 (9)	225 (9)	544 (22)
Considerable/expected	105 (4)	388 (16)	1177 (49)	1670 (69)
Total	314 (13)	666 (27)	1443 (60)	2423

Kappa measurements can only be calculated on complete information from both surgeon and assessor; Kappa score (K)=0.27, 95% CI 0.25–0.29, indicating that surgeons and assessor were in 'fair agreement'.

4.5.4 Areas of concern or adverse events associated with operative and non-operative cases

Areas of concern and adverse events are depicted in Figure4.17 and 4.18

Figure 4.17: Cumulative proportion of cases associated with areas of concern or adverse events in all participating hospitals

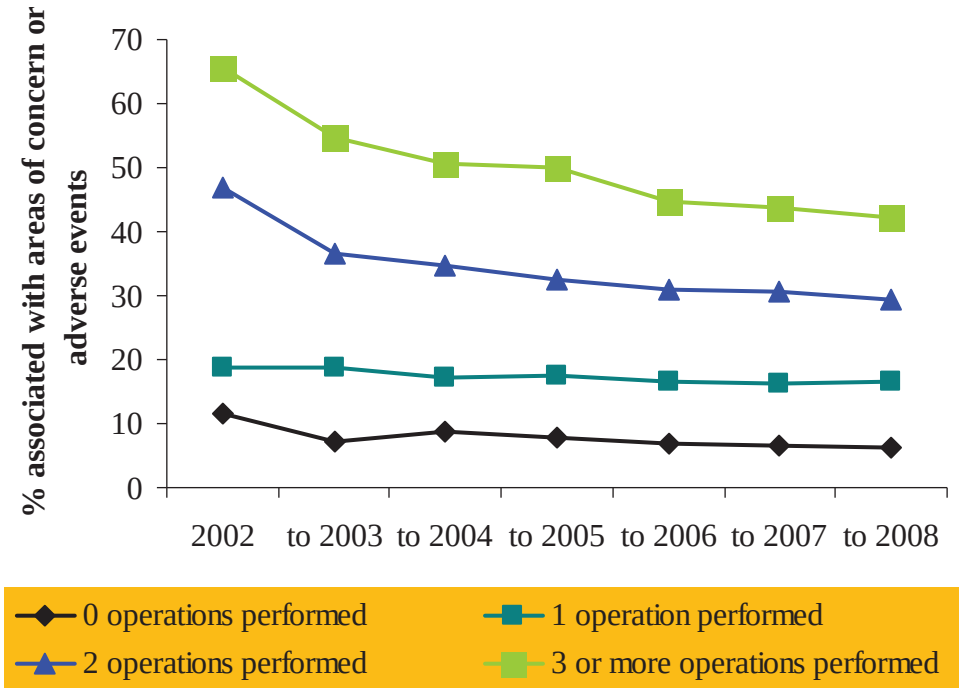
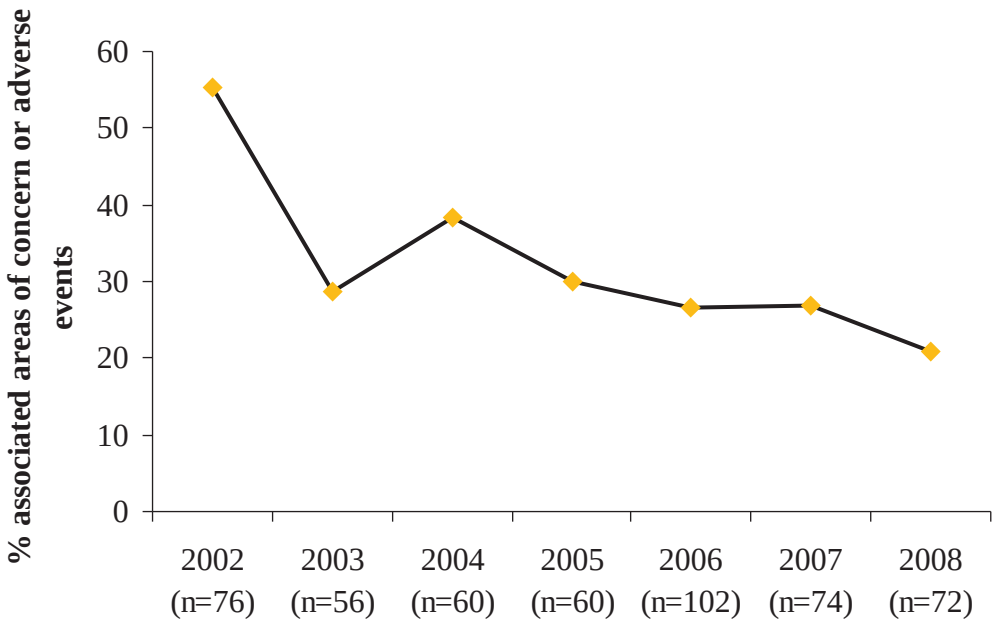


Figure 4. 18: Areas of concern or adverse events associated with cases where more than one operation was performed in Western Australian teaching hospitals (n=500)



4.5.5 Unplanned return to theatre

Unplanned return to theatre is depicted in Table 4.18.

Table 4.18: Unplanned return to theatre (2004-2008)

	2004	2005	2006	2007	2008	Total
Total number of cases where an operation was performed	356	356	424	360	294	1790
Cases where surgeons reported an unplanned return to theatre (%)	50 (14)	55 (15)	59 (14)	41 (11)	45 (15)	250 (14)

4.6 Grade of surgeon (teaching hospitals)

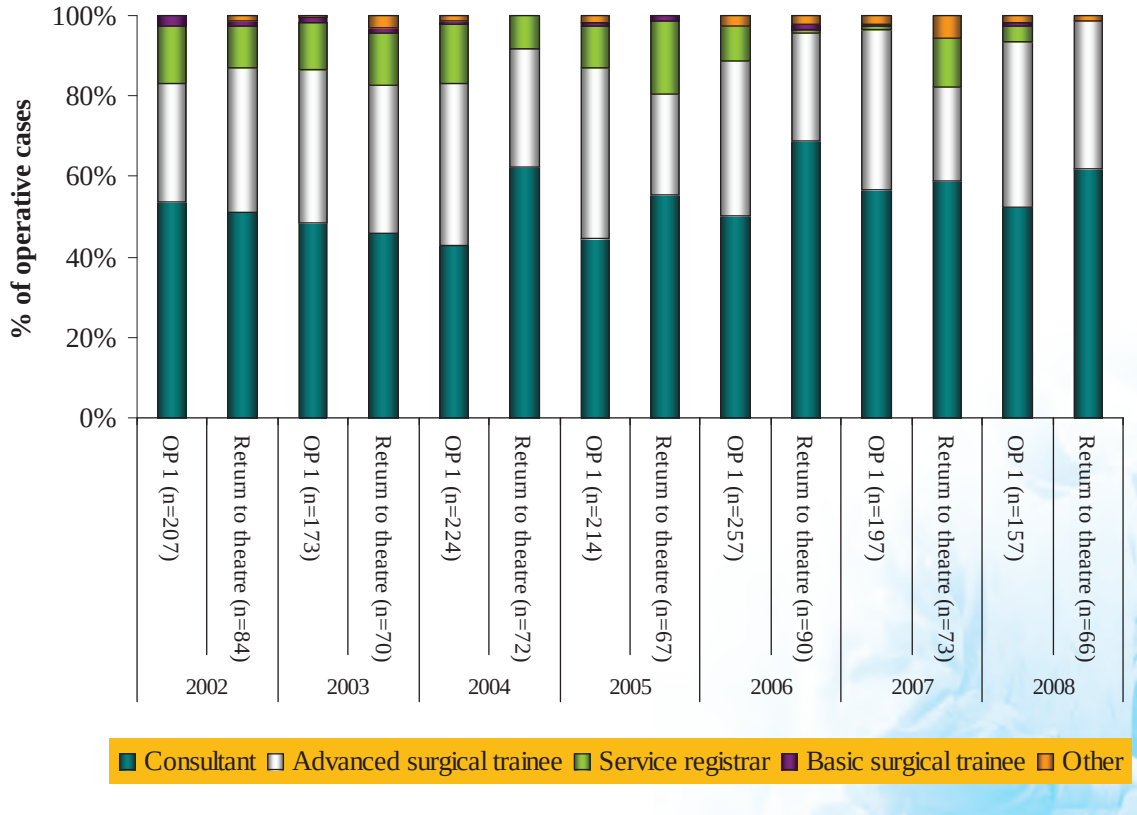
When completing the WAASM proforma, surgeons are asked to indicate the grade of surgeon making the operative decision, performing the operation and directly assisting during the operation.

Table 4.19: Deaths after surgery in Western Australian teaching hospitals (2002–2008)

	No. of cases (%)						
	2002	2003	2004	2005	2006	2007	2008
Number of audited operative cases in teaching hospitals	225	191	244	258	326	256	198
Consultant decision to operate	192 (85)	162 (85)	203 (83)	206 (80)	250 (77)	212 (83)	187 (94)
Consultant operating or directly assisting	126 (56)	106 (55)	123 (50)	117 (45)	161 (49)	139 (54)	131 (66)

Note: Data missing as not all proformas are completed.

Figure 4.19: Grade of surgeon performing first and subsequent operations, by year in Western Australian teaching hospitals (2002–2008)[a]



[a] Total OP1 n=1429; total return to theatre n=522.

Notes:
'Return to theatre' includes all second, third or subsequent operations.
Some of the information on grade of operating surgeon was missing.
'Other' includes interns, resident medical officers and senior registrars.

Figure 4.20: Consultant supervision in cases returned to theatre

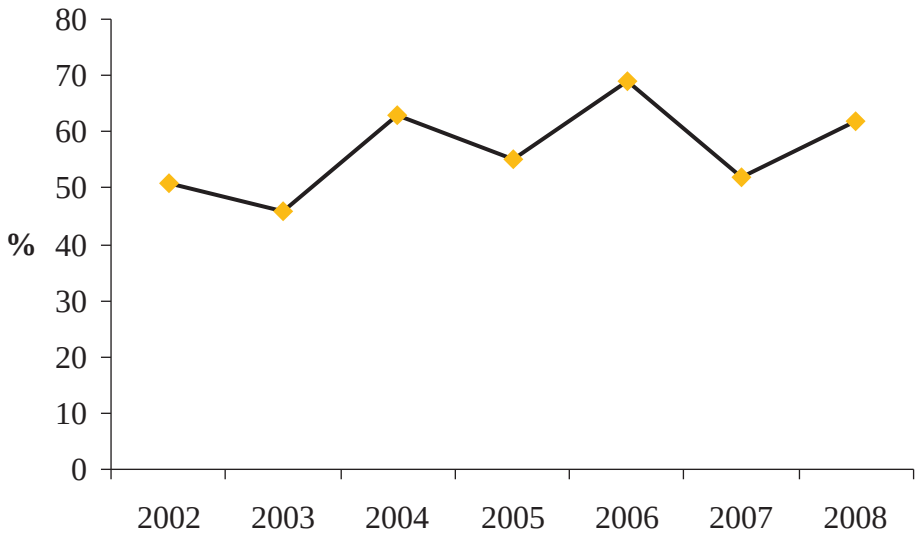
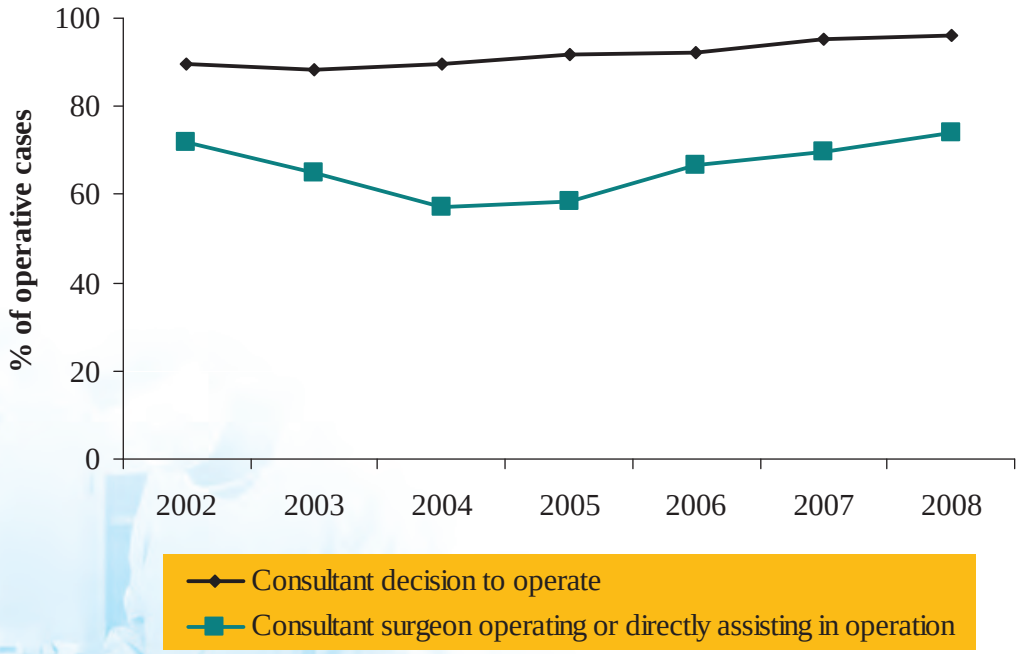


Figure 4.21: Consultant surgeons involved in primary operations, by year in Western Australian teaching hospital (2002-2007) (n=1429)



Comment

There continues to be an increase in the direct involvement of consultant surgeons when a patient undergoes a second or subsequent operation. Over the same period the proportion of cases with areas of concern or adverse events has decreased (refer to Figure 4.18).

4.7 Prophylaxis of thromboembolism

Surgeons are asked on the proforma whether deep vein thrombosis (DVT) prophylaxis was used and if not the reason why it was withheld. During case review assessors indicate whether they think that the decision was appropriate.

Figure 4.22: Use of DVT prophylaxis, by year (2002–2008) (n=2871)

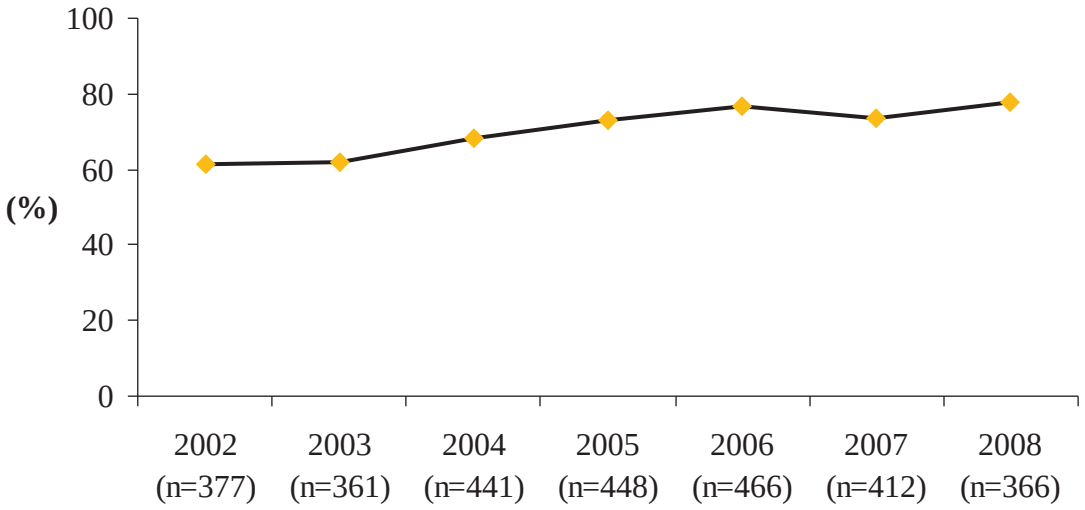
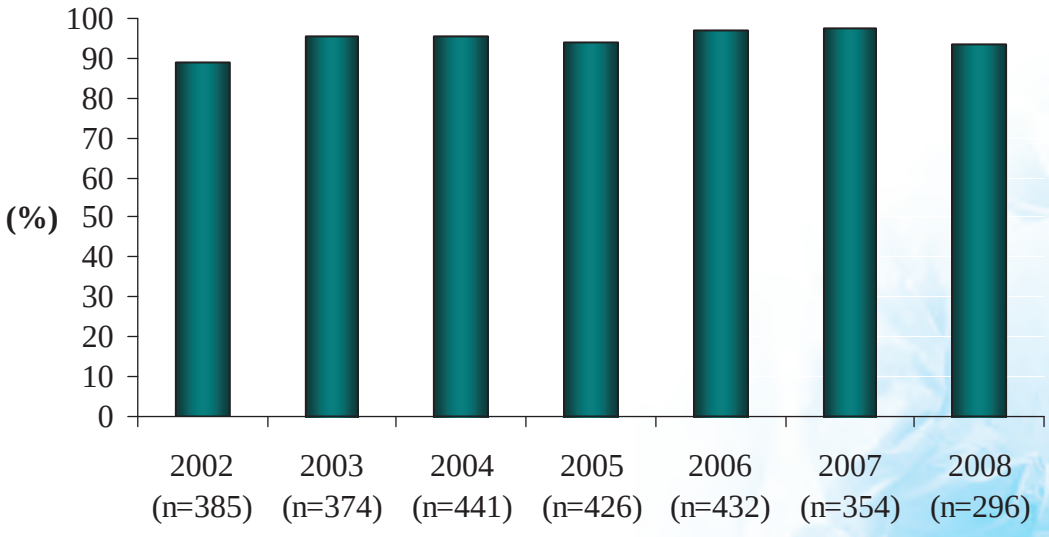


Figure 4.23: Cases where assessors noted that use of DVT prophylaxis was appropriate, by year (n=2914)



Note: Neurosurgeons do not complete this question in the proforma unless it has been flagged as an area of concern or adverse event.

Comment

DVT prophylaxis is now being given a very high priority in the Western Australian Safety and Quality agenda. While the overall trend recorded by WAASM is encouraging, the audit is still reviewing cases in which a patient died of a pulmonary embolus when DVT prophylaxis was not given correctly. Almost always multiple factors combined to create an overall failure in care. WAASM urges surgeons to very critically review what actually happened, as opposed to what was intended, whenever confronted by a DVT or pulmonary embolism.

4.8 Delays

KEY POINTS

- The most common deficiency of care recorded by WAASM is delay.
- During the two years from 1 January 2007 to 31 December 2008, WAASM identified 73 cases of delay available for analysis.
- Surgeons were responsible for 54% of delays.
- The major cause for delay was a failure to identify an ill or deteriorating patient.

In the previous WAASM annual reports it has been noted that one of the most common cause of concern or adverse events was a delay. A more detailed review has been undertaken on the two-year period from 1 January 2007 to 31 December 2008. During this period WAASM identified 79 patients. On review, delays did not contribute to the death in six of those patients, leaving 73 available for analysis.

The clinician responsible for the patient's care at the time of the delay is shown in Table 4.20. This was normally the surgeon responsible for the final episode of care. In some cases the delay was while the patient was under the care of the surgeon who initially managed the patient, either prior to referral to a tertiary centre or within the original centre, or under a physician's management. In three cases, the delay was attributed to a non-surgeon failing to respond in a timely manner following a request by a surgeon for a review.

Table 4.20: Clinician responsible for the patient's care at the time of the delay

Clinician responsible	No. of cases %
Pre-transfer institute	13
General practitioner	2
Hospital of death	
▪ Emergency department	7
▪ Physician	16
▪ Surgeon i/c* at time of death	30
▪ Surgeon initially i/c	9
Total	**77**

*i/c = in charge

Note: In some cases, the patient has been counted twice e.g. a delay in the emergency department at the initial hospital and then again in the tertiary hospital.

The seven (9.6%) delays occurring in the emergency department were secondary to an incorrect initial diagnosis. Of note, five patients with a ruptured abdominal aortic aneurysm had delayed treatment because the initial diagnosis was incorrect, three being initially diagnosed as urinary tract pathology.

In seven (9.6%) patients the delay was caused by difficulties in accessing other hospital facilities, principally a delay in theatre or ICU access. In nine (12.3%) the delay was secondary to slow radiology support, an important observation as their techniques may be preferable to surgery and cannot be offered on an intermittent basis.

The underlying diagnoses associated with delays are shown in Table 4.21. A failure to recognise progressing sepsis was the most common cause for delay. Review of the proformas showed that the surgeon usually recognised there had been a potentially avoidable delay. Whilst intra-peritoneal sepsis was the most common source, the number of cases associated with missed diagnoses of urosepsis and cholangitis serve to emphasise that other potentially serious infections can rapidly overwhelm a patient.

Table 4.21: Principal Pathology of cases associated with delays

Principal Pathology		No. of Cases %
Abdominal aneurysm		5
Other vascular		3
Ischemic bowel		9
Small bowel	- Obstruction	9
	- Perforation	2
Large bowel	- Obstruction	4
	- Perforation	3
Intra-abdominal sepsis	- Anastomotic leak	5
	- Other	6
Urosepsis		5
Cholangitis		4
Orthopaedic		6
Other		13
Total		73

Other observations related to diagnosis of note are:

- Mesenteric ischemia is a notoriously difficult diagnosis at early presentation. Given the very high (>80%) mortality associated with mesenteric ischaemia, it is very likely the outcome in these patients would have been the same even if there had been no delay.
- Nine (12.3%) cases presenting with small bowel obstruction were initially treated conservatively and when they did not settle and underwent surgery, a segment of bowel had to be resected. Delayed resection is known to substantially increase mortality and suggests that conservative management was too long. Such delay is at least potentially avoidable.
- Two of the three patients who died following a haematemesis and melena died as a consequence of an over-reliance on therapeutic endoscopy. In the view of the external assessor, both were potentially avoidable. In two additional patients lack of endoscopy support was the cause of delay. Death after upper GI haemorrhage is being considered in a separate report.
- Of six orthopaedic cases, all with a fractured neck of femur, the delay was related to theatre access in two and the surgeon in four. In the latter, delays were related to correcting medical comorbidities. In two, there was confusion about reversing anti-coagulation. In addition to the symposia WAASM held there have been recent reviews of this issue. [7, 8]

In 13 (17.8%) patients, the assessor was of the view that the delay caused a potentially avoidable death. An unexpected observation was that almost half the delays in these surgical patients were not generated by a surgeon. The source of these non-surgical delays was variable, but serves to emphasise the importance of the systemic overview that WAASM provides. If there has been a deficiency of care, a copy of assessment sent to the surgeon is, as a matter of routine, sent by WAASM to all relevant parties.

Some will undoubtedly argue that whether there has been delay, and its contribution to death, is a subjective assessment. Others will argue that whilst delay might have contributed to the death, it is often difficult to state whether the delay caused the death of the patient who would have otherwise survived. However, those concerned about the subjective element should note that in a majority of cases the surgeon himself or herself recognised there had been a delay.

It is important that Western Australian surgeons do not ignore the lessons of history. In 2005, the National Confidential Enquiry into Patient Outcome and Death (NCEPOD) reported that the ‘clinical indicators of acute deterioration are not infrequently overlooked’.[9] In other studies there is much evidence to show that those in whom there is delay prior to an unplanned admission to ICU have a worse outcome.

In the United Kingdom such observations prompted The National Institute of Health and Clinical Excellence (NICE) to publish its guidelines on the identification and response to the acutely ill in-patient. [10] The Patient Safety First Campaign in the UK has identified the ‘deteriorating patient’ as one of the first five interventions that it is supporting . [11]

This Western Australian data confirms that a failure by a clinician to appreciate a deteriorating patient was the main cause of the delay. The consultant often acknowledged that with hindsight there was sufficient evidence to suggest the delay was at least potentially avoidable.

This suggests that the application of current knowledge would prevent many of these problems. The Critical Care of the Ill Surgical Patient (CCriSP) course, mandatory for Australasian surgical trainees, was specifically created for this reason.

5 PERFORMANCE REVIEW

This section reviews progress made on each of the recommendations of the 2008 WAASM annual report.

5.1 Western Australian surgeons should submit their deaths through WAASM rather than WARM.
The data strongly suggests that surgeons prefer their deaths to be audited through WAASM.

5.2 Western Australian surgeons should ensure that all proformas are completed fully.

This is an issue that has been raised by other states. Now that participation in a Western Australian mortality audit is mandatory, WAASM will be able to return incomplete proformas to the surgeon; unless the proforma is returned completed, that surgeon will appear with an incomplete record. This position will be further entrenched if the College makes participation in mortality audits part of CPD.

5.3 ANZASM should define an agreed list of adverse events to ensure uniformity of data collection across the country.
A draft list has been drawn up and is under discussion by the ANZASM Steering Committee.

5.4 A detailed study on the reasons for delays should be included in the next WAASM annual report.

This is included in this report. This has also been sent to Western Australian surgeons as part of the May newsletter.

ACKNOWLEDGMENTS

The Western Australian Audit of Surgical Mortality (WAASM) would like to acknowledge the support and assistance of those individuals and institutions that have helped in the continuation and development of this project, including the:

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  - Mr Stephen Baker
  - Mr Robert Davies
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  - Project Officer — Ms Natalie Underwood
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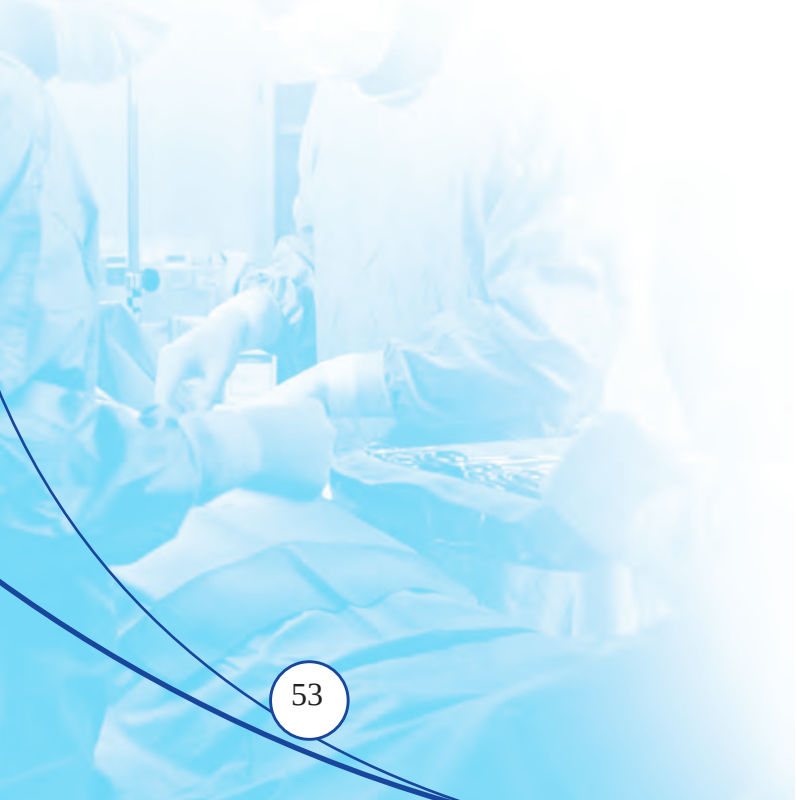

APPENDIX 1: Cause of death reported to WAASM

Table A1.1: Cause of death in men aged <70 years (n=599)		
	n	**(%)**
Heart failure	71	12
Malignancy	60	10
Severe brain injury	56	9
Multiple organ failure	54	9
Brain haemorrhage	53	9
Septicaemia	48	8
Brain stroke	32	5
Respiratory failure	28	5
Pneumonia	18	3
Renal failure	14	2
Cardiopulmonary failure	13	2
Pulmonary embolism	12	2
Vascular insufficiency of the intestine	12	2
Aortic aneurysm	11	2
Liver failure	11	2
Cause unknown	10	2
Cerebral oedema	10	2
Missing data	10	2
Aspiration pneumonia	9	2
Severe multiple injuries	6	1
Severe burns	2	<1
Other	59	10

Table A1.2: Cause of death in women aged <70 years (n=346)		
	n	**(%)**
Brain haemorrhage	63	18
Septicaemia	34	10
Malignancy	33	10
Heart failure	32	9
Multiple organ failure	30	9
Brain stroke	19	5
Respiratory failure	16	5
Severe brain injury	15	4
Vascular insufficiency of the intestine	10	3
Pulmonary embolism	8	2
Cerebral oedema	7	2
Missing data	7	2
Pneumonia	5	1
Renal failure	5	1
Liver failure	5	1
Aspiration pneumonia	4	1
Cardiopulmonary failure	3	<1
Aortic aneurysm	3	<1
Cause unknown	3	<1
Severe burns	2	<1
Severe multiple injuries	1	<1
Other	41	12

Table A1.3: Cause of death in men aged ≥70 years (n=1194)		
	n	**(%)**
Heart failure	272	23
Septicaemia	112	9
Pneumonia	91	8
Malignancy	88	7
Multiple organ failure	76	6
Respiratory failure	72	6
Renal failure	62	5
Vascular insufficiency of the intestine	55	5
Aortic aneurysm	51	4
Brain haemorrhage	38	3
Cardiopulmonary failure	36	3
Aspiration pneumonia	34	3
Brain stroke	28	2
Cause unknown	21	2
Missing data	19	2
Pulmonary embolism	18	2
Severe brain injury	11	<1
Liver failure	6	<1
Severe multiple injuries	3	<1
Severe burns	2	<1
Cerebral oedema	1	<1
Other	98	8

Table A1.4 Cause of death in women aged ≥70 years (n=1189)		
	n	**(%)**
Heart failure	259	22
Septicaemia	121	10
Multiple organ failure	112	9
Respiratory failure	83	7
Vascular insufficiency of the intestine	66	6
Renal failure	58	5
Pneumonia	57	5
Malignancy	53	4
Brain haemorrhage	41	3
Cardiopulmonary failure	41	3
Brain stroke	39	3
Aspiration pneumonia	31	3
Cause unknown	28	2
Missing data	27	2
Aortic aneurysm	26	2
Pulmonary embolism	22	2
Severe brain injury	4	<1
Liver failure	3	<1
Severe multiple injuries	1	<1
Cerebral oedema	1	<1
Other	116	10

APPENDIX 2: WAASM assessor report details of adverse events and areas of concern (2002–2007)

Table A2.1 Details of adverse events and areas of concern as reported by assessors in 573 of 4829 cases reported to WAASM (2002–2008)

Related to open surgery (n=122)	No.
Anastomotic leak after open surgery	53
Related to open surgery	16
Post operative bleeding after open surgery	14
Infection	7
Injury to organ during surgery	7
Complication of open surgery	3
Perforation of duodenum during endoscopic operation	6
Cerebrovascular accident following open surgery	2
Wound infection after open surgery	5
Fistula from colon after open surgery	2
Failed arterial reconstruction after open surgery	1
Air embolism after surgery	1
Blood clot dislodged	1
Bowel infarction after open vascular operation	1
Dislocated hip prosthesis	1
Arterial occlusion related to open surgery	1
Sepsis peritonitis related to jejunostomy	1

Delays (n=100)	No.
Delay to surgery – earlier operation desirable	24
Delay in diagnosis	15
Delay in transfer to surgical unit	13
Delay in transfer to tertiary hospital	8
Delay starting DVT prophylaxis	7
Delay in recognising complications	5
Delay in transfer to surgeon by physicians	4
Delay starting medical treatment	4
Delay to endoscopic retrograde cholangiopancreatography	3
Delay in recognising a bleeding complication	3
Delay in surgery due to missed diagnosis	2
Earlier operation desirable – no theatre available	2
Delay to surgery whilst obtaining a computed tomography scan	2
Delay to starting ventilation	1
Delay in transferring patient to ICU	1
Delay to blood transfusion	1
Delay in recognising an anastomotic leak	1

Delay in transfer to surgeon by general practitioner	1
Delay starting antibiotics	1
Delay in investigating the patient	1
Delay to re-operation	1

Incorrect or inappropriate therapy (n=83)	**No.**
Decision to operate	20
Fluid balance unsatisfactory	19
Better to have done different operation or procedure	10
Wrong surgical approach used	3
Operation should not have been done or was unnecessary	3
Tracheostomy problems	3
Postoperative care unsatisfactory	3
Unsatisfactory medical management	3
Better not to have treated laparoscopically	2
Duration of operation too long	2
Operation would have been better delayed	2
Operation should have been done	2
Incorrect or inappropriate therapy	2
Better to have had more extensive surgery	2
More aggressive treatment of infection needed	2
Over transfusion of blood	1
Too early removal of nasogastric tube	1
Operation following recent cessation of anticoagulant drug	1
Wrong operation performed	1
Pre-operative assessment inadequate	1

General complications (n=67)	**No.**
Aspiration pneumonia	20
Septicaemia	9
Wound infection	7
Pulmonary embolus	12
Cerebrovascular accident	3
Peri-operative intracranial infarction	2
Abdominal abscess	1
Postoperative pancreatitis	1
Postoperative bleeding due to coagulopathy	1
Postoperative intracranial haematoma	2
Renal failure	1
Wound skin necrosis	1
Wound dehiscence	3
Fasciitis	1

Failure to use facilities (n=44)	No.
Failure to use DVT prophylaxis	23
Failure to use high dependency unit	7
Failure to use intensive care unit	7
Failure to use antibiotic prophylaxis	2
Failure to use drug for treatment or prophylaxis	2
Failure to obtain postmortem	2
Failure to use facilities	1

Patient related factors (n=31)	No.
Injury caused by fall in hospital	24
Patient refused treatment	4
Patient related factors	3

Drug-related problems (n=20)	No.
Anticoagulation causing post-operative bleeding	4
Under anticoagulation	3
Wrong dose of drug used	3
Drug-related complication	3
Over anticoagulation	2
Reaction to drugs	2
Anaphylactic shock related to drug treatment	1
Wrong drug used	1
Overdose of narcotics	1

Problems related to diagnosis (n=20)	No.
Diagnosis missed by medical unit	7
Diagnosis missed by surgeons	5
Diagnosis missed by radiologist	3
Diagnosis missed by referring hospital	3
Diagnosis missed by unspecified	1
Diagnosis missed on endoscopy	1

Communication failures (n=16)	No.
Poor documentation	6
Communication failures	4
No protocol for DVT prophylaxis	2
Poor communication in emergency department	1
Poor communication between physician and surgeon	1
Failure in communication between x-ray department and clinicians	1
Failure to communicate with senior staff	1

Related to endoscopic surgery (n=15)	No.
Perforation of bowel during endoscopic operation	6
Complication related to endoscopic operation	3
Related to endoscopic surgery	2
Injury to duodenum during endoscopic operation	1
Operation-induced acute pancreatitis after endoscopic operation	1
Injury to heart during endoscopic operation	1
Postoperative bleeding related to endoscopic operation	1

Assessment problems (n=14)	No.
Pre-operative assessment inadequate	9
Failure to investigate or assess adequately	2
Failure to recognise severity of illness	1
Pre-operative respiratory assessment inadequate	1
Assessment problems	1

Staff problems (n=7)	No.
Surgeon too junior	3
Failure of junior surgeon to seek advice	1
Fatigue of operating surgeon	1
Surgeon operating without a speciality	1
Anaesthetist should have been involved in preparation and resuscitation	1

Related to laparoscopic surgery (n=7)	No.
Anastomotic leak related to laparoscopic operation	3
Arterial bleeding after laparoscopic operation	1
Fistula from duodenum after laparoscopic operation	1
Perforation of colon related to laparoscopic operation	1
Extension of ischaemia after laparoscopic operation	1

Related to radiological surgery (n=7)	No.
Arterial bleeding after radiological operation	2
Related to radiological surgery	2
Bile leakage from liver after radiological operation	1
Heart complication of radiological operation	1
Distal arterial embolism after radiological procedure	1

Related to anaesthesia (n=6)	No.
Pneumothorax complication general anaesthetic	2
Premature extubation	2
Technique not ideal during general anaesthetic	1
Intubation failed for general anaesthetic	1

Transfer problems (n=5)	No.
Transfer should not have occurred	2
Transfer necessary due to bed shortage	2
Problem during transfer	1

Resuscitation problems (n=4)	No.
Resuscitation inadequate	3
Fluid and electrolyte resuscitation inadequate	1

Monitoring problems (n=2)	No.
Inadequate metabolic monitoring	1
CVP insertion failed	1

Problems with blood or blood products (n=2)	No.
Blood product complication	1
No blood available	1

Related to equipment (n=1)	No.
Failure of equipment	1

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