Royal Australasian College of Surgeons
Australian Capital Territory
Audit of Surgical Mortality

Australian Capital Territory Audit of Surgical Mortality (ACTASM)

Annual Report 2018-2022

Royal Australasian
College of Surgeons

Acknowledgements

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Cover photo: Architectural projections on Australia's Parliament House during 10-day Enlighten Festival.

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1. Chair's report

I am pleased to present the 2022 annual report for the Australian Capital Territory Audit of Surgical Mortality (ACTASM) as well as the 5-year data (2018–2022) included in the appendix of the report. There has been an increase in the number of cases reported in the year 2022, compared to previous years that had previously seen a continuous downward trend. The majority of the patients continue to be represented by emergency admissions to public hospitals.

All health facilities and surgeons in the ACT participate in the audit process. New continuing professional development (CPD) standards of the Medical Board of the Australian Health Practitioner Regulation Agency (AHPRA) came into effect on 1 January 2023. Participation in the Australian and New Zealand Audit of Surgical Mortality (ANZASM) process is a mandatory component of the CPD program for Fellows of the Royal Australasian College of Surgeons (RACS) as well as the CPD program of the Australian Orthopaedic Association (AOA). The ACTASM team has been active in engaging with surgeons to complete the surgical case forms in a timely manner so as to fulfil the legal requirements to be CPD compliant.

The purpose of the audit process is an unbiased, robust peer review of surgical mortality to provide opportunities for self-reflection and practice improvement. The process has been helpful not only to the surgeons involved with the cases but also the first-line and second-line assessors. We hope to continue the engagement with surgeons and health facilities to have a robust audit process to provide safe and good-quality care to the patients of the ACT and the surrounding regions.

I would like to thank ACT Health for the continued funding of this important quality assurance activity. I would also like to thank the ACTASM team, members of the ACTASM committee, health facilities and the surgeons for the commitment to the audit process and ultimately to the provision of safe and quality surgical care.

Sivakumar Gananadha FRACS
Clinical Director
Australian Capital Territory Audit of Surgical Mortality

2. Executive summary

ACTASM case inclusion

There were 135 cases that met the inclusion criteria for the Australian Capital Territory Audit of Surgical Mortality (ACTASM) where a patient died between 1 January and 31 December 2022. Of these, 8.9% (12 cases) were excluded from further evaluation due to being terminal care admissions and 1.5% (2/135) were lost to follow-up. Of the remaining 121 cases, 76.9% (93 cases) have completed the audit process, 11.6% (14 cases) are pending surgical case form (SCF) submission and 11.6% (14 cases) are still undergoing evaluation.

Key findings

Key findings are based on the 93 peer-reviewed cases for patients who died between 1 January and 31 December 2022 that had completed the ACTASM evaluation process by 27 October 2023. All analysis is based on closed cases unless otherwise specified.

Admission profile

The majority of patients were public admissions (94.6%, 88/93) predominately admitted to public hospitals (95.7%, 89/93), with 88.2% of patients (82/93) being emergency admissions. The overall median length of stay for all admissions was 5 days (interquartile range [IQR] 2–14). The most common surgical diagnoses were for perforated intestine, intestinal ischaemia, and carcinoma.

The population was elderly, with a mean age of 74 years (IQR 65–84). Just over half of the population was male (53.8% male, 46.2% female). Overall, 76.3% of patients (71/93) were considered ASA (American Society of Anesthesiologists physical status classification system) grade 3–4 (i.e. a patient with either mild or severe systemic disease that may be a threat to life);[1] 83.9% (78/93) were recorded as having at least one comorbidity, with the most common being age (48.4%, 45/93) and cardiovascular disease (41.9%, 39/93).

Patient management

During admission, 80.6% of patients (75/93) underwent at least one operation, with 57.8% of total operations (59/102) being considered an emergency or scheduled emergency procedure. Postoperative complications were reported in 28.0% of cases (21/75). Delays in recognising complications were reported for 9.5% of cases (2/21).

Deep vein thrombosis (DVT) prophylaxis was used in 92.5% of patients (86/93), with heparin (84.9%, 73/86) being the most commonly used prophylactic agent, followed by thromboembolic deterrent (TED) stockings (34.9%, 30/86) and sequential compression devices (26.7%, 23/86). ACTASM assessors concluded that the DVT prophylactic strategy employed was appropriate in 80.6% of cases (75/93).

Clinically significant infections were reported in 34.4% of cases (32/93). Of these, 53.1% (17/32) were acquired during admission. Pneumonia was the most commonly reported infection (40.6%, 13/32). Just over half of hospital-acquired infections (58.8%, 10/17) were acquired postoperatively. Delays in initiating treatment for infections were minimal (9.4%, 3/32) and the antibiotic treatment regime was considered appropriate for the majority of cases (93.8%, 30/32).

ACTASM evaluation outcomes

Following completion of the evaluation process, assessors were able to identify areas for improvement (clinical management issues [CMIs]) in 30.1% of cases (28/93), with a total of 34 CMIs reported. Most of these issues were considered relatively minor (area of consideration: 55.9%, 19/34), while a further 32.4% (11/34) were considered more serious (area of concern). There were 2 adverse events (5.9%) identified.

In 8 instances (23.5%), the CMIs identified were thought to have made no difference to the outcome. However, in 21 of 34 instances (61.8%) the issues identified may have contributed to or caused the death of the patient.

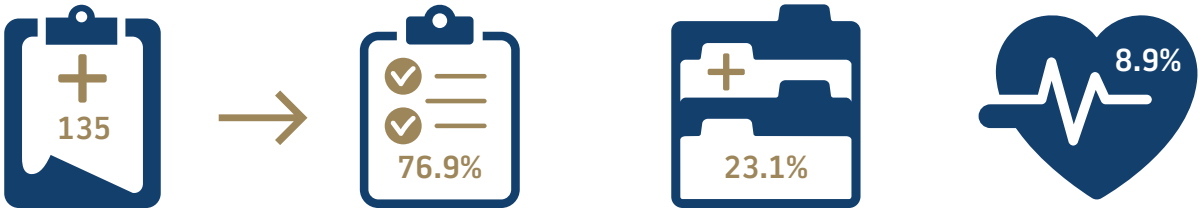
More than half (58.8%, 20/34) of the CMIs identified were considered definitely or probably preventable, and 64.7% (22/34) were associated with the surgical team under evaluation.

3. ACTASM audit summary

This summary covers cases reported to ACTASM from 1 January to 31 December 2022.

Note: Differences in denominators are due to incomplete information provided in surgical case forms and assessment forms, resulting in missing data.

ACTASM cases



Reported cases meeting ACTASM criteria

Completed cases (93/121)

Cases in progress (28/121)

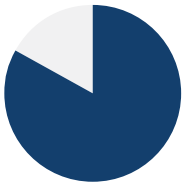
Excluded terminal care cases (12/135)

Emergency 88.2% (82/93)

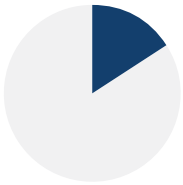
Elective 11.8% (11/93)

Note: two cases (1.5%) were lost to follow up.

Hospital admission profile



95.7% Public (89/93)



4.3% Private (4/93)

Patient profile

Overall median age

74 years (IQR 65-84)

53.8% 46.2%

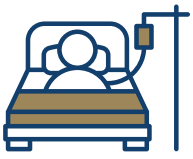
Male (50/93)
Female (43/93)

83.9%

Comorbidities (78/93)

Length of stay
5 days (IQR 2-14)

92.5%
DVT prophylaxis use (86/93)



75.3%
CCU use (70/93)

Patient transfers

38.7% Patients transferred (36/93)

8.3% Delay in transfer (3/36)

2.8% Inappropriate transfer (1/36)

5.6% Insufficient clinical information (2/36)

2.8% Inappropriate level of care (1/36)

Operations

OPERATION URGENCY

80.6% Patients had surgery (75/93)

85.3% Emergency procedures (87/102)

14.7% Elective procedures (15/102)

28.0% Postoperative complications (21/75)

9.5% Delay recognising complication (2/21)

15.1% Unplanned returns to theatre (14/93)

Infection

34.4% Patients with clinically significant infection (32/93)

53.1% Acquired after admission (17/32)

40.6% Pneumonia (13/32)

21.9% Septicaemia (7/32)

9.4% 'Other source' of infection (3/32)

Peer-review outcomes

30.1% Cases with one or more clinical management issues (28/93)

34 Number of clinical management issues

58.8% Considered preventable (20/34)

61.8% May have contributed to or caused death (21/34)

64.7% Associated with surgical team (22/34)

4. Recommendations

The goal of ACTASM is to improve outcomes and services provided to patients in ACT hospitals. As such, ACTASM encourages surgeons, hospitals and the health department to consider the following recommendations from the 2022 report:

Completion of ACTASM surgical case forms

It is an ACTASM expectation that cases are submitted within 60 days (i.e. 2 months) of notification. The duration between patient death and subsequent notification of an ACTASM case to the nominated treating surgeon has been fairly consistent over the 2020–2022 period (median 25 days, IQR 15–32 days for 2022). The duration from notification to submission of a case has improved over this same period, from median 90 days (IQR 6–237) in 2020 to median 42 days (IQR 5–108) in 2022. When assessing duration to submission according to specialty, Neurosurgery (median 107 days, IQR 12–253) and Urology (median 100 days, IQR 90–141) were notable outliers in 2022.

ACTASM will continue to:

- work with surgeons to help improve the timely completion of surgical case forms
- improve communication to keep surgeons updated regarding ACTASM and RACS CPD requirements.

Inter-hospital patient transfer

Transferred patients had proportionately more CMIs identified by assessors compared to non-transferred patients. The proportion of transferred cases where at least one CMI was reported significantly increased in 2022 (41.7%, 15/36) compared with 2021 (25.8%, 8/31), with delays in investigating the patient and initiating surgical intervention once again being reported. In 2022, there was a slight increase in the proportion of cases where a delay in transfer was reported (8.3%, 3/36) compared with 2021 cases (6.5%, 2/31), although this still has significantly improved since 2020 (30.8%, 8/26). Some of the identified issues include delays in diagnosis, delays in transfer, delayed surgery, and futile surgery. Issues with communication and staffing were other issues identified.

ACTASM recommends:

- improved communication between the referring hospital consultant and the receiving hospital consultant to facilitate early transfer and select appropriate therapy
- improved collaboration with peripheral referring hospitals in the early identification of deteriorating patients, so the decision for the need for transfer is made early
- decision-making for transfer occurs at a senior level, so futile transfers are minimised.

Clinically significant infections

Approximately one-third of cases reported in the 2021 ACTASM annual report had a clinically significant infection present (34.4%, 32/93). Of those acquired during admission, the majority occurred postoperatively, with pneumonia being the most common infection. This trend continued in 2022, with 34.4% (32/93) of cases reporting a clinically significant infection, and 58.8% (10/17) of infections acquired during admission being acquired postoperatively. However, it is worth noting that the proportion of infections acquired postoperatively has decreased since 2020 (85.7%, 12/14). It is reassuring that the antibiotic regime was deemed appropriate in the majority of patients, with no delay in initiating treatment.

ACTASM recommends:

- attention be paid to appropriate surgical antibiotic prophylaxis
- early mobilisation, chest physiotherapy and implementation of Enhanced Recovery After Surgery (ERAS) programs to decrease postoperative chest infections and improve other postoperative outcome measures.

Peer review outcomes

Independent peer review identified CMIs in 30.1% of cases, with 58.3% of cases from Vascular Surgery having at least one CMI present. The majority of CMIs (61.8%) were thought to have potentially contributed to or caused the death of a patient and more than half (58.8%) were thought to be potentially preventable. Some of these identified CMIs included: wrong surgery performed, unnecessary surgery, delayed surgery, and inadequate patient assessment. One important finding is that fewer patients are having multiple operations during their final admission, suggesting possible early recognition of the futility of further surgery.

ACTASM recommends:

- early recognition of patients who may not benefit from surgery and application of various scoring systems (such as the NELA score) to guide discussion with patients and their families
- peer support and advice in difficult cases to select the most appropriate operation
- examination of CMIs and utilisation of the provided feedback for self-reflection and discussion within the unit for practice improvement.

5. Introduction

The Australian Capital Territory Audit of Surgical Mortality (ACTASM) was launched in 2010 to support surgeons by the provision of an independent peer-review process for all in-hospital mortality associated with surgical care. As of 27 October 2023, ACTASM has evaluated 1,245 cases since its inception, while 190 cases are still undergoing the audit process. A further 221 cases were excluded from the full audit process due to being terminal care (palliative) admissions.

This report incorporates in-hospital surgery-related deaths that occurred between 1 January and 31 December 2022. Five-year data (1 January 2018–31 December 2022) is reported in the Appendix. Clinical and demographic characteristics of cases are presented, as are the perspectives on case management of both treating surgeons and independent assessors. The objective of this report is to identify potential areas of improvement for the ongoing professional development of surgeons, as well as the systems and processes within which care is conducted.

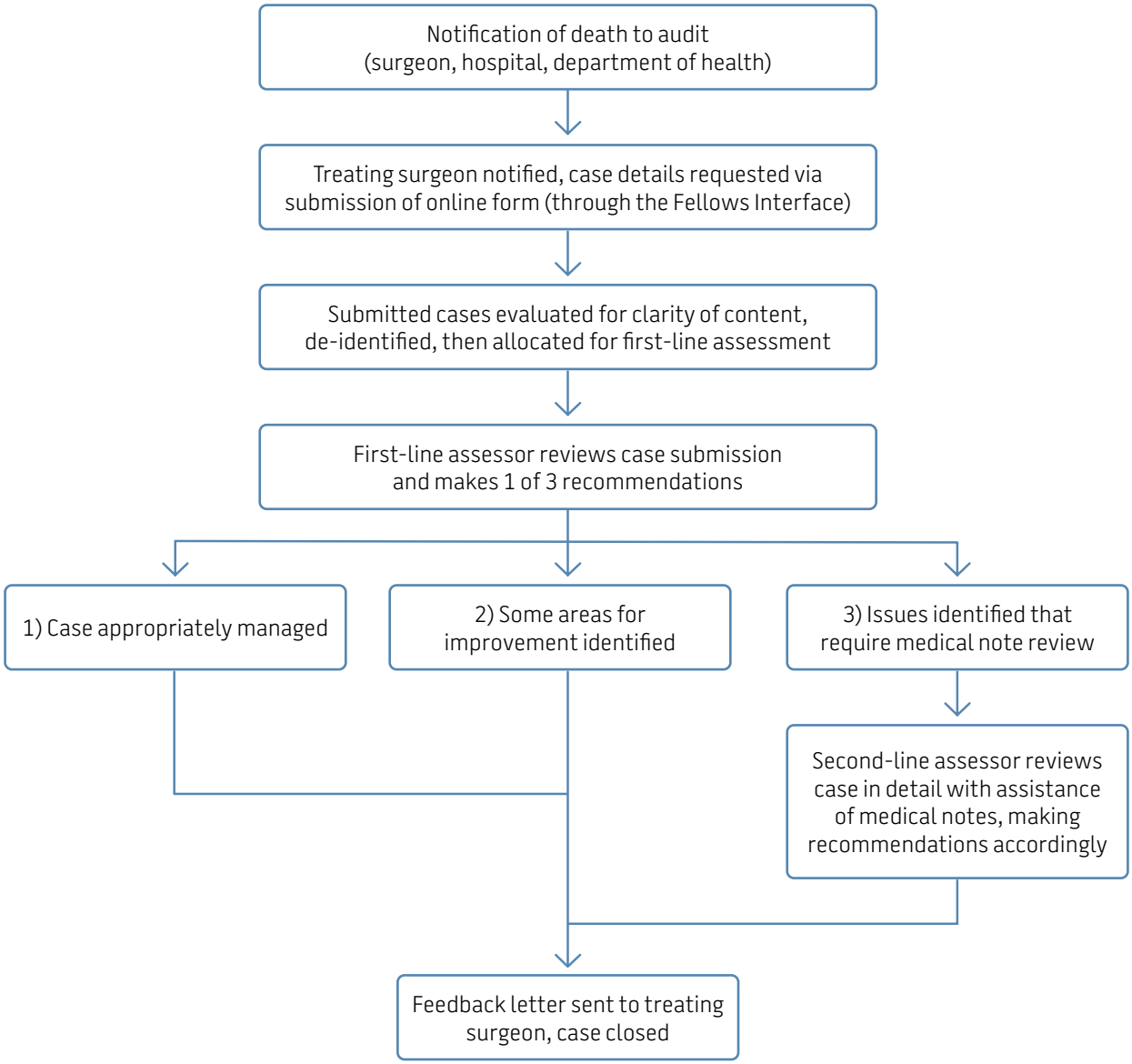
ACTASM is funded by the Australian Capital Territory (ACT) Health Directorate and governed by the ACTASM Management Committee. By its inclusion in the Australian and New Zealand Audit of Surgical Mortality (ANZASM), ACTASM is protected by Commonwealth Qualified Privilege as a declared quality assurance activity. This protection has helped foster the engagement of surgeons, whether by submission of cases in which they were involved in surgical care or by undertaking assessments and providing critical yet constructive feedback.

ACTASM would like to acknowledge its productive relationships with hospitals within the ACT and with those interstate health institutions that share close ties with the ACT health system.

6. Methods

The ACTASM evaluation process is depicted in Figure 1. A full description of the methods, including data collection by ACTASM and subsequent analysis, is provided in the Appendix. Except where stated, reported data are for patient deaths that occurred between 1 January and 31 December 2022 for which the ACTASM evaluation process was completed by the census date of 27 October 2023.

Figure 1: Summary of overall ACTASM evaluation process from case inception to delivery of feedback and case closure

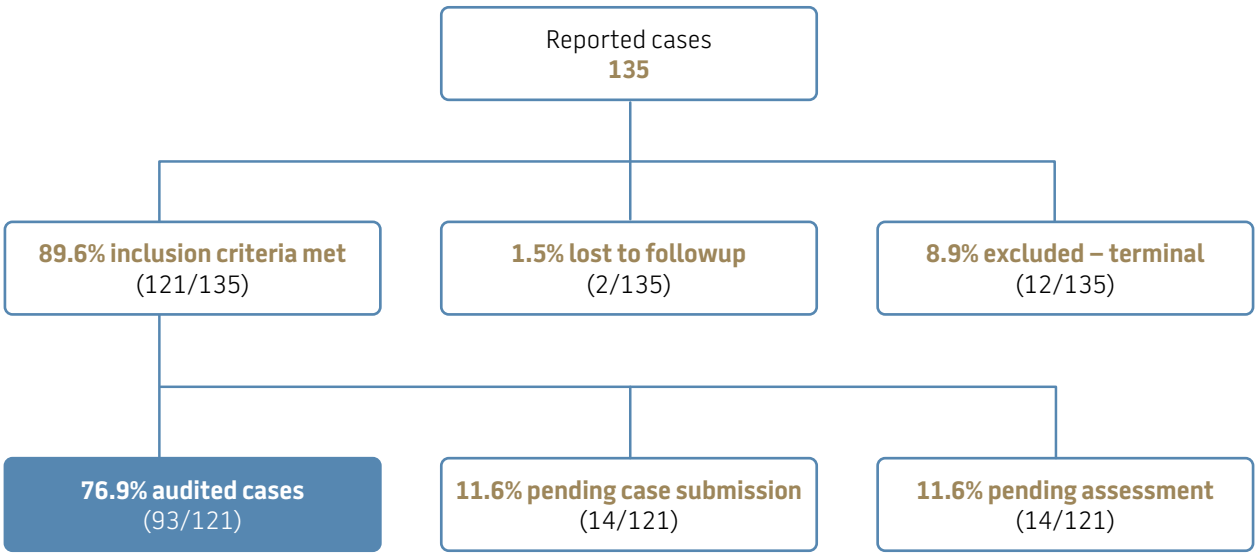


7. Engagement with ACTASM

ACTASM case load

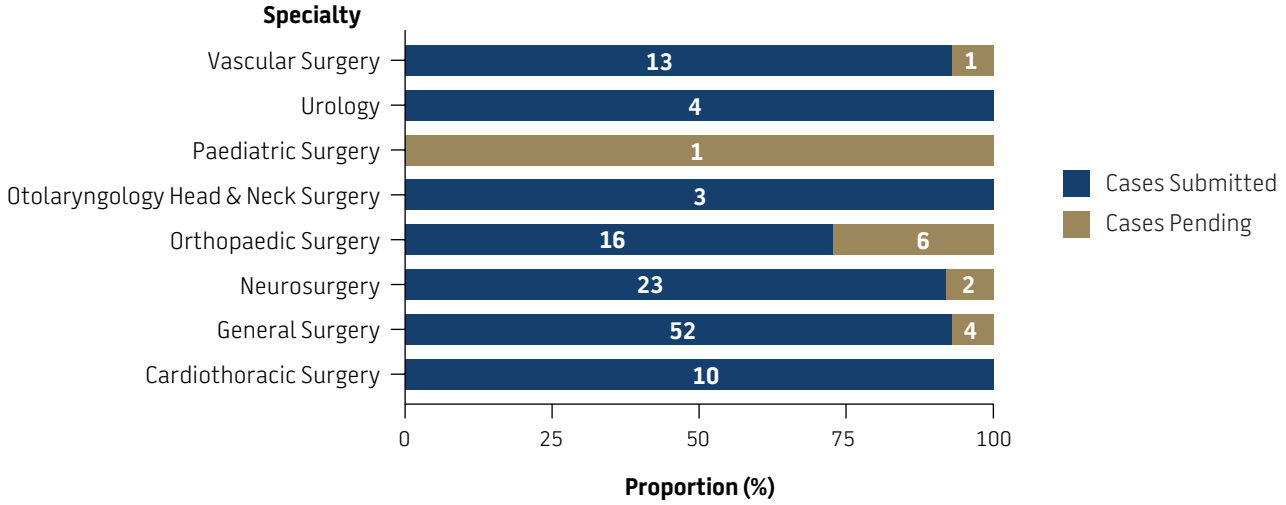
A total of 135 cases were notified to ACTASM by 5 hospitals in which a patient died during 2022 (Figure 2, Appendix Table A). Of these cases, 12 (8.9%) were confirmed as terminal care admissions and were excluded from the full evaluation process, while 2 were lost to follow-up (1.5%). Of the remaining 121 cases, 76.9% (93/121) completed the evaluation process and feedback was delivered to surgeons. A further 11.6% (14/121) are currently undergoing assessment. Unfortunately, as of the 27 October 2023 census date, 11.6% (14/121) of cases are still pending submission (Appendix Table B). It is expected that surgeons will make every effort to submit their cases within 2 months of being notified. ACTASM continues to work with surgeons to improve the timeliness of submissions, noting that submission of cases is a mandatory component of the continuing professional development programs of both the Royal Australasian College of Surgeons (RACS) and the Australian Orthopaedic Association (AOA).

Figure 2: ACTASM cases for patients who died during 2022 and progression through the ACTASM evaluation process



The proportion of cases still pending submission, according to specialty, is depicted in Figure 3.

Figure 3: Proportion of ACTASM 2022 cases still pending submission according to specialty



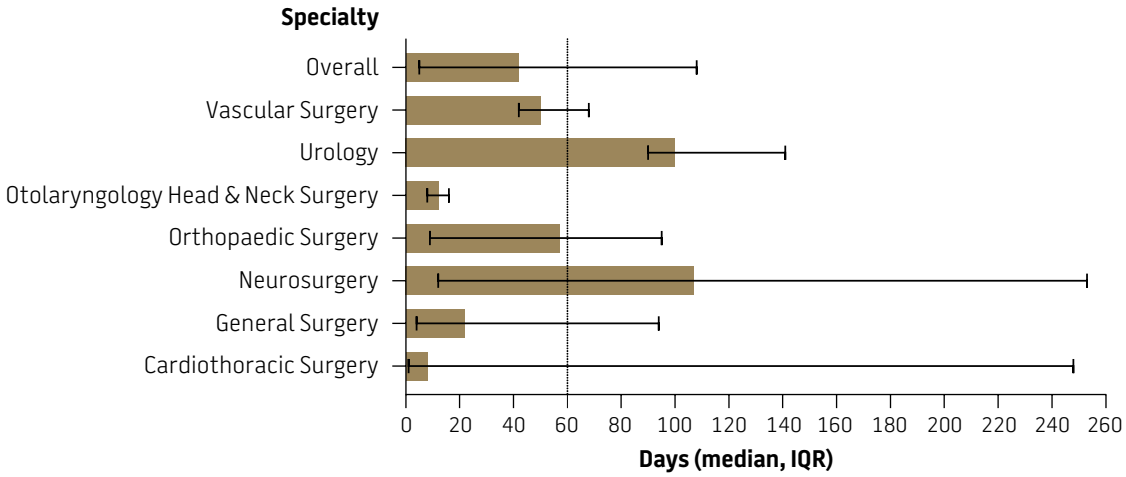
Note: no cases were reported for Obstetrics & Gynaecology, Ophthalmology, Oral/Maxillofacial, and Plastic Surgery in 2022.

Hospital and surgeon engagement

ACTASM relies on hospitals and surgeons for timely notification of cases that fulfill the ACTASM inclusion criteria. Once ACTASM has been notified of a case, the nominated treating surgeon is promptly contacted with a request to complete submission to ACTASM. Overall, it took a median of 25 days (IQR 15–32) following a patient death for the nominated treating surgeon to be notified, consistent with the median of 27 days (IQR 17–46) observed for 2021 (Appendix Table C). Timely notification after patient death is beneficial, as it enables surgeons to address cases while the details are still fresh to mind.

The overall time taken for submission of cases to ACTASM by the treating surgeon was very good (median 42 days; IQR 5–108) (Figure 4; Appendix Table D). This is well within the ANZASM submission standard of 2 months (60 days) and an improvement on previous years, despite some cases still awaiting submission. ACTASM encourages questioning at hospital morbidity and mortality meetings regarding whether SCFs for cases under discussion have been submitted. When reviewing the time taken for submission of cases by particular specialties, Neurosurgery (median 107 days; IQR 12–253) and Urology (median 100 days; IQR 90–141) are clear outliers that require significant improvement (Figure 5; Appendix Table E).

Figure 4: Time taken for submission of ACTASM 2022 cases according to specialty

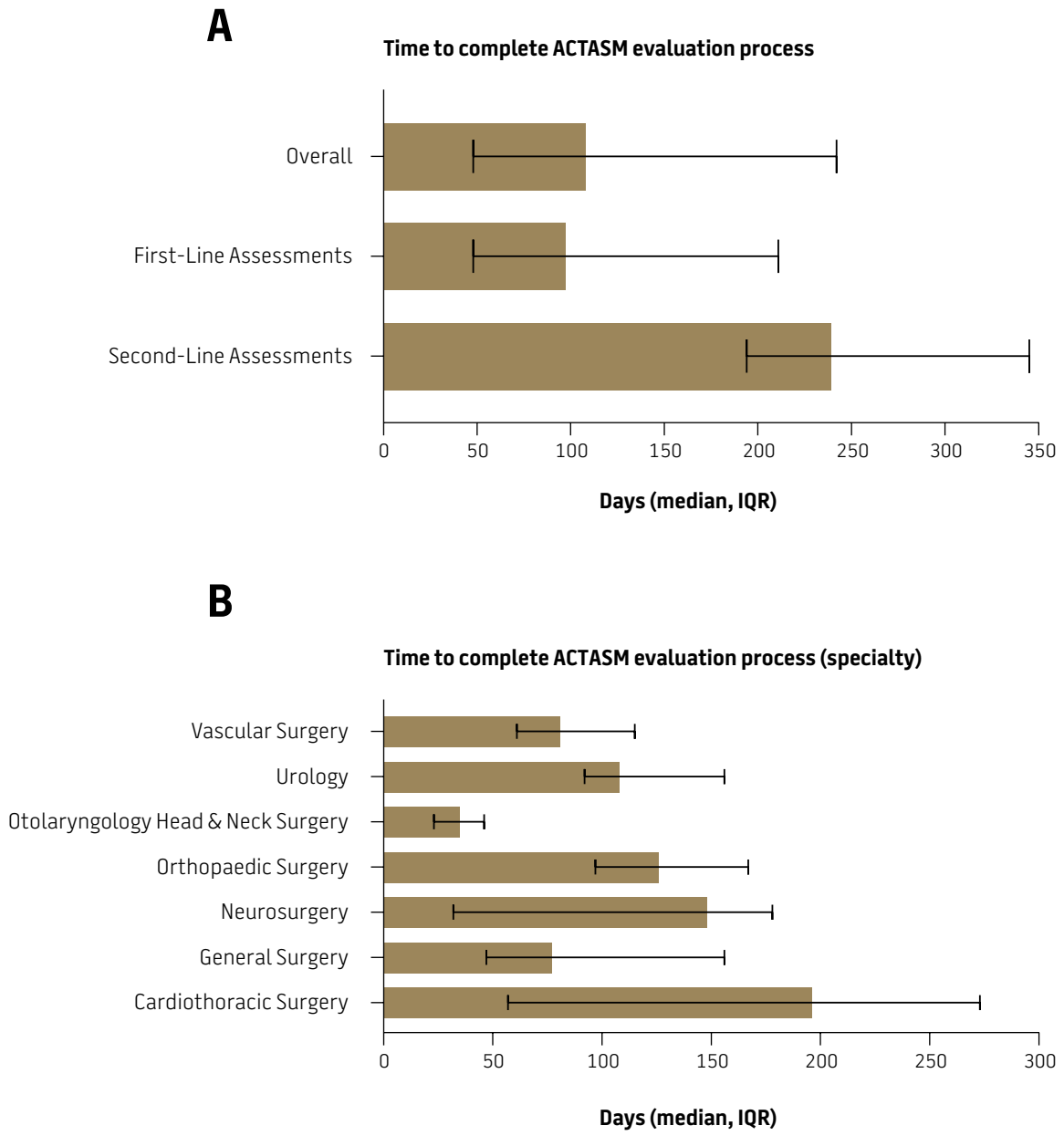


Notes: 5-year data for this figure appear in Appendix Tables D and E; Time taken (median days) from notification of ACTASM by the hospital to submission of the surgical case form by the treating surgeon.
The dotted line indicates the ANZASM submission standard of 60 days. Bars represent the interquartile range.

ACTASM evaluation process

From case creation through to delivery of feedback and case closure, the ACTASM evaluation process took an overall median of 108 days (IQR 48–242) to complete (Figure 5; Appendix Tables F and G). When considering cases that only underwent first-line assessment, this period was largely unchanged at a median of 97 days (48–211). For cases that underwent second-line assessment, which includes medical note review, the timespan more than doubled to a median of 239 days (IQR 194–345). As of 27 October 2023, 93.5% of closed cases (87/93) had undergone first-line assessment and 6.5% (6/93) had undergone second-line assessment.

Figure 5: Time taken for completion of the ACTASM evaluation process during 2022 according to assessment status and specialty



Note: 5-year data for this figure appear in Appendix Tables F and G.
5A = Overall time taken for cases to complete the ACTASM evaluation process, and time taken for cases to complete the ACTASM evaluation process according to whether they underwent first- or second-line assessment.
5B = Time taken for cases to complete the ACTASM evaluation process according to specialty.

8. Patient profile

Demographics

The demographics for cases notified to ACTASM that have completed the evaluation process are summarised in Table 1. The population was elderly (median age 74 years, IQR 65–84), 53.8% male sex (50/93) and had spent approximately one week in hospital for the final admission (median 5 days, IQR 2–14). Most of the cases were ASA grade[1] 3–4 (76.4% of total), and the most commonly reported comorbidities were age (48.4%) and cardiovascular disease (41.9%). Moderate concordance was observed between surgeons and assessors with regards to the overall perceived risk of death, except for when the risk of death was considered small: surgeons were much more likely to form this conclusion than were assessors. These demographics have remained relatively consistent across the 5-year period (1 January 2018–31 December 2022) (Appendix Table H). Most cases were emergency admissions (88.2%, 82/93) to public hospitals (95.7%, 89/93) as public patients (94.6%, 88/93) (Appendix Table I).

A comparison was also undertaken comparing male and female admissions (Appendix Table J). Male and female patients were of similar age—median age 73 years (IQR 65–82) and 75 years (IQR 64–85), respectively—and had broadly similar distributions for ASA status, although a higher proportion of male patients was classified as ASA 4 (60.0% vs 46.5%) whereas a higher proportion of female patients was classified as ASA 5 (16.3% vs 12.0%).

Subtle differences in the comorbidity profiles of male and female patients are also apparent. The most common comorbidity for males is cardiovascular disease (54.0%), while for females it is age (51.2%). The admission profiles of male and female patients were also similar (Appendix Table K).

[1] American Society of Anesthesiologists physical status classification scale – ASA 1: A normal healthy patient; ASA 2: A patient with mild systemic disease; ASA 3: A patient with severe systemic disease; ASA 4: A patient with severe systemic disease that is a constant threat to life; ASA 5: A moribund patient who is not expected to survive without the operation; ASA 6: A declared brain-dead patient whose organs are being removed for donor purposes.

Table 1: Demographics of ACTASM 2022 cases	
	ACTASM (n=93)
Age (years)[1]	74 (65–84)
Sex, male:female (%)	53.8:46.2
Length of Stay (days)[1]	5 (2–14)
Indigenous (%)	2.2
ASA (%)[2]	
1	1.1
2	8.6
3	22.6
4	53.8
5	14.0
6	0.0
Comorbidities (%)[3]	
Age	48.4
Cardiovascular	41.9
Respiratory	38.7
Other	24.7
Advanced malignancy	20.4
Diabetes	17.2
Neurological	15.1
Renal	12.9
Obesity	11.8
Hepatic	7.5
Perceived risk of death, Surgeon (%)[4]	
Minimal	1.3
Small	22.7
Moderate	24.0
Considerable	45.3
Expected	6.7
Perceived risk of death, Assessor (%)[4]	
Minimal	1.1
Small	7.5
Moderate	30.1
Considerable	51.6
Expected	9.7

Notes: 5-year ACTASM data for this table appear in Appendix Table H; data are from closed cases as of 27 October 2023.
[1] Data are medians (25th, 75th percentiles).
[2] American Society of Anesthesiologists physical status classification.[1]
[3] Proportions are not mutually exclusive.
[4] Overall perceived risk of patient death as determined by surgeon or assessor.

Surgical Diagnosis

The most common surgical diagnoses overall and for each specialty are summarised in Table 2 (see Appendix Table L for the 3 most frequent surgical diagnoses overall and according to specialty).

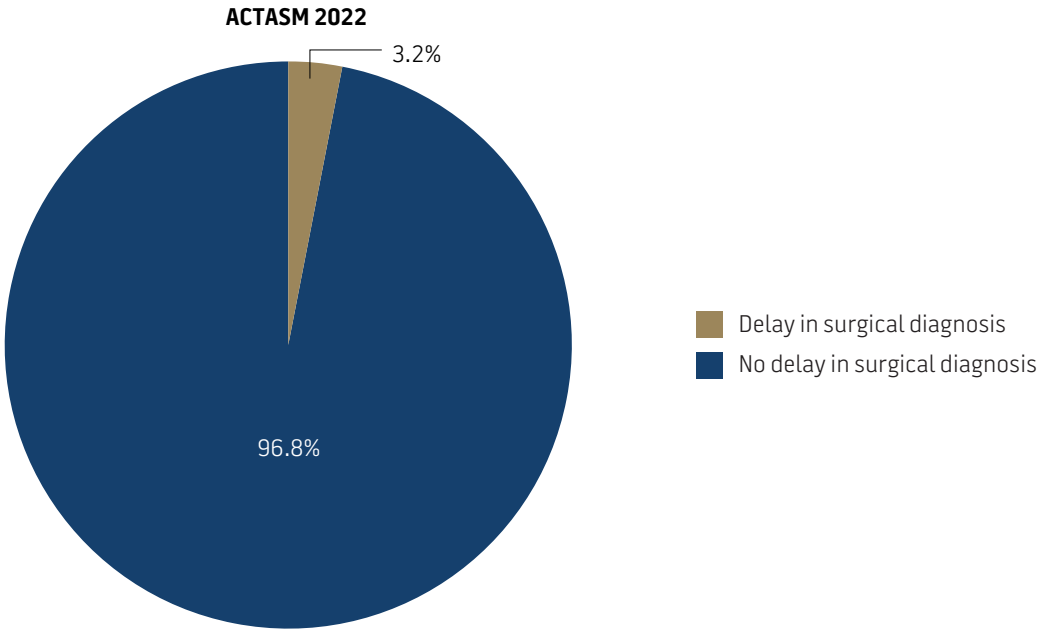
Table 2: Top surgical diagnoses for ACTASM 2022 cases according to specialty

Specialty	Diagnosis
Overall	Perforation of intestine
Cardiothoracic Surgery	Aortic dissection
General Surgery	Perforation of intestine
Neurosurgery	Subdural haematoma
Orthopaedic Surgery	Fractured neck of femur
Otolaryngology Head & Neck Surgery	Carcinoma
Urology	Carcinoma
Vascular Surgery	Abdominal aortic aneurysm

Abbreviation: N/A = not applicable.
Notes: 5-year ACTASM data for this table appear in Appendix Table L. No cases were reported to ACTASM during 1 January 2018–31 December 2022 for Obstetrics & Gynaecology, Ophthalmology, Oral/Maxillofacial Surgery, Paediatric Surgery and Plastic Surgery that had completed the evaluation process as of 27 October 2023.

The proportion of cases from 2022 where a delay in determining the surgical diagnosis was reported was low, with just 3 cases (3.2%) experiencing a delay (Figure 6; Appendix Table M).

Figure 6: ACTASM 2022 cases that had a delay in surgical diagnosis



Note: 5-year data for this figure appear in Appendix Table M.

Operative profile

During 2022, 80.6% (75/93) of closed cases underwent at least 1 operation, with 102 operations in total being reported (Table 3; Appendix Table N). Of those patients that underwent surgery, 81.3% (61/75) had 1 operation, 10.7% (8/75) had 2 operations and 8.0% (6/75) had 3 or more operations. Appendix Table N summarises the 5-year trend data, highlighting that the proportion of patients undergoing multiple operations has steadily decreased over time. This may possibly indicate increased awareness around potentially futile surgery and increased availability of palliative care services.

Table 3: Operation demographics for ACTASM 2022 cases

	ACTASM (n=93)
Cases with Operations (%)[1]	80.6
1 operation	81.3
2 operations	10.7
3 or more operations	8.0
Total Operations (n)	**102**
Operation Urgency (%)[2]	
Immediate	27.5
Emergency	32.4
Scheduled emergency	25.5
Elective	14.7
Reason why No Operation (%)[3]	
Not a surgical problem	38.9
Consultant decision not to operate	50.0
Active decision not to operate	50.0
Patient refused operation	5.6
Limit treatment decision	0.0
Rapid death	11.1

Notes: 5-year ACTASM data for this table appear in Appendix Table N; data are from closed cases as of 27 October 2023.
[1] Data are proportional to closed cases as of 27 October 2023 where at least one operation during admission was reported.
[2] Data are proportional to the total number of operations reported from closed cases as of 27 October 2023.
[3] Data are proportional to closed cases as of 27 October 2023 where no operation during admission was reported. Proportions are not mutually exclusive.

Regarding surgical urgency, an immediate operation is one that occurs within 2 hours of admission, an emergency operation occurs within 24 hours of admission and a scheduled emergency occurs more than 24 hours after admission. In 2022, 27.5% (28/102) of operations were immediate, 32.4% (33/102) were emergencies and 25.5% (26/102) were scheduled emergencies. These proportions are reasonably consistent with 5-year trends (Appendix Table N).

Surgical procedures

The most frequent surgical procedures for patients that died during 2022 are summarised in Table 4. The types of operations reported were broadly consistent over time, with variation apparent in those specialties tending to report low numbers of mortalities (Appendix Table O).

Table 4: Top surgical procedures for ACTASM 2022 cases for all cases and each specialty

Specialty	Diagnosis
Overall	Exploratory laparotomy
Cardiothoracic Surgery	Coronary artery bypass graft
General Surgery	Exploratory laparotomy
Neurosurgery	External ventricular drain
Orthopaedic Surgery	Hemiarthroplasty
Otolaryngology Head & Neck Surgery	Tracheostomy
Urology	Cystoscopy
Vascular Surgery	Axilo-femoral bypass

Abbreviation: N/A = not applicable.
Notes: 5-year ACTASM data for this table appear in Appendix Table O. No cases were reported to ACTASM during 1 January 2018–31 December 2022 for Obstetrics & Gynaecology, Ophthalmology, Oral/Maxillofacial Surgery, Paediatric Surgery and Plastic Surgery that had completed the evaluation process as of 27 October 2023.

Clinically significant infections

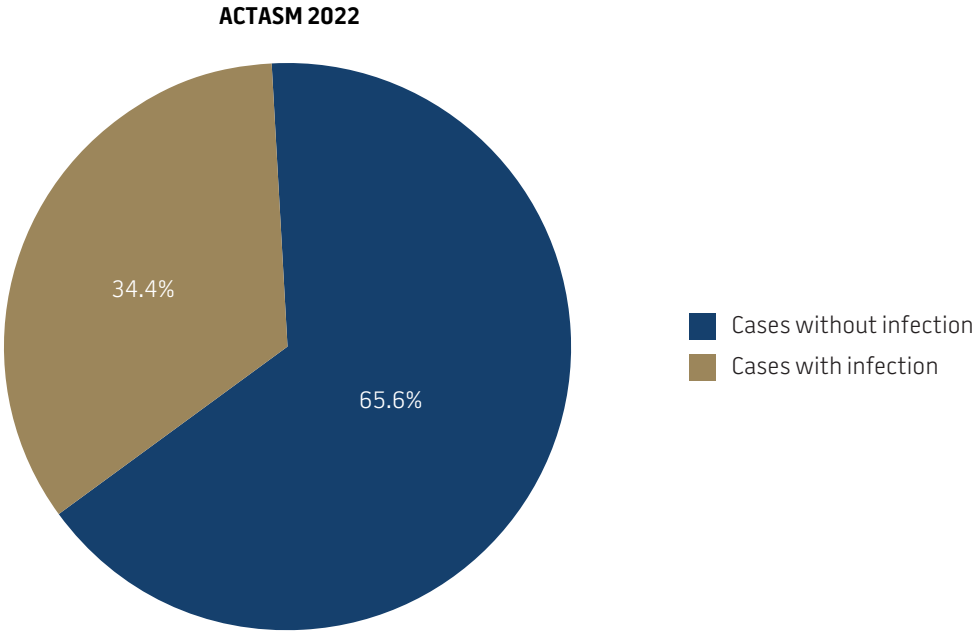
Vignette: Ongoing sepsis in a transferred patient admitted for thrombus embolisation

An elderly male patient with numerous comorbidities was transferred and admitted with superior mesenteric artery (SMA) thrombosis and small bowel ischaemia. The patient underwent 5 procedures during a 2–week admission, including laparotomies, bowel resections, an SMA embolectomy, an anastomosis, and 2 drainages of intra-abdominal collections. The patient developed procedure-related sepsis and tissue ischaemia. He was managed for septic shock with IV antibiotics, fluid replacement and continuous dialysis for renal failure. The patient developed metabolic acidosis; he was hypotensive and hypothermic, and died 10 days after the last procedure.

Delays in recognising an anastomotic leak and in draining the intra-abdominal collections resulted in further septic shock in an already deconditioned patient. The assessor noted issues in the course of patient management including clinical indications for bowel anastomosis rather than end ileostomy and total parenteral nutrition. The choice of operation, intraoperative care (including the experience of the operating surgeon) and postoperative care could have been improved.

Clinically significant infections were reported in 34.4% (32/93) of ACTASM cases, which is broadly consistent with 5-year trends (Figure 7; Appendix Table P).

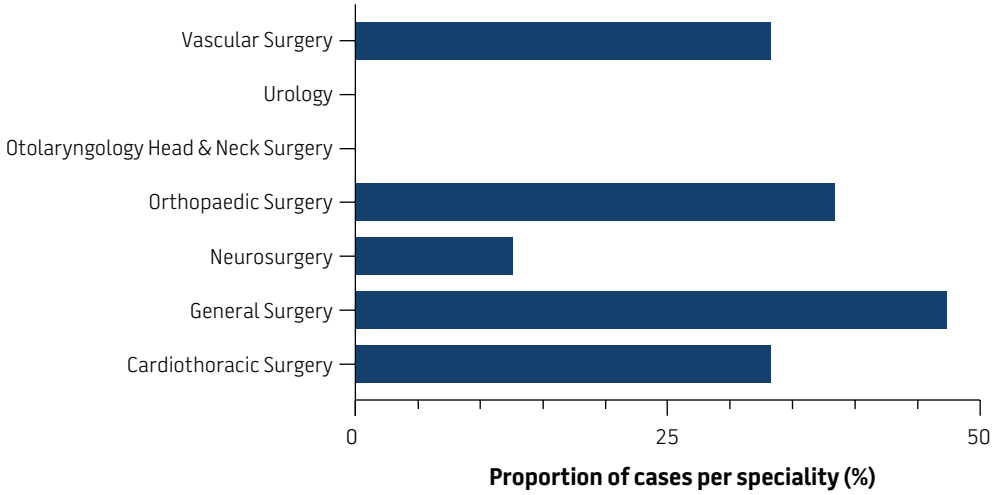
Figure 7: Proportion of ACTASM 2022 cases that had a clinically significant infection



Note: 5-year ACTASM data for this figure appear in Appendix Table P.

General Surgery reported notably higher proportions of infections (47.4%) when compared with other specialties, while Otolaryngology Head and Neck Surgery and Urology reported none (Figure 8; Appendix Table Q).

Figure 8: Proportion of ACTASM cases within each specialty that had a clinically significant infection in 2022



Note: 5-year ACTASM data for this figure appear in Appendix Table Q.

Just over half of these infections were acquired during admission (53.1%, 17/32), with 58.8% (10/17) of these infections acquired postoperatively (Table 5; Appendix Table S). The majority of infections acquired were either sepsis (50.0%), including intra-abdominal sepsis and septicaemia, or pneumonia (40.6%). The antibiotic regime was overwhelmingly considered appropriate (93.8%) and was administered without delay (90.6%).

Table 5: Demographics of ACTASM 2022 cases that had a clinically significant infection

	ACTASM (n=93)
Clinically Significant Infection (%)	34.4
Infection Acquired Time (%)	
Before admission	46.9
During admission	53.1
Infection Acquired During Admission (%)[1]	
Acquired preoperatively	29.4
Surgical-site infection	5.9
Acquired postoperatively	58.8
Other invasive-site infection	5.9
Infection Type (%)[2]	
Pneumonia	40.6
Intra-abdominal sepsis	28.1
Septicaemia	21.9
Other source	9.4
Antibiotic Regime Appropriate (%)[2]	
Yes	93.8
No	0.0
Not applicable	6.3
Delay Initiating Treatment (%)[2]	
Yes	9.4
No	90.6

Notes: 5-year ACTASM data for this table appear in Appendix Table S; data are from closed cases as of 27 October 2023.
[1] Data are proportional to closed cases as of 27 October 2023 where a clinically significant infection was acquired following admission.
[2] Data are proportional to closed cases as of 27 October 2023 where a clinically significant infection was reported.

Given that the proportion of ACTASM cases reporting the presence of a clinically significant infection has remained fairly consistent over the 5-year period 1 January 2018–31 December 2022, ACTASM sought to compare the demographics of those who had an infection with those who did not (Table 6). Admission status for cases where an infection was reported is summarised in Appendix Table R, with patients predominantly public emergency admissions to public hospitals.

Table 6: Demographics of ACTASM 2022 cases according to whether a clinically significant infection was present

	Infection (n=32)	No Infection (n=61)
Age (years)[1]	71 (64–84)	75 (66–84)
Sex, male:female (%)	56.3:43.8	47.5:52.5
Length of Stay (days)[1]	9 (14–17)	4 (2–12)
Indigenous (%)	3.1	1.6
ASA Grade (%)[2]		
1	3.1	0.0
2	12.5	6.6
3	21.9	23.0
4	62.5	49.2
5	0.0	21.3
6	0.0	0.0
Comorbidities (%)[3]		
Advanced malignancy	12.5	24.6
Age	50.0	47.5
Cardiovascular	34.4	45.9
Diabetes	18.8	16.4
Hepatic	9.4	6.6
Neurological	6.3	19.7
Obesity	9.4	13.1
Other	31.3	21.3
Renal	12.5	13.1
Respiratory	40.6	37.7
Perceived risk of death, Surgeon (%)[4]		
Minimal	0.0	2.0
Small	20.8	23.5
Moderate	25.0	23.5
Considerable	41.7	47.1
Expected	12.5	3.9
Perceived risk of death, Assessor (%)[4]		
Minimal	3.1	0.0
Small	6.3	8.2
Moderate	34.4	27.9
Considerable	50.0	52.5
Expected	6.3	11.5

Notes: 5-year ACTASM data for cases with clinically significant infections appear in Appendix Table S; data are from closed cases as of 27 October 2023.
[1] Data are medians (25th, 75th percentiles).
[2] American Society of Anesthesiologists physical status classification[1].
[3] Proportions are not mutually exclusive.
[4] Overall perceived risk of patient death as determined by surgeon or assessor.

DVT prophylaxis

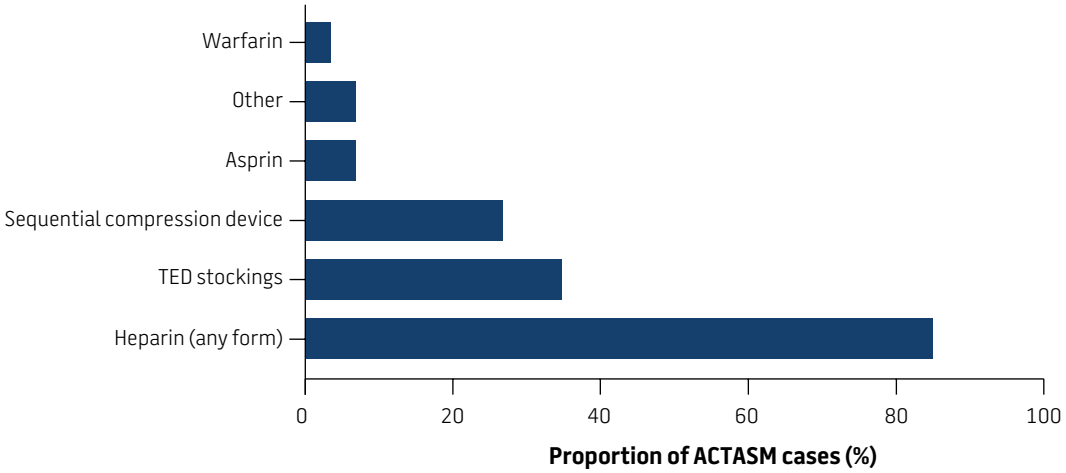
Almost all closed cases (92.5%) employed DVT prophylaxis (Table 7). Heparin was the most common prophylactic agent (84.9%), followed by TED stockings (34.9%) and sequential compression devices (26.7%) (Figure 9; Appendix Table T). In 2022, similar to 2021, 80.6% (75/93) of assessors approved of the DVT strategy employed, none disapproved, and 19.4% (18/93) were unsure. This perception has remained fairly consistent over time (Appendix Table T).

Table 7: DVT prophylaxis demographics for ACTASM 2022 cases

	ACTASM (n=93)
DVT Prophylaxis Used (%)	
Yes	92.5
No	7.5
Reason DVT Not Used (%)[1]	
Active decision to withhold	42.9
Not appropriate	57.1
Not considered	0.0
Not stated	0.0
DVT Prophylaxis Strategy Appropriate (%)[2]	
Yes	80.6
No	0.0
Unknown	19.4

Abbreviation: DVT = deep vein thrombosis.
Notes: 5-year ACTASM data for this table appear in Appendix Table T; data are from closed cases as of 27 October 2023.
[1] Data are proportional to closed cases as of 27 October 2023 where DVT prophylaxis was applied. Data are not mutually exclusive.
[2] Data are proportional to closed cases as of 27 October 2023.

Figure 9: Types of DVT prophylaxis used in ACTASM 2022 cases



Abbreviation: TED = thromboembolic deterrent.
Notes: 5-year ACTASM data for this figure appear in Appendix Table T; data are not mutually exclusive.

Postoperative complications

Vignette: Delayed diagnosis of bowel ischaemia following repair of a ruptured abdominal aortic aneurysm

A man in his late 60s presented to a regional hospital with abdominal and back pain of 6 hours duration. A computed tomography (CT) scan identified a ruptured abdominal aortic aneurysm. It was decided to transfer the patient to a tertiary hospital. This was delayed due to poor weather.

Upon arrival at the tertiary hospital it was determined that the patient was unsuitable for endovascular repair due to the juxtarenal location of the ruptured aneurysm. The aneurysm was repaired via laparotomy. The patient was discharged to the ward intubated, on vasopressors and dialysis (anuric renal failure).

He remained intubated postoperatively due to the development of pneumonia, which was addressed (with limited effect) with IV antibiotics. He continued to deteriorate. General Surgery was consulted for suspicion of intestinal ischaemia, but an infected haematoma or diverticular abscess was believed to be more likely. The patient was taken to theatre for laparotomy one week later, which identified an ischaemic sigmoid with perforation and necrotic small bowel. This was resected and stapled off. Two days later he was returned to theatre for an end colostomy and anastomosis of the small bowel. Despite this, the patient deteriorated. He eventually received palliative care.

Both the submitting surgeon and assessor agreed that the significant delay in diagnosing bowel ischaemia was of concern, although may not have altered the outcome in this instance.

Postoperative complications occurred in 28.0% (21/75) of cases where at least one operation had occurred (Table 9). This is a slight increase from 2021 (24.6%), within an otherwise downward trend since 2018 (Appendix Table U).

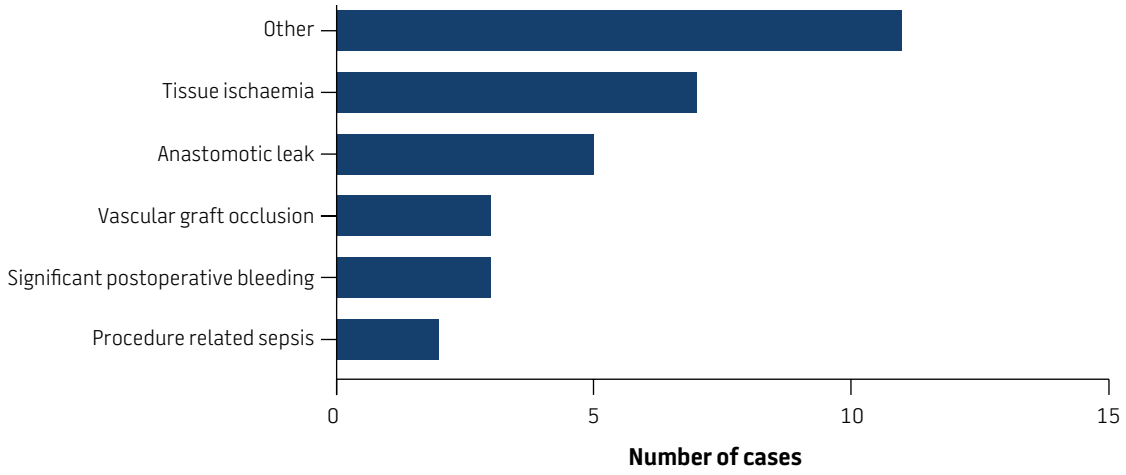
Table 8: Postoperative complications in ACTASM 2022 cases

	ACTASM (n=75)[1]
Cases with postoperative complications (%)[2]	28.0
Postoperative complications (n)	31
Other (%)[3]	35.5
Tissue ischaemia (%)[3]	22.6
Anastomotic leak (%)[3]	16.1
Significant postoperative bleeding (%)[3]	9.7
Vascular graft occlusion (%)[3]	9.7
Procedure-related sepsis (%)[3]	6.5
Endoscopic perforation (%)[3]	0.0
Delay recognising complication (%)[4]	
Yes	9.5
No	90.5

Notes: 5-year data for this table appear in Appendix Table U.
[1] Number of cases where at least one operation during admission was reported.
[2] Data are proportional to closed cases as of 27 October 2023 where at least one operation during admission was reported.
[3] Data are proportional to the number of postoperative complications reported from closed cases as of 27 October 2023; data not mutually exclusive.
[4] Data are proportional to closed cases as of 27 October 2023 where the occurrence of postoperative complications was reported.

The category of 'other' (i.e. disparate complications not easily categorised) was the most frequent postoperative complication in 2022 (35.5%; 11/31 complications) (Figure 10; Appendix Table U). This was followed by tissue ischaemia (22.6%; 7/31 complications) and anastomotic leak (16.1%; 5/31 complications). (Note: patients may have more than one postoperative complication.)

Figure 10: Top 5 postoperative complications for ACTASM 2022 cases



Note: 5-year data for this figure appear in Appendix Table U.

Table 9 summarises the demographics of patients who experienced postoperative complications compared with those who did not. Patients who experienced postoperative complications had lengths of stay (14 days; IQR 4–24) more than triple the duration of those without postoperative complications (4 days; IQR 2–11). Patients with postoperative complications also had a much higher comorbidity burden than those without.

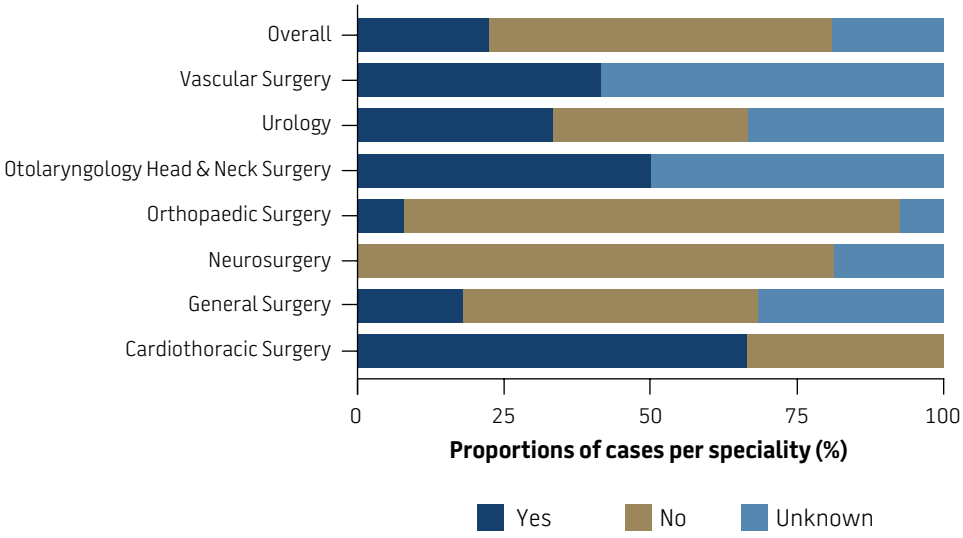
Table 9: Demographics of ACTASM 2022 cases according to whether a postoperative complication was present

	Postoperative complications (n=21)	No postoperative complications (n=54)
Age (years)[1]	74 (64–85)	73 (64–81)
Length of stay (days)[1]	14 (4–24)	4 (2–11)
Sex (% male:female)	52.4:47.6	48.1:51.9
Indigenous (%)	0.0	3.7
ASA Grade (%)[2]		
1	0.0	1.9
2	23.8	3.7
3	23.8	24.1
4	52.4	51.9
5	0.0	18.5
6	0.0	0.0
Comorbidities (%)[3]		
Advanced malignancy	14.3	5.6
Age	57.1	22.2
Cardiovascular	33.3	13.0
Diabetes	9.5	3.7
Hepatic	9.5	3.7
Neurological	9.5	3.7
Obesity	14.3	5.6
Other	19.0	7.4
Renal	4.8	1.9
Respiratory	38.1	14.8
Perceived risk of death, Surgeon (%)[4]		
Minimal	0.0	1.9
Small	33.3	18.5
Moderate	38.1	18.5
Considerable	23.8	53.7
Expected	4.8	7.4
Perceived risk of Death, Assessor (%)[4]		
Minimal	4.8	0.0
Small	14.3	5.6
Moderate	38.1	25.9
Considerable	42.9	59.3
Expected	0.0	9.3

Notes: Data are from closed cases as of 27 October 2023.
[1] Data are medians (25th, 75th percentiles).
[2] American Society of Anesthesiologists physical status classification.[1]
[3] Proportions are not mutually exclusive.
[4] Overall perceived risk of patient death as determined by surgeon or assessor.

As depicted in Figure 11, the proportions of cases with postoperative complications varied across specialties in 2022, being highest for Cardiothoracic Surgery, in which 66.7% of cases had a postoperative complication. No Neurosurgery cases were reported to have a postoperative complication.

Figure 11: Proportion of ACTASM 2022 cases with postoperative complications, according to specialty



Note: 5-year ACTASM data for this table appear in Appendix Table V.

Critical care unit usage

Three-quarters of ACTASM cases (75.3%, 70/93) required the use of a critical care unit (CCU) during admission, with 18.6% of these being unplanned admissions (13/70). Surgeons overwhelmingly approved of the care received by their patients during admissions to CCU (Table 10).

Table 10: Demographics of CCU usage for ACTASM 2022 cases

	ACTASM (n=93)
CCU Used (%)	
Yes	75.3
No	24.7
CCU Should Have Been Used (%)[1]	
ICU	0.0
HDU	0.0
Surgical Team Satisfied with CCU Care (%)[2]	
Yes	98.6
No	1.4

Abbreviations: CCU = critical care unit; ICU = intensive care unit; HDU = high dependency unit.
Notes: 5-year ACTASM data for this table appear in Appendix Table W; data are from closed cases as of 27 October 2023.
[1] Data are proportional to closed cases as of 27 October 2023 where CCU facilities were not used.
[2] Data are proportional to closed cases as of 27 October 2023 where CCU facilities were used.

Causes of death

The most commonly cited cause of death was multiple organ failure (Table 11). Trend data for the 5-year period 1 January 2018–31 December 2022 are summarised in Appendix Table X.

Table 11: Top causes of death for ACTASM 2022 cases according to specialty

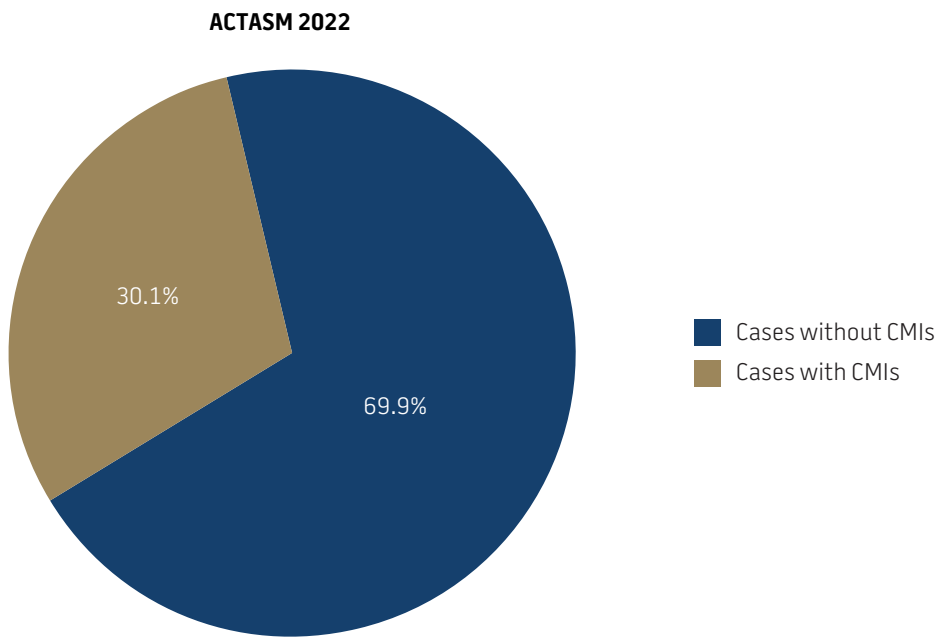
Specialty	Diagnosis
Overall	Multiple organ failure
Cardiothoracic Surgery	Cerebrovascular accident
General Surgery	Multiple organ failure
Neurosurgery	Cerebrovascular accident
Orthopaedic Surgery	Aspiration pneumonia
Otolaryngology Head & Neck Surgery	Unknown cause of death
Urology	Carcinoma
Vascular Surgery	Multiple organ failure

Abbreviations: N/A = not applicable.
Notes: 5-year ACTASM data for this table appear in Appendix Table X. No cases were reported to ACTASM during 1 January 2018–31 December 2022 for Obstetrics & Gynaecology, Ophthalmology, Oral/Maxillofacial Surgery, Paediatric Surgery and Plastic Surgery that had completed the evaluation process as of 27 October 2023.

9. Peer review outcomes

The ACTASM evaluation process facilitates independent assessment of the surgical care afforded to patients who die in hospital. These evaluations are undertaken by surgeons from the same specialty unaffiliated with the hospital from which the case arose. As part of their evaluations, assessors are asked to identify any CMIs that occurred during the course of patient care. For cases from 2022 that have completed the ACTASM evaluation process, assessors identified the presence of CMIs in 30.1% of cases (28/93) (Figure 12), with a total of 34 CMIs identified (Table 12; Appendix Table Y). This is higher than 2021 which reported the presence of CMIs in 22.6% of cases (24/93) with a total of 28 CMIs (Appendix Table Y).

Figure 12: Proportion of ACTASM 2022 cases that had CMIs



Abbreviation: CMI = clinical management issue.
Notes: 5-year ACTASM data appear in Appendix Table X; proportion of ACTASM cases from 2022 that had a CMI, as determined by the assessor.

Clinical management issues by specialty

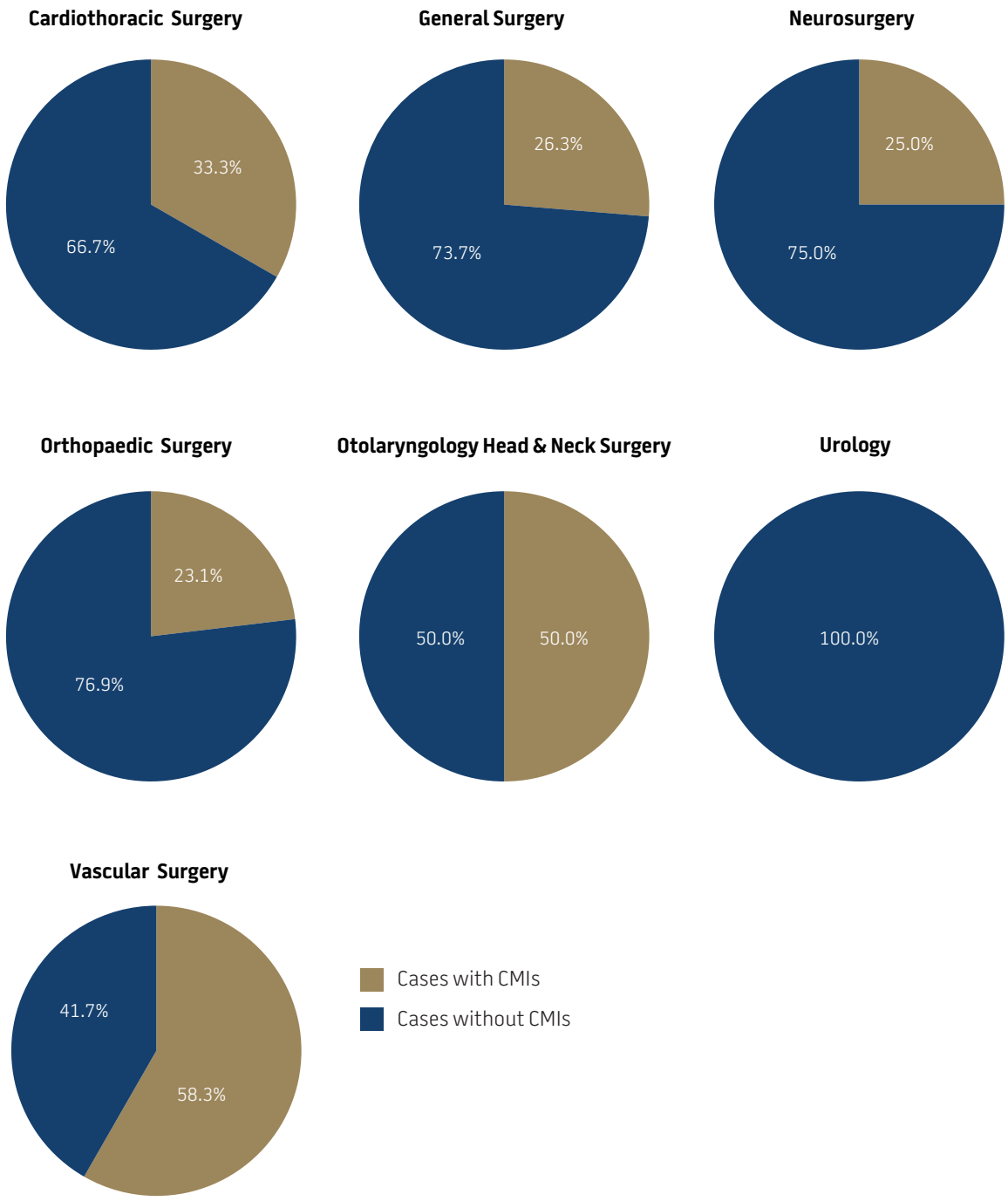
Vascular surgery reported the highest proportion of cases where at least one CMI was identified following assessment (58.3%, 7/12), followed by Otolaryngology, Head and Neck Surgery (50.0%, 1/2), Cardiothoracic Surgery (33.3%, 3/9), General Surgery (26.3%, 10/38), Neurosurgery (25.0%, 4/16) and Orthopaedic Surgery (23.1%, 3/13). No CMIs were identified for Urology cases (0.0%, 0/3) (Figure 13, Appendix Table Y).

Table 12: Demographics of CMIs for ACTASM 2022 cases

	ACTASM (n=93)
Cases with CMIs (%)	30.1
Total CMIs (n)	34
CMI Severity (%)[1]	
Consideration	55.9
Concern	32.4
Adverse event	5.9
Unknown	5.9
CMI Outcome (%)[1]	
Made no difference	23.5
May have contributed to death	52.9
Caused death of patient otherwise expected to survive	8.8
Unknown	14.7
CMI Preventability (%)[1]	
Definitely	23.5
Probably	35.3
Probably not	35.3
Definitely not	0.0
Unknown	5.9
CMI Associated with (%)[1,2]	
Audited surgical team	64.7
Another clinical team	26.5
Hospital	5.9
Other	8.8

Abbreviation: CMI = clinical management issue.
Notes: 5-year ACTASM data for this table appear in Appendix Table Z. Data are from the highest level of assessment undertaken for closed cases as of 27 October 2023.
[1] Data are proportional to the total CMIs reported by assessors from the highest level of assessment undertaken for closed cases as of 27 October 2023.
[2] Data not mutually exclusive.

Figure 13: Proportion of ACTASM 2022 cases that had CMIs by specialty



Abbreviation: CMI = clinical management issue.
Notes: 5-year ACTASM data appear in Appendix Table Y; proportion of ACTASM cases from 2022 that had a CMI per specialty, as determined by the assessor.

Severity of clinical management issues

Most CMIs identified were relatively minor (55.9%; 19/34), being viewed as areas of consideration. A further 32.4% (11/34) were deemed to be of moderate concern (area of concern). Only 2 adverse events were identified (5.9%) (Table 12; Appendix Table Z). When considering the effects on patient outcomes, 61.7% of CMIs (21/34) were thought to have potentially contributed to death in some way ('may have contributed to death' or 'caused death of a patient otherwise expected to survive') and more than half of CMIs (58.8%; 20/34) were considered potentially preventable ('definitely' or 'probably' preventable). Approximately two-thirds of CMIs (64.7%; 22/34) were attributed to the surgical team.

The decision to operate and the choice of operation undertaken were prevalent CMIs identified by assessors (Table 13; Appendix Table AA).

Table 13: Top CMIs identified by assessors for ACTASM 2022 cases according to specialty

Specialty	Diagnosis
Overall	Decision to operate
Cardiothoracic Surgery	Decision to operate
General Surgery	Better to have done different procedure
Neurosurgery	Better to have done different procedure
Orthopaedic Surgery	Aspiration pneumonia
Otolaryngology Head & Neck Surgery	N/A
Plastic Surgery	N/A
Urology	N/A
Vascular Surgery	Decision to operate

Abbreviation: N/A = not applicable.
Notes: 5-year ACTASM data for this table appear in Appendix Table AA; data represent grouped definitions.

Pathway of care

Assessors' overall perceptions of the quality of surgical care offered during a patient's admission—from preoperative to postoperative management—is summarised in Appendix Table BB. Levels of assessor approval or disapproval of the care offered is relatively consistent over the period 1 January 2018–31 December 2022.

10. Patient transfer

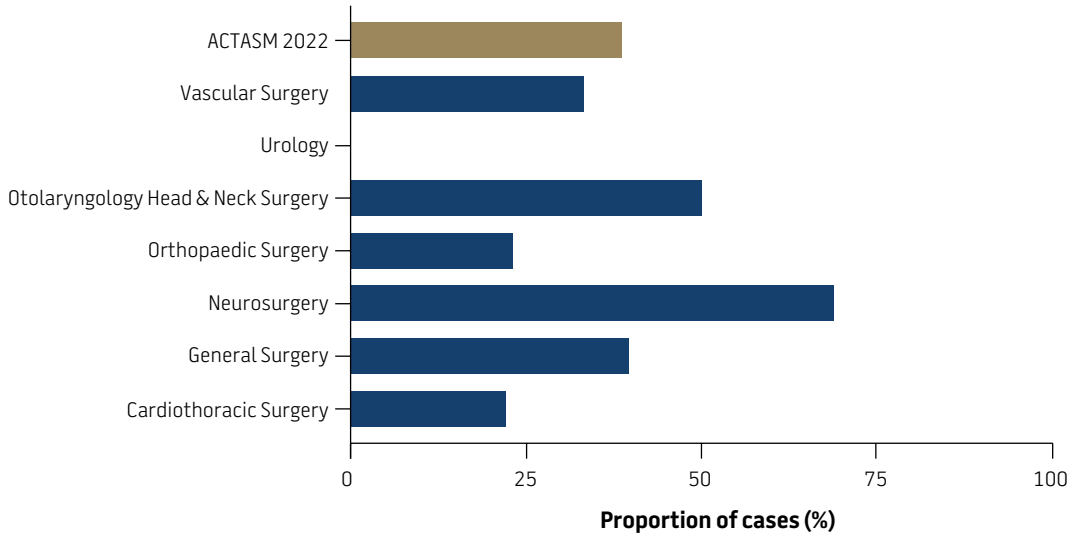
Vignette: Significant delays for a patient with severe peritonitis

An elderly male patient was transferred and admitted emergently for sigmoid volvulus. Sigmoidoscopy was performed 12 hours after admission, which found gut ischaemia and perforation at the volvulus site from which faecal peritonitis had developed. A Hartmann's procedure was performed, but the patient died 3 days later from severe sepsis.

The assessor noted that failure to organise a colonoscopic decompression when the patient was first admitted to the receiving hospital significantly contributed to this patient's death. Refusal by the gastroenterologist to attend the patient and lack of escalation by the treating surgeon for 12 hours allowed faecal peritonitis to develop into severe sepsis and multiple organ failure, which caused the terminal event.

Transfer of patients between treating institutions occurred for 38.7% (36/93) of closed cases reported to ACTASM for 2022 (Figure 14), which is broadly consistent with 5-year trends (Appendix Table BB). The proportions of cases resulting from transfers were also relatively consistent across specialties; however, there was a notable increase observed from 2021 for General Surgery and Neurosurgery, and a decrease for Orthopaedic Surgery (Appendix Table CC).

Figure 14: Proportion of transferred ACTASM 2022 cases according to specialty



Notes: 5-year ACTASM data appear in Appendix Table CC. Otolaryngology Head and Neck Surgery only had 2 cases reported for 2022.

The proportion of transferred cases where a delay in transfer was reported increased slightly from 2021, although this remains substantially reduced since 2020, with 8.3% of cases (3/36) reporting delays in 2022, compared to 30.8% (8/26) in 2020 (Appendix Table DD). Otherwise, the quality of patient care offered during transfer in 2022 was met with overwhelming approval from the treating surgeon's perspective (97.2%, 35/36), consistent with 5-year trends (Appendix Table DD).

The demographics of transferred versus non-transferred patients are summarised in Table 14. Transferred patients were younger than non-transferred patients (median 70 years IQR [63–79] versus median 75 years IQR [68–85]), and Indigenous patients also appeared more likely to undergo transfer during the course of care.

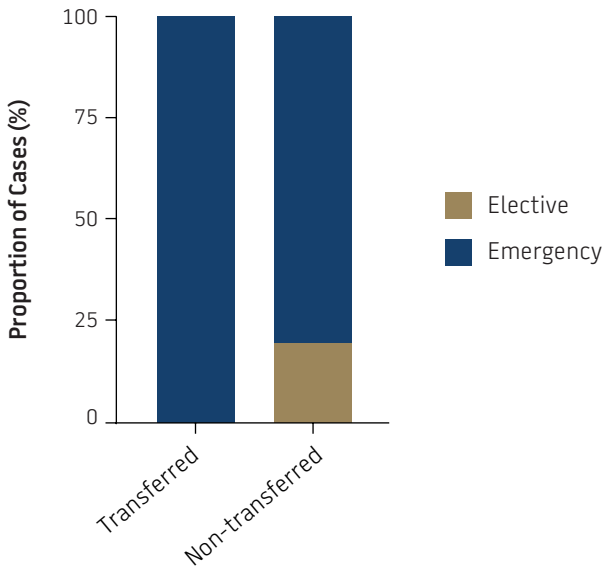
Table 14: Demographics of transferred and non-transferred ACTASM 2022 cases

	Transferred (n=36)	Non-transferred (n=57)
Age (years)[1]	70 (63–79)	75 (68–85)
Sex, male:female (%)	63.9:36.1	52.6:47.4
Length of Stay (days)[1]	4 (2–13)	6 (3–15)
Indigenous (%)	5.6	0.0
ASA Grade (%)[2]		
1	2.8	0.0
2	5.6	10.5
3	25.0	21.1
4	58.3	50.9
5	8.3	17.5
6	0.0	0.0
Comorbidities (%)[3]		
Advanced malignancy	2.8	31.6
Age	41.7	52.6
Cardiovascular	44.4	40.4
Diabetes	16.7	17.5
Hepatic	11.1	5.3
Neurological	11.1	17.5
Obesity	8.3	14.0
Other	22.2	26.3
Renal	11.1	14.0
Respiratory	36.1	40.4
Perceived risk of death, Surgeon (%)[4]		
Minimal	0.0	2.2
Small	20.7	23.9
Moderate	20.7	26.1
Considerable	51.7	41.3
Expected	6.9	6.5
Perceived risk of death, Assessor (%)[4]		
Minimal	0.0	2.2
Small	8.3	8.7
Moderate	36.1	32.6
Considerable	41.7	71.7
Expected	13.9	8.7

Notes: 5-year data for patients who were transferred during the course of care appear in Appendix Table EE; data are from closed cases where patient transfer was reported as of 27 October 2023.
[1] Data are medians (25th, 75th percentiles).
[2] American Society of Anesthesiologists physical status classification.[1]
[3] Proportions are not mutually exclusive.
[4] Overall perceived risk of patient death as determined by surgeon or assessor.

Patient transfers were exclusively considered to be emergency admissions (100.0%, 36/36), a marked difference from non-transferred patients (80.7%; Figure 15). Distributions of patient transfers according to metropolitan versus rural status and public versus private status are shown in Appendix Tables FF and GG, respectively. During 2022, 36.1% of transfers (13/36) were from rural/remote health centres, 50.0% (18/36) were from metropolitan hospitals, and the remaining transfers (13.9%; 5/36) were of unknown status (Appendix Table FF). (Note: all hospitals in the ACT are classified as metropolitan hospitals.) All transfers were to public institutions (100.0%; 36/36) (Appendix Table GG). These transfer patterns have remained broadly consistent over the 5-year period.

Figure 15: Admission status of transferred and non-transferred ACTASM 2022 cases

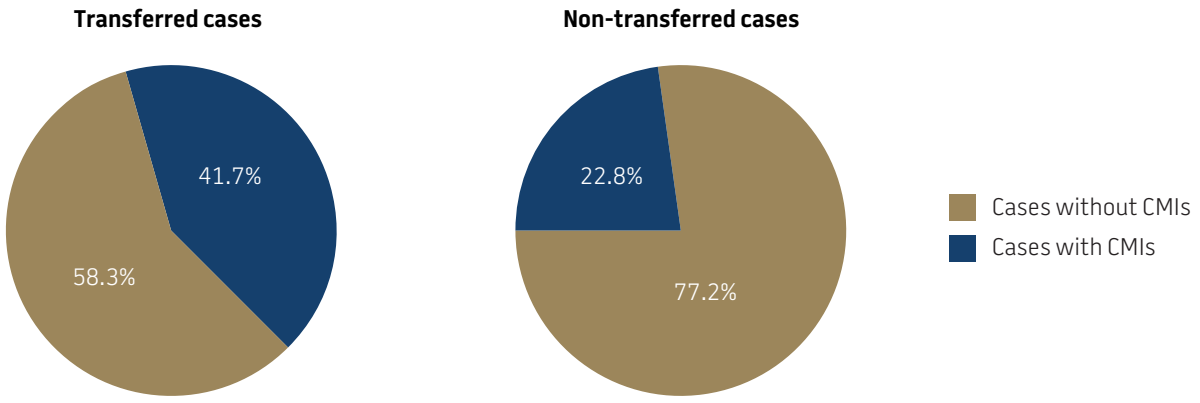


Note: 5-year ACTASM data for this figure appear in Appendix Table EE.

Evaluation of care

When reviewing the quality of surgical care experienced by transferred versus non-transferred patients, assessors identified CMIs in more than half of transferred patients (58.3%), compared with less than one-quarter of non-transferred patients (22.8%) (Figure 16; Appendix Table HH).

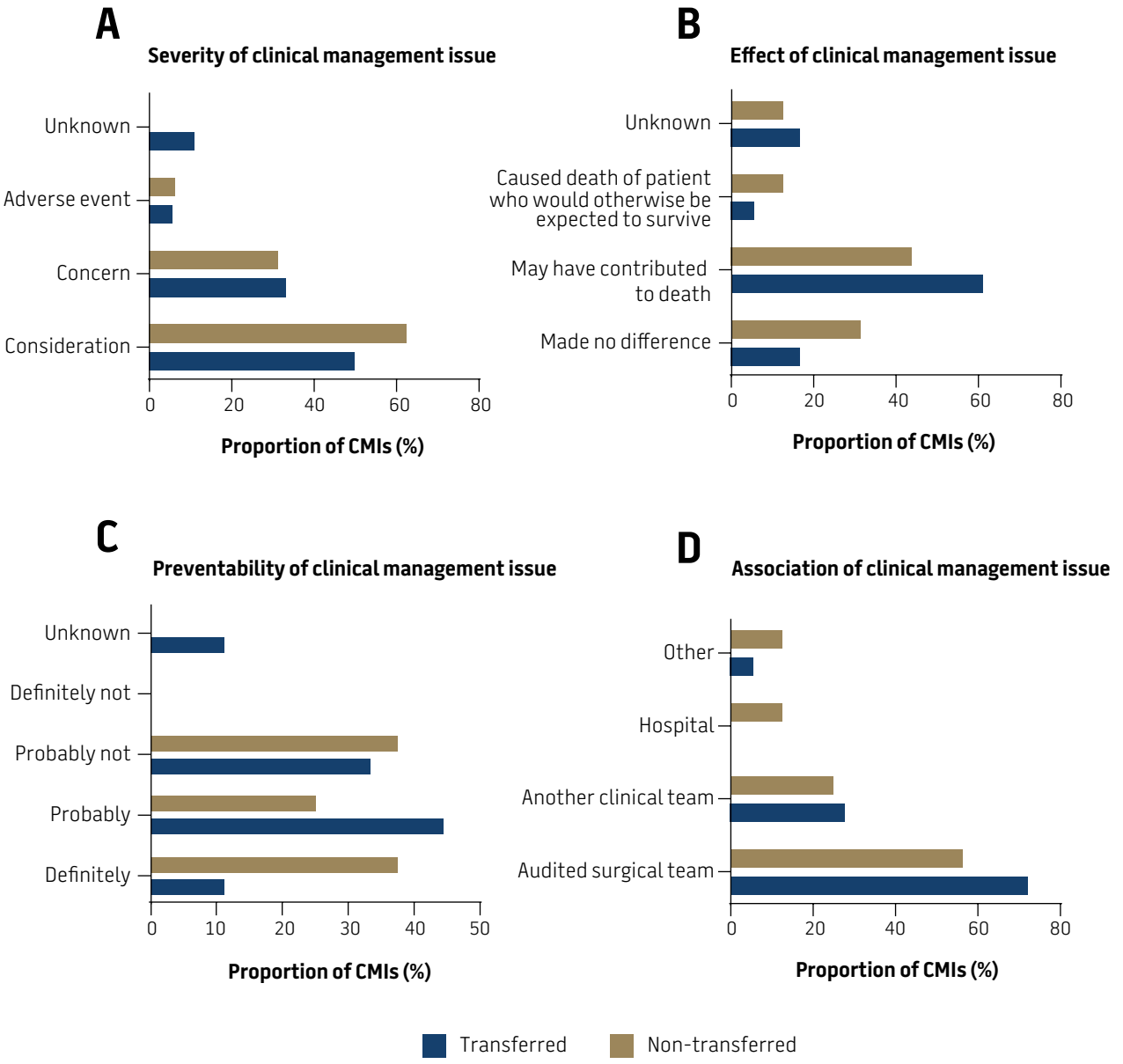
Figure 16: Proportion of transferred and non-transferred ACTASM 2022 cases with assessor-identified CMIs



Abbreviation: CMI = clinical management issue.
Note: 5-year data for identified CMIs in transferred patients appear in Appendix Tables II and JJ.

The characteristics of CMIs identified among transferred versus non-transferred patients are depicted in Figure 17 (Appendix Table JJ). Assessor perceptions of the extent to which the issues identified contributed to patient death varied between transferred and non-transferred cases. CMIs identified in transferred cases were more likely to have potentially contributed to death, while CMIs identified that caused the death of a patient otherwise expected to survive were higher in non-transferred cases. CMIs identified in the transferred cohort were also more likely to be considered 'probably' preventable, however CMIs identified in the non-transferred cohort were more likely to be considered 'definitely' preventable. Common types of CMIs identified in the transferred cohort were delays in transfer and delays to surgery (Appendix Table KK).

Figure 17: CMI demographics of transferred and non-transferred ACTASM 2022 cases



Notes:5-year ACTASM data appear in Appendix Table GG. Data for association of clinical management issue not mutually exclusive.

11. Unplanned returns to theatre

Vignette: Anastomotic leak following sigmoidectomy for a malignant large bowel obstruction

A woman in her late 70s presented to the emergency department with a large bowel obstruction secondary to a large malignant mass. She had previously undergone a hysterectomy and cholecystectomy and was glucose intolerant. The following day, she underwent sigmoidectomy and tension-free stapled anastomosis (based on observations that the bowel was not grossly dilated and appeared viable). The following morning, in response to developing sepsis, the patient underwent a CT scan, which confirmed the presence of an anastomotic leak. A Hartmann's procedure was performed that day. She was discharged to the intensive care unit where she developed atrial flutter and multiple organ failure.

The treating surgeon acknowledged the technical failure of the anastomosis, which resulted in the anastomotic leak. The assessor concurred with this observation, suggesting a more conservative approach from the outset (e.g. end colostomy or covering loop ileostomy) may have been preferred.

Unplanned returns to theatre (URTT) remain of particular interest to ACTASM because when they occur, they contribute to increased hospital burdens. In 2022, 15.1% of cases (14/93) had a URTT. As shown in Table 15, patients who experienced a URTT had longer lengths of stay compared with those who did not.

Patients who underwent URTT were similar in age to those who did not; however, distinctions between patients who underwent URTT and those who did not are also apparent (Table 16). A higher proportion of the URTT cohort was female (57.1% female patients with URTT; 44.3% female patients without URTT). No Indigenous patients underwent URTT, whereas 2.5% of cases without URTT were Indigenous. Interestingly, the ASA grades of cases with URTT were lower than were cases without URTT. Those with URTT were more likely to have a respiratory comorbidity and twice as likely to have obesity listed as a comorbidity. Some disparity existed between surgeons' perceived overall risk of death and that of assessors, with assessors twice as likely to record a 'moderate' risk of death than were assessors for the URTT cohort.

Table 15: Demographics of ACTASM 2022 cases according to URTT status

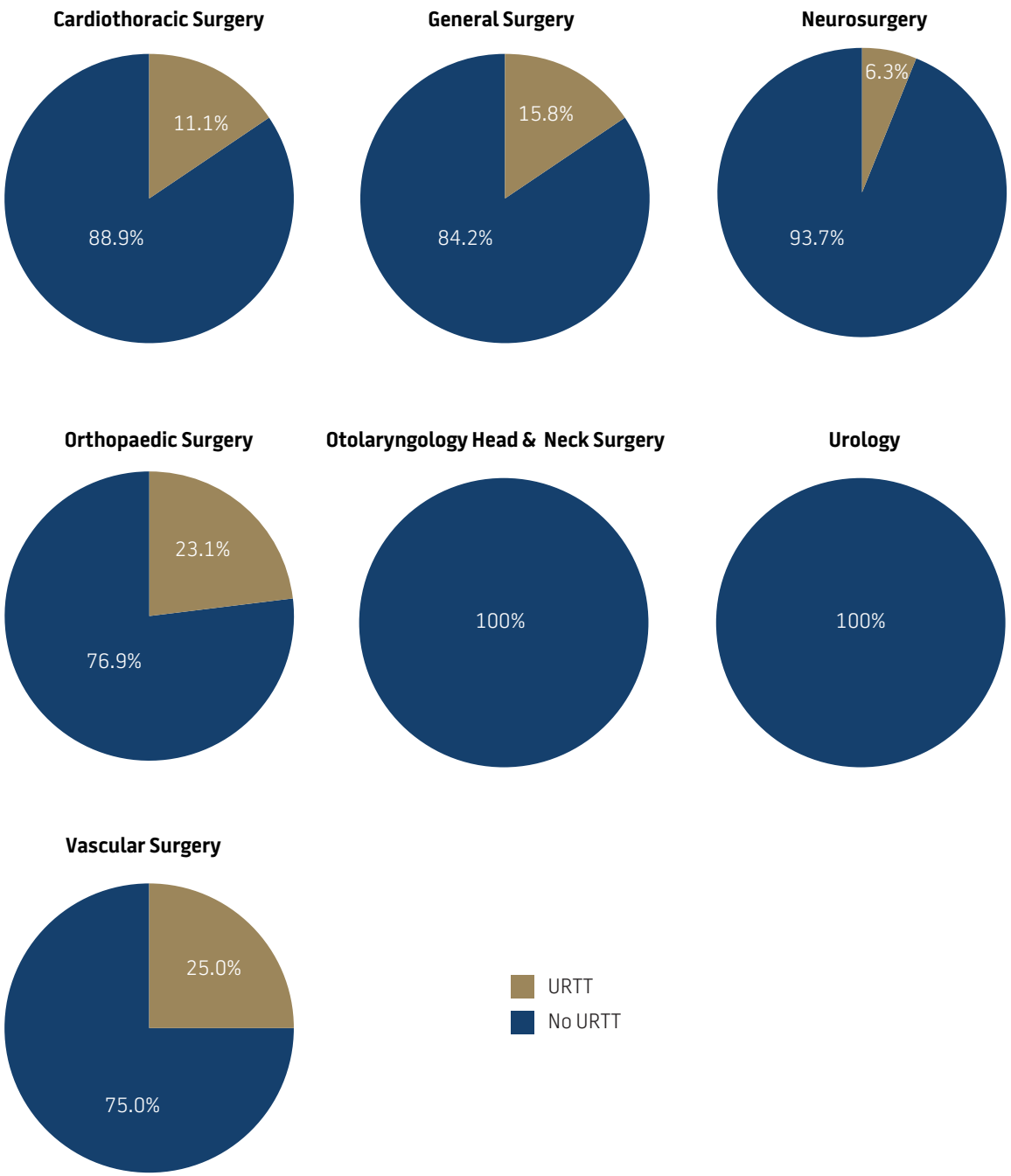
	URTT (n=14)	No URTT (n=79)
Age (years)[1]	73 (65–77)	75 (65–84)
Length of Stay (days)[1]	10 (5–20)	4 (2–14)
Sex (% male:female)	42.9:57.1	55.7:44.3
Indigenous (%)	0.0	2.5
ASA Grade (%)[2]		
1	0.0	1.3
2	28.6	5.1
3	28.6	21.5
4	35.7	57.0
5	7.1	15.2
6	0.0	0.0
Comorbidities (%)[3]		
Advanced malignancy	14.3	21.5
Age	42.9	49.4
Cardiovascular	14.3	46.8
Diabetes	7.1	19.0
Hepatic	7.1	7.6
Neurological	0.0	17.7
Obesity	21.4	10.1
Other	35.7	22.8
Renal	7.1	13.9
Respiratory	50.0	36.7
Perceived risk of death, Surgeon (%)[4]		
Minimal	7.1	0.0
Small	35.7	16.0
Moderate	21.4	20.0
Considerable	35.7	38.7
Expected	0.0	6.7
Perceived risk of death, Assessor (%)[4]		
Minimal	7.1	0.0
Small	21.4	5.1
Moderate	42.9	27.8
Considerable	28.6	55.7
Expected	0.0	11.4

Abbreviation: URTT = unplanned return to theatre.
Notes: 5-year data for patients that had a URTT appear in Appendix Table LL; data are from closed cases as of 27 October 2023.
[1] Data are medians (25th, 75th percentiles).
[2] American Society of Anesthesiologists physical status classification.[1]
[3] Proportions not mutually exclusive.
[4] Overall perceived risk of patient death as determined by surgeon or assessor.

URTT by specialty

Vascular Surgery had the highest proportion of URTT at 25.0% of cases (3/12) followed by Orthopaedic Surgery at 23.1% of cases (6/38), whereas Otolaryngology Head and Neck Surgery and Urology reported no URTT (Figure 18, Appendix Table MM).

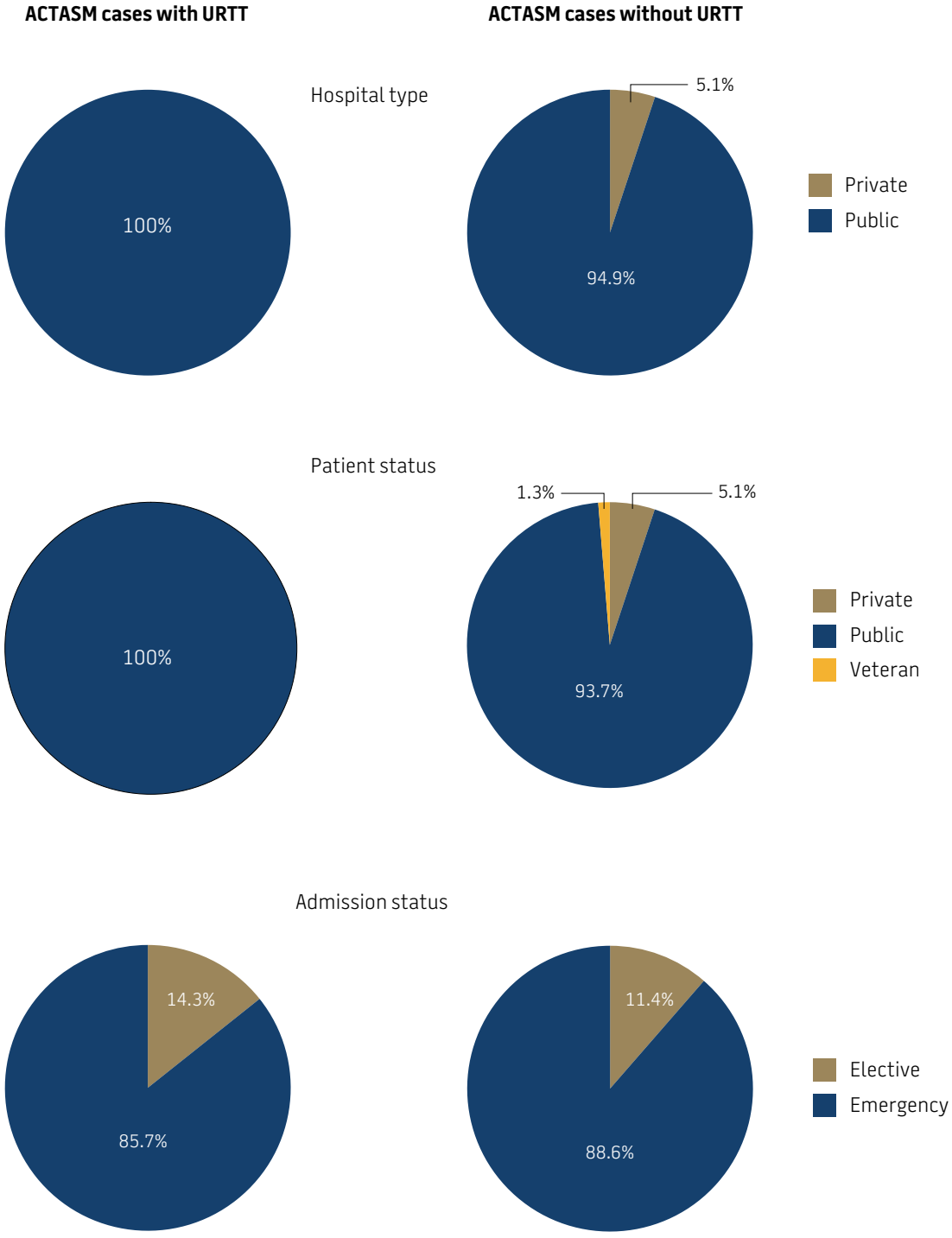
Figure 18: Specialty breakdown for ACTASM 2022 cases according to URTT status



Abbreviation: URTT = unplanned return to theatre
Notes: 5-year data for patients that had a URTT per specialty appear in Appendix Table MM; data are from closed cases as of 27 October 2023.

There are subtle differences in admission characteristics between those who had a URTT and those who did not (Figure 19, Appendix Table NN). All cases with a URTT were public patients admitted to public hospitals. The proportions of emergency and elective admissions were similar between the URTT and non-URTT cohorts.

Figure 19: Hospital and admission demographics of ACTASM 2022 cases, according to URTT status



Abbreviation: URTT = unplanned return to theatre.
Note: 5-year ACTASM data for this table appear in Appendix Table NN.

Clinical management issues in cases with URTT

Cases with a URTT were more likely to have CMIs present (Table 16). Two adverse events (20%, 2/10) were reported in cases with a URTT and none in those without. Three CMIs in cases with a URTT were considered to have caused the death of a patient otherwise expected to survive (30%, 3/10), compared to none in those without. A higher proportion of the CMIs identified in the URTT cohort was considered definitely or probably preventable and was attributed to the managing surgical team. It is important to note that a URTT may represent an attempt to rescue a patient following a recognised complication. On the other hand, in circumstances of no URTT followed by patient death, this may represent a rational limitation of care where further surgery is thought to be futile.

Table 16: CMI demographics for ACTASM 2022 cases according to URTT status

	URTT (n=14)	No URTT (n=79)
Cases with CMIs Present (%)	50.0	26.6
Total CMIs (n)	10	24
CMI Severity (%)[1]		
Consideration	50.0	58.3
Concern	30.0	33.3
Adverse event	20.0	0.0
Unknown	0.0	8.3
CMI Outcome (%)[1]		
Made no difference	10.0	29.2
May have contributed to death	40.0	58.3
Caused death of patient otherwise expected to survive	30.0	0.0
Unknown	20.0	12.5
CMI Preventability (%)[1]		
Definitely	30.0	20.8
Probably	40.0	33.3
Probably not	20.0	41.7
Definitely not	0.0	0.0
Unknown	10.0	4.2
CMI Associated With (%)[1,2]		
Audited surgical team	70.0	62.5
Another clinical team	20.0	29.2
Hospital	10.0	4.2
Other	30.0	0.0

Abbreviation: CMI = clinical management issue.
Notes: 5-year ACTASM data for patients that had a URTT appear in Appendix Table 00; data are from the highest level of assessment undertaken for closed cases as of 27 October 2023 where a clinically significant infection was reported.
[1] Data are proportional to the total CMIs reported by assessors from the highest level of assessment undertaken for closed cases as of 27 October 2023.
[2] Data not mutually exclusive.

The most frequent types of CMIs identified for those cases where a URTT occurred were unnecessary operations and inadequate postoperative assessment (Appendix Table PP).

12. Discussion

This report summarises the outcomes from the ACTASM evaluation of the 93 completed cases of patients who died during 2022 following surgical care. Long-term trend data are available in the appendix. The broad demographics of the ACTASM patient cohort have remained stable over this 5-year period, with age, comorbidity profiles and admission types remaining relatively unchanged, even during years challenged by COVID-19.

It is pleasing to observe that 88.4% of cases (107/121) from 2022 have been submitted to ACTASM. However, 11.6% of cases (14/121) are still pending submission. It is important to note that the census date for data in this report is 27 October 2023 and the deadline for renewal of registration with the Australian Health Practitioner Regulation Agency (AHPRA) is 30 September. Surgeons who undertake their CPD through RACS or the AOA should be mindful of the potential implications on registration of having cases still outstanding.

The proportion of cases where CMIs were reported following assessment has increased in 2022, with more 'areas of concern' identified. However, fewer 'areas for consideration' and 'adverse events' were identified. The most commonly reported types of issues were 'delays to investigating the patient' and 'delays to surgery'. This may be related, in part, to the high burden of transferred patients that ACT hospitals must manage, where 38.7% of cases in 2022 documented patient transfer during the course of care. These cases were more likely than their non-transferred counterparts to have CMIs identified following peer assessment, with those issues also being linked to delays in patient care. While correlation between these observations may be speculative, the relative consistency with which these issues have been reported over time may speak to systemic issues that still need addressing.

Australian Capital Territory Audit of Surgical Mortality (ACTASM)

Annual Report 2022

Appendix: 5-year data, 1 January 2018–31 December 2022

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Methods

Case criteria

Following notification from public and private hospitals, ACTASM evaluates all in-hospital surgical deaths that meet either of the following criteria:

- any patient admitted to hospital by a surgeon, regardless of whether a procedure took place
- any hospital admission where a procedure took place that was performed by a surgeon.

Terminal care admissions (admissions where no intent-to-treat medical or surgical interventions took place and the patient is transitioned to palliative care) are excluded from the full audit process.

Collaborations

The Royal Australasian College of Surgeons (RACS) has collaborations with the Australian and New Zealand College of Anaesthetists (ANZCA) and the Royal Australian and New Zealand College of Obstetricians and Gynaecologists (RANZCOG) for participation in ACTASM. For cases involving gynaecological surgery, the treating surgeon is invited to participate in the audit and to voluntarily submit the case to ACTASM. Similarly, Fellows from the Royal Australian and New Zealand College of Ophthalmologists (RANZCO) and the Royal Australasian College of Dental Surgeons (RACDS) are invited to participate in the audit on a voluntary basis. Participation in ACTASM has been mandated by RACS and the Australian Orthopaedic Association (AOA) as part of their continuing professional development (CPD) programs.

Data collection

Following notification of a patient death, ACTASM requests that the consultant surgeon responsible for the patient submits a surgical case form (SCF), which details the clinical, diagnostic and procedural data of the patient's final hospital admission. The SCF includes the opportunity to identify any clinical management issues (CMIs) perceived to have occurred during the course of patient care. It is also possible for a consultant surgeon to declare a case to have been a terminal care admission (i.e. the patient was palliated almost immediately upon admission, with no medical or surgical intervention taking place). Terminal admissions are excluded from the full audit process.

SCFs are reviewed for clarity, de-identified and assigned for first-line assessment (FLA) by ACTASM. Assessors provide initial feedback on the overall management of submitted cases and the level of care provided. They also indicate whether there is a need for further evaluation via second-line assessment (SLA), which includes medical note review. An SLA is generally requested because of specific questions arising from the FLA that require more considered evaluation. All assessors invited to evaluate submissions are surgeons from the same surgical specialty as the treating surgeon and are independent of the institution from which the case arose. All assessors are required to sign a declaration acknowledging the confidentiality of the process. SLAs allow for the provision of in-depth feedback to the consultant surgeon responsible for the case.

CMIs identified by surgeons or assessors as part of the audit process are classified as either:

- *Areas of consideration* – the clinician believes aspects of care could have been improved but recognises that this is debatable
- *Areas of concern* – the clinician believes that aspects of care should have been better
- *Adverse events* – an unintended injury caused by patient management rather than by the disease process that is sufficiently serious to lead to prolonged hospitalisation or temporary or permanent disability of the patient, or which contributes to or causes death.

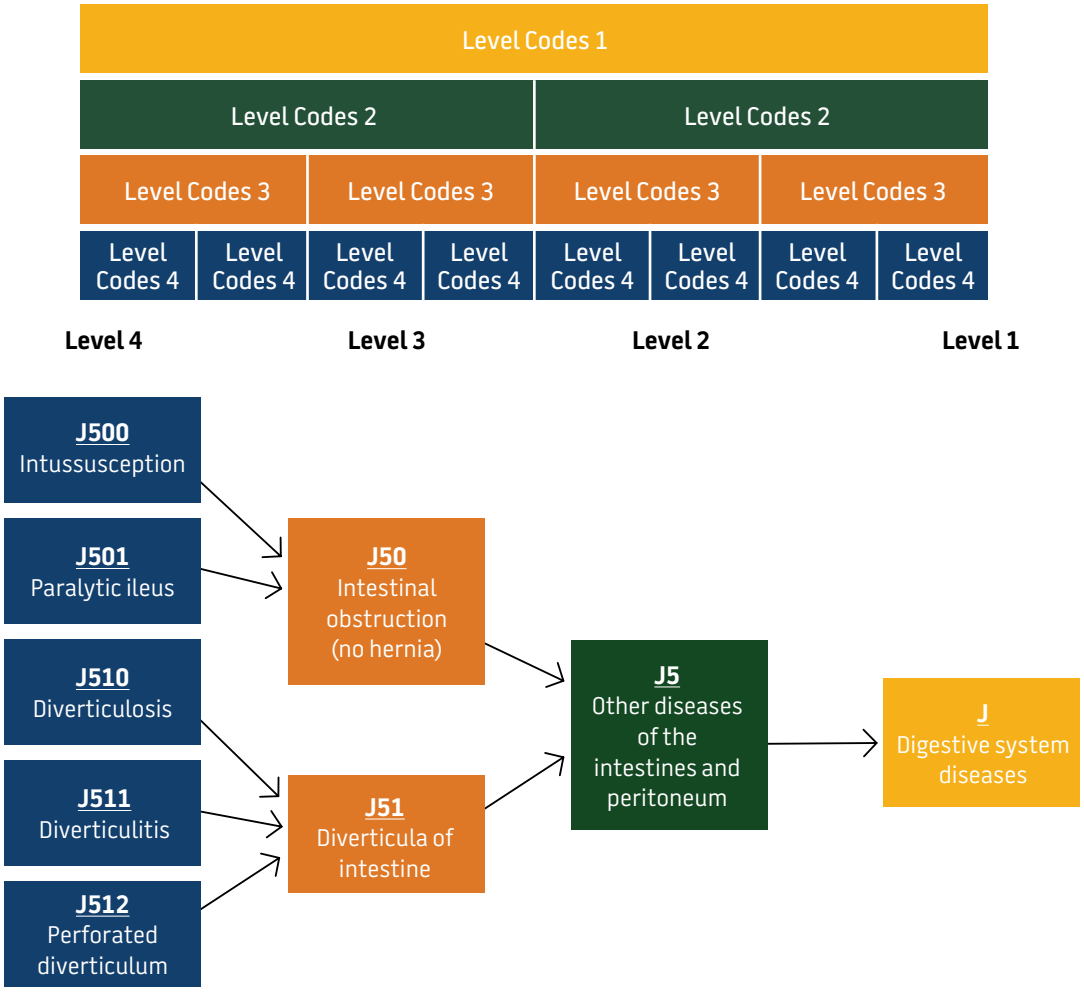
The collection of SCF and FLA data is facilitated by the Fellow's Interface, which is a secure online platform to which surgeons have access. SLA data are entered by RACS staff using a bespoke administrative interface.

Where relevant, data are coded using READ code designations.[1] Data are stored securely and encrypted using Microsoft SQL Server 2017, with data subsets scrutinised for consistency on a monthly basis.

READ Codes

Coding of clinical information for subsequent analysis is undertaken through use of the READ codes, originally developed for use in primary healthcare and subsequently adapted for use by audits of surgical mortality.[2, 3, 4] The READ codes comprise a mono-hierarchical coding system that defines the diagnoses, procedures and CMIs reported from the ACTASM evaluation process. An example of how these codes are hierarchically grouped is depicted in Figure A.

Figure A: Mono-hierarchical structure of the Read codes used by SAASM



Notes: the hierarchical structure of the READ codes is such that individual codes are successively grouped into higher level concepts, from individual codes (level 4) through to parent groupings (level 1).

Data analysis

This report includes cases for inpatients who died during the period 1 January 2018 through 31 December 2022 (census date 27 October 2023). Data were analysed using R 4.3.1[5], RStudio 2023.06.1[6], GraphPad Prism 10.0.2 (GraphPad Software, US) and Excel 365 (Microsoft, US). Statistical tests are introduced in the context within which they were applied. Categorical variables are expressed as counts and/or proportions. Continuous variables are expressed as means (± standard deviation) or medians (with interquartile range [IQR]) depending on the normality of the distribution. Statistical significance was assumed at $p \leq 0.05$ (ns = non-significant). Analyses have been conducted using all available valid data points. Auditable cases comprise all cases notified to ACTASM, except those excluded due to being terminal care admissions, and includes those cases still pending submission as of the census date.

Engagement with ACTASM

ACTASM case-load

Table A: Status of cases progressing through the ACTASM evaluation and feedback process, according to year of patient death

Case Status	2018	2019	2020	2021	2022
Pending submission[1]	0.0 (0/137)	0.0 (0/124)	0.8 (1/120)	0.0 (0/118)	10.4 (14/135)
Under assessment[2]	2.2 (3/137)	0.8 (1/124)	1.7 (2/120)	3.4 (4/118)	10.4 (14/135)
Closed[3]	82.5 (113/137)	80.6 (100/124)	75.0 (90/120)	78.8 (93/118)	68.9 (93/135)
Terminal care[4]	10.9 (15/137)	16.9 (21/124)	16.7 (20/120)	14.4 (17/118)	8.9 (12/135)
Non-participant[5]	0.7 (1/137)	0.0 (0/124)	0.8 (1/120)	0.0 (0/118)	0.0 (0/135)
Lost to follow-up[6]	3.6 (5/137)	1.6 (2/124)	5.0 (6/120)	3.4 (4/118)	1.5 (2/135)

Notes: Data are reported as % (numerator/denominator); proportions are relative to the total cases notified to ACTASM; data are from all cases, except those excluded due to error, as of 27 October 2023.

[1] Cases that have been entered into the database and are awaiting notification of treating surgeon, or cases notified to the treating surgeon and awaiting submission to ACTASM.

[2] Cases submitted to ACTASM and undergoing the evaluation process, includes cases undergoing initial assessment (first-line assessment), medical note review (second-line assessment) or Clinical Director review before feedback issued.

[3] Cases that have completed the ACTASM evaluation process and feedback delivered to treating surgeons.

[4] Cases where patients were palliated upon admission with no active medical or surgical intervention.

[5] Cases where the treating surgeon was not mandated to participate (e.g. as a Fellow of RACS or the AOA) and voluntarily chose to not participate.

[6] Cases where the treating surgeon has retired, moved overseas or is deceased and no other consultant surgeon was associated with care.

Table B: Cases pending submission to ACTASM, according to specialty and year of patient death

Specialty (%)	2018 (n=137)	2019 (n=124)	2020 (n=120)	2021 (n=118)	2022 (n=135)
Cardiothoracic Surgery	0.0 (0/5)	0.0 (0/11)	0.0 (0/8)	0.0 (0/5)	0.0 (0/10)
General Surgery	0.0 (0/50)	0.0 (0/43)	0.0 (0/40)	0.0 (0/51)	7.1 (4/56)
Neurosurgery	0.0 (0/26)	0.0 (0/24)	0.0 (0/21)	0.0 (0/29)	8.0 (2/25)
Orthopaedic Surgery	0.0 (0/22)	0.0 (0/16)	5.6 (1/18)	0.0 (0/12)	27.3 (6/22)
Otolaryngology Head & Neck Surgery	N/A	0.0 (0/1)	0.0 (0/2)	N/A	0.0 (0/3)
Paediatric Surgery	N/A	N/A	N/A	N/A	100.0 (1/1)
Plastic Surgery	0.0 (0/3)	0.0 (0/2)	0.0 (0/6)	0.0 (0/3)	N/A
Urology	0.0 (0/10)	0.0 (0/6)	0.0 (0/4)	0.0 (0/6)	0.0 (0/4)
Vascular Surgery	0.0 (0/21)	0.0 (0/21)	0.0 (0/20)	0.0 (0/12)	7.1 (1/14)

Abbreviation: N/A = not applicable.

Notes: Data are reported as % (numerator/denominator); proportions are relative to the total cases notified to ACTASM for the specialty; data are from all cases, except those excluded due to error, as of 27 October 2023.

Hospital and surgeon engagement

Table C: Duration (days) from patient death to notification of treating surgeon of a pending ACTASM case, according to year of patient death

	2018 (n=137)	2019 (n=124)	2020 (n=120)	2021 (n=118)	2022 (n=135)
Overall	44 (27–71)	43 (29–82)	30 (19–50)	27 (17–46)	25 (15–32)

Abbreviation: N/A = not applicable.
Notes: Data are medians (25th, 75th percentiles); data are from all cases, except those excluded due to error, as of 27 October 2023.

Table D: Duration (days) from notification of treating surgeon to submission of a pending case to ACTASM, according to year of patient death

	2018 (n=113)	2019 (n=100)	2020 (n=90)	2021 (n=93)	2022 (n=93)
Overall	76 (8–195)	81 (7–238)	90 (6–237)	75 (7–210)	42 (5–108)

Abbreviation: N/A = not applicable.
Notes: Data are medians (25th, 75th percentiles); data are from closed cases as of 27 October 2023.

Table E: Duration (days) from notification of treating surgeon to submission of a pending case to ACTASM, according to specialty and year of patient death

Specialty	2018 (n=113)	2019 (n=100)	2020 (n=90)	2021 (n=93)	2022 (n=93)
Cardiothoracic Surgery	3 (1–41)	26 (3–74)	143 (2–258)	1 (1–18)	8 (1–248)
General Surgery	107 (14–224)	45 (5–188)	143 (31–221)	76 (9–202)	22 (4–94)
Neurosurgery	22 (6–128)	161 (72–238)	35 (3–65)	126 (44–329)	107 (12–253)
Orthopaedic Surgery	127 (30–538)	412 (136–643)	362 (62–490)	124 (57–276)	57 (9–95)
Otolaryngology Head & Neck Surgery	N/A	14 (14–14)	N/A	N/A	12 (8–16)
Paediatric Surgery	N/A	N/A	N/A	N/A	N/A
Plastic Surgery	164 (128–199)	39 (19–58)	7 (4–11)	44 (24–65)	N/A
Urology	34 (5–148)	1 (0–169)	438 (438–438)	18 (3–146)	100 (90–141)
Vascular Surgery	62 (18–96)	63 (26–123)	50 (28–109)	42 (24–61)	50 (42–68)

Abbreviation: N/A = not applicable.
Notes: Data are medians (25th, 75th percentiles); data are from closed cases as of 27 October 2023; no cases were reported to ACTASM during 1 January 2018–31 December 2022 for Obstetrics & Gynaecology, Ophthalmology, Oral/Maxillofacial Surgery and Paediatric Surgery that had completed the evaluation process as of 27 October 2023.

ACTASM evaluation process

Table F: Time taken (days) to complete the ACTASM evaluation process, according to year of patient death

	2018 (n=113)	2019 (n=100)	2020 (n=90)	2021 (n=93)	2022 (n=93)
Overall	**316 (129–767)**	**343 (128–854)**	**363 (159–800)**	**178 (73–317)**	**108 (48–242)**
FLA	306 (119–675)	302 (124–648)	317 (156–695)	140 (66–316)	97 (48–211)
SLA	645 (209–1468)	1315 (1062–1523)	1036 (650–1238)	287 (266–352)	239 (194–345)

Abbreviations: FLA = first-line assessment; SLA = second-line assessment; N/A = not applicable.
Notes: Data are medians (25th, 75th percentiles); data are from closed cases as of 27 October 2023.

Table G: Time taken (days) to complete the ACTASM evaluation process, according to specialty and year of patient death

Specialty	2018 (n=113)	2019 (n=100)	2020 (n=90)	2021 (n=93)	2022 (n=93)
Cardiothoracic Surgery	104 (94–371)	221 (175–1037)	402 (190–738)	86 (47–265)	191 (68–278)
General Surgery	213 (100–695)	201 (67–445)	287 (157–459)	176 (71–289)	69 (41–163)
Neurosurgery	336 (146–470)	403 (313–966)	398 (173–1084)	211 (103–525)	152 (55–325)
Orthopaedic Surgery	468 (134–800)	605 (366–784)	734 (477–1083)	293 (116–534)	139 (97–336)
Otolaryngology Head & Neck Surgery	N/A	41 (41–41)	398 (398–398)	N/A	22 (17–28)
Plastic Surgery	653 (445–860)	305 (275–334)	128 (62–231)	79 (48–109)	N/A
Urology	316 (274–427)	1028 (478–1450)	448 (448–448)	259 (153–314)	108 (102–156)
Vascular Surgery	602 (157–1462)	555 (234–834)	255 (152–780)	94 (66–209)	91 (61–144)

Abbreviation: N/A = not applicable.
Notes: Data are medians (25th, 75th percentiles); data are from closed cases as of 27 October 2023; no cases were reported to ACTASM during 1 January 2018–31 December 2022 for Obstetrics & Gynaecology, Ophthalmology, Oral/Maxillofacial Surgery and Paediatric Surgery that had completed the evaluation process as of 27 October 2023.

Patient Profile

Demographics

Table H: Population characteristics for cases notified to ACTASM, according to year of patient death

	2018 (n=113)	2019 (n=100)	2020 (n=90)	2021 (n=93)	2022 (n=93)
Age (years)[1]	76 (63–85)	77 (71–83)	77 (61–83)	77 (64–84)	74 (65–84)
Sex, male:female (%)	67.3:32.7	57.0:43.0	52.2:47.8	60.2:39.8	53.8:46.2
Length of Stay (days)[1]	5 (2–10)	5 (2–12)	5 (2–12)	5 (2–16)	5 (2–14)
Indigenous (%)					
Yes	0.9	2.0	1.1	3.2	2.2
No	96.5	98.0	98.9	96.8	97.8
Unknown	2.7	0.0	0.0	0.0	0.0
ASA Grade (%)[2]					
1	2.7	0.0	2.2	0.0	1.1
2	0.9	5.0	6.7	8.6	8.6
3	30.1	26.0	28.9	32.3	22.6
4	40.7	39.0	45.6	43.0	53.8
5	12.4	18.0	13.3	15.1	14.0
6	1.8	0.0	1.1	1.1	0.0
Unknown	11.5	12.0	2.2	0.0	0.0
Comorbidities (%)[3]					
Advanced malignancy	15.9	18.0	12.2	14.0	20.4
Age	58.4	56.0	46.7	50.5	48.4
Cardiovascular	55.8	50.0	52.2	52.7	41.9
Diabetes	21.2	20.0	22.2	17.2	17.2
Hepatic	3.5	4.0	5.6	0.0	7.5
Neurological	19.5	21.0	18.9	24.7	15.1
Obesity	8.8	7.0	11.1	9.7	11.8
Other	16.8	22.0	13.3	19.4	24.7
Renal	19.5	21.0	27.8	12.9	12.9
Respiratory	31.9	23.0	21.1	20.4	38.7
Perceived risk of death, surgeon (%)[4]					
Minimal	3.2	2.6	4.1	5.8	1.3
Small	9.6	9.1	10.8	18.8	22.7
Moderate	26.6	28.6	35.1	23.2	24.0
Considerable	45.7	53.2	44.6	49.3	45.3
Expected	12.8	6.5	5.4	2.9	6.7
Unknown	2.1	0.0	0.0	0.0	0.0
Perceived risk of death, assessor (%)[4]					
Minimal	4.4	4.0	2.2	4.3	1.1
Small	4.4	6.0	10.0	10.8	7.5
Moderate	27.4	24.0	27.8	26.9	30.1
Considerable	47.8	53.0	51.1	46.2	51.6
Expected	15.9	13.0	8.9	11.8	9.7
Unknown	0.0	0.0	0.0	0.0	0.0

Notes: Data are from closed cases as of 27 October 2023.
[1] Data are medians (25th, 75th percentiles).
[2] American Society of Anesthesiologists physical status classification.[7]
[3] Proportions are not mutually exclusive.
[4] Overall perceived risk of patient death, as determined by surgeon or assessor.

Table I: Admission profile for cases notified to ACTASM, according to year of patient death

	2018 (n=113)	**2019** (n=100)	**2020** (n=90)	**2021** (n=93)	**2022** (n=93)
Admission Status (%)					
Elective	17.7	20.0	21.1	16.1	11.8
Emergency	82.3	80.0	78.9	83.9	88.2
Unknown	0.0	0.0	0.0	0.0	0.0
Hospital Status (%)					
Private	0.0	8.0	5.6	4.3	4.3
Public	99.1	91.0	94.4	95.7	95.7
Co-location	0.0	1.0	0.0	0.0	0.0
Unknown	0.9	0.0	0.0	0.0	0.0
Patient Status (%)					
Private	1.8	9.0	4.5	4.3	4.3
Public	97.3	91.0	92.2	94.6	94.6
Veteran	0.9	0.0	1.1	1.1	1.1
Unknown	0.0	0.0	2.2	0.0	0.0

Notes: Data are from closed cases as of 27 October 2023.

Table J: Population characteristics for cases notified to ACTASM, according to patient sex

	Male (n=50)	Female (n=43)
Age (years)[1]	73 (65–82)	75 (64–85)
Length of Stay (days)[1]	6 (3–15)	4 (2–11)
Indigenous (%)		
Yes	4.0	0.0
No	96.0	100.0
Unknown	0.0	0.0
ASA Grade (%)[2]		
1	0.0	2.3
2	6.0	11.6
3	22.0	23.3
4	60.0	46.5
5	12.0	16.3
6	0.0	0.0
Unknown	0.0	0.0
Comorbidities (%)[3]		
Advanced malignancy	22.0	18.6
Age	46.0	51.2
Cardiovascular	54.0	27.9
Diabetes	20.0	14.0
Hepatic	12.0	2.3
Neurological	16.0	14.0
Obesity	10.0	14.0
Other	18.0	32.6
Renal	16.0	9.3
Respiratory	32.0	37.2
Perceived risk of death, surgeon (%)[4]		
Minimal	2.7	0.0
Small	24.3	21.1
Moderate	18.9	28.9
Considerable	48.6	42.1
Expected	5.4	7.9
Unknown	0.0	0.0
Perceived risk of death, assessor (%)[4]		
Minimal	0.0	2.3
Small	6.0	9.3
Moderate	30.0	30.2
Considerable	58.0	44.2
Expected	6.0	14.0
Unknown	0.0	0.0

Notes: Data are from closed cases as of 27 October 2023.
[1] Data are medians (25th, 75th percentiles).
[2] American Society of Anesthesiologists physical status classification.[7]
[4] Proportions are not mutually exclusive.
[6] Overall perceived risk of patient death, as determined by surgeon or assessor.

Table K: Admission profile for cases notified to ACTASM, according to patient sex

	Male (n=50)	**Female** (n=43)
Admission Status (%)		
Elective	8.0	16.3
Emergency	92.0	83.7
Unknown	0.0	0.0
Hospital Status (%)		
Private	4.0	4.7
Public	96.0	95.3
Co-location	0.0	0.0
Unknown	0.0	0.0
Patient Status (%)		
Private	4.0	4.7
Public	94.0	95.3
Veteran	2.0	0.0
Unknown	0.0	0.0

Notes: Data are from closed cases as of 27 October 2023 where patient death occurred in 2022.

Surgical Diagnosis

Table L: Most frequent types of surgical diagnoses, according to year of patient death and specialty

Specialty	2018	2019	2020	2021	2022
Overall	Fractured neck of femur, septicaemia, abdominal aortic aneurysm	Fractured neck of femur, diffuse brain injury, trauma admission, intestinal obstruction/ ischaemia, carcinoma	Fractured neck of femur, intestinal ischaemia	Subarachnoid haemorrhage, intestinal ischaemia, perforation of intestine	Perforation of intestine, intestinal ischaemia, carcinoma
Cardiothoracic Surgery	Carcinoma, coronary atherosclerosis, dissecting aortic aneurysm, cardiac tamponade	Carcinoma, aortic stenosis, ischaemic heart disease, haemopneumothorax	Left ventricular failure, ischaemic heart disease, carcinoma	Ischaemic heart disease, valvular disease, carcinoma	Aortic dissection, ischaemic heart disease, valvular disease
General Surgery	Septicaemia, diffuse brain injury, chronic ischaemic colitis	Intestinal obstruction, intestinal ischaemia, carcinoma	Diffuse brain injury, intestinal ischaemia, carcinoma,	Intestinal ischaemia, perforation of intestine, intestinal obstruction	Perforation of intestine, intestinal ischaemia, carcinoma
Neurosurgery	Subarachnoid haemorrhage, intracerebral haemorrhage, brain injury	Diffuse brain injury, subarachnoid haemorrhage, subdural haemorrhage	Subarachnoid haemorrhage, intracranial arteriovenous malformation, carcinoma	Subarachnoid haemorrhage, diffuse brain injury, arteriovenous malformation	Subdural haematoma, cerebrovascular accident, subarachnoid haemorrhage
Orthopaedic Surgery	Fractured neck of femur, septicaemia, other fracture of femur	Fractured neck of femur, attention to total hip replacement, closed fracture of femur	Fractured neck of femur, fracture of prosthetic joint component, septicaemia	Fractured neck of femur, closed fracture proximal femur, infective arthritis	Fractured neck of femur, fracture of prosthetic joint component, closed fracture proximal femur
Otolaryngology Head & Neck Surgery	N/A	Cervical and neck disorders	Aspiration pneumonia	N/A	Carcinoma, epistaxis
Plastic Surgery	Chronic renal failure, haematoma, cellulitis, infective arthritis	Carcinoma	Carcinoma, skin and subcutaneous skin infections, chronic skin ulcers	Operative wound infection/ dehiscence, osteomyelitis	N/A
Urology	Septicaemia, peritonitis, calculus of kidney and ureter	Carcinoma, ureteric obstruction, haematuria	Septicaemia	Ureteric obstruction, carcinoma, haematuria	Carcinoma, septicaemia
Vascular Surgery	Abdominal Aortic aneurysm, swelling of limb	Abdominal Aortic aneurysm, swelling of limb, peripheral vascular disease	Peripheral vascular disease, swelling of limb, ischaemic ulcer	Peripheral vascular disease, abdominal aortic aneurysm, diabetic ulcer	Abdominal aortic aneurysm, diabetic ulcer, peripheral vascular disease

Notes: Data are from closed cases as of 27 October 2023; no cases were reported to ACTASM during 1 January 2018–31 December 2022 for Obstetrics & Gynaecology, Ophthalmology, Oral/Maxillofacial Surgery and Paediatric Surgery that had completed the evaluation process as of 27 October 2023. Some specialties had equal most frequent codes hence why more than one is commonly listed.

Table M: Cases where a delay in determining the surgical diagnosis was reported by the treating surgeon, according to year of patient death

Delayed Surgical Diagnosis (%)	2018 (n=113)	2019 (n=100)	2020 (n=90)	2021 (n=93)	2022 (n=93)
Yes	6.2	1.0	4.4	5.4	3.2
No	93.8	99.0	95.6	94.6	96.8
Healthcare Unit Associated (%)[1]					
General practitioner	14.3	0.0	0.0	0.0	0.0
Medical unit	42.9	100.0	25.0	40.0	33.3
Surgical unit	14.3	0.0	50.0	20.0	0.0
Other	28.6	0.0	50.0	100.0	66.7
Cause of Delay (%)[1]					
Inexperienced staff	0.0	100.0	0.0	40.0	66.7
Incorrect test	14.3	100.0	25.0	0.0	66.7
Misinterpreted results	14.3	0.0	25.0	0.0	0.0
Results not seen	0.0	0.0	0.0	0.0	0.0
Unavoidable	28.6	0.0	25.0	40.0	0.0
Other	28.6	0.0	50.0	20.0	66.7

Notes: Data are from closed cases as of 27 October 2023.
[1] Data proportional to closed cases as of 27 October 2023 where a delay in determining the surgical diagnosis was reported; data not mutually exclusive.

Operative profile

Table N: Surgical profile for ACTASM cases, according to year of patient death

	2018 (n=113)	2019 (n=100)	2020 (n=90)	2021 (n=93)	2022 (n=93)
Cases with Operations (%)	83.2	77.0	82.2	74.2	80.6
1 operation[1]	72.3	71.4	68.9	69.6	81.3
2 operations[1]	21.3	14.3	16.2	15.9	10.7
3 or more operations[1]	6.4	14.3	14.9	14.5	8.0
Total Operations (n)	128	116	121	104	102
Operation Urgency (%)[2]					
Emergency	30.5	32.8	24.8	32.7	32.4
Scheduled emergency	18.0	15.5	31.4	22.1	25.5
Immediate	29.7	34.5	25.6	27.9	27.5
Elective	21.1	17.2	18.2	17.3	14.7
Unknown	0.8	0.0	0.0	0.0	0.0
Reason why No Operation (%)[3]					
Not a surgical problem	26.3	30.4	37.5	29.2	38.9
Active decision not to operate	57.9	43.5	50.0	54.2	50.0
Consultant decision not to operate	52.6	39.1	50.0	54.2	50.0
Patient refused operation	10.5	13.0	0.0	16.7	5.6
Limit treatment decision	0.0	0.0	0.0	0.0	0.0
Rapid death	10.5	30.4	18.8	16.7	11.1

Notes: Data are from closed cases as of 27 October 2023.
[1] Data are proportional to closed cases as of 27 October 2023 where at least one operation during admission was reported.
[2] Data are proportional to the total number of operations reported from closed cases as of 27 October 2023.
[3] Data are proportional to closed cases as of 27 October 2023 where no operation during admission was reported.

Surgical procedures

Table 0: Most frequent reported types of operations, according to specialty and year of patient death

Specialty	2018	2019	2020	2021	2022
Overall	Laparoscopy, laparotomy, external ventricular drain	Laparotomy, external ventricular drain, intracranial pressure monitor	External ventricular drain, hemiarthroplasty, laparotomy, debridement of skin, evacuation of haematoma	Laparotomy, external ventricular drain, exploratory laparotomy	Exploratory laparotomy, external ventricular drain, colostomy, hemiarthroplasty, anastomosis of ileum to colon
Cardiothoracic Surgery	Replacement of aortic valve, pleurodesis, debulking of tumour, coronary artery bypass graft	Coronary artery bypass graft, replacement of aortic/mitral/ valve, pleurodesis, lobectomy, decompression of cardiac tamponade, thoracotomy	Coronary artery bypass graft, lobectomy, replacement of aortic/mitral valve, pleurodesis	Coronary artery bypass graft, replacement of mitral valve, annuloplasty, lobectomy	Coronary artery bypass graft, replacement of mitral valve, annuloplasty, aorta operations, pneumonectomy
General Surgery	Laparoscopy, laparotomy, lavage of peritoneum, adhesiolysis, anastomosis (unspecified)	Laparotomy, laparoscopy, exploratory laparotomy	External ventricular drainage, laparotomy, debridement of skin, adhesiolysis, colectomy, ileostomy	Laparotomy, exploratory laparotomy, ileostomy, colostomy, laparoscopy	Exploratory laparotomy, colostomy, anastomosis of ileum to colon
Neurosurgery	External ventricular drainage, intracranial pressure monitor, evacuation of intracerebral haematoma, craniectomy	External ventricular drainage, intracranial pressure monitor, evacuation of subdural haematoma, craniotomy	External ventricular drainage, intracranial pressure monitor, craniectomy, craniotomy	External ventricular drainage, intracranial pressure monitor, craniotomy, evacuation of subdural haematoma, craniectomy, cerebral angiography, ventriculoperitoneal shunt	External ventricular drainage, evacuation of intracerebral haematoma, craniotomy, cerebral angiography, craniectomy,
Orthopaedic Surgery	Open reduction internal fixation of fracture, hemiarthroplasty, closed reduction internal fixation of fracture	Revision prosthetic hip joint, hemiarthroplasty, open reduction internal fixation fracture	Hemiarthroplasty, revision prosthetic hip joint, closed reduction internal fixation fracture, open reduction internal fixation fracture	Hemiarthroplasty, open reduction internal fixation fracture, acromioplasty	Hemiarthroplasty, open reduction internal fixation fracture, total knee replacement
Otolaryngology Head & Neck Surgery	N/A	Excision of parotid gland, dissection of cervical lymph nodes, functional endoscopic sinus surgery	N/A	N/A	Tracheostomy, microlaryngoscopy, bronchoscopy
Plastic Surgery	Joint irrigation, evacuation of haematoma	Autograft of skin, excision of lesion of skin	Evacuation of haematoma, debridement of skin, canthopexy, tarsorrhaphy, amputation of finger	Debridement of skin	N/A
Urology	Cystoscopy, nephrectomy, nephroscopy, pyeloscopy, endoscopic insertion/removal ureteric stent	Cystoscopy, prostatectomy	Cystoscopy, endoscopic insertion/ removal ureteric stent, pyelography	Cystoscopy, nephrouretectomy, endoscopic replacement of ureteric stent	Cystoscopy
Vascular Surgery	Femoral/popliteal artery bypass, plastic repair of aorta	Amputation of toe, femoral/popliteal artery bypass, thrombectomy	Amputation of toe, thrombectomy, endarterectomy and repair of artery	Thrombectomy, endarterectomy and patch repair of artery, fasciotomy	Axilo-femoral bypass, amputation of limb, angiography, arterial operations

Notes: Data are from closed cases as of 27 October 2023; no cases were reported to ACTASM during 1 January 2018–31 December 2022 for Obstetrics & Gynaecology, Ophthalmology, Oral/Maxillofacial Surgery and Paediatric Surgery that had completed the evaluation process as of 27 October 2023.

Clinically significant infections

Table P: Infection profile for ACTASM cases, according to year of patient death

	2018 (n=113)	2019 (n=100)	2020 (n=90)	2021 (n=93)	2022 (n=93)
Clinically Significant Infection (%)					
Yes	31.0	38.0	25.6	34.4	34.4
Infection Acquired Time (%)					
Before admission	45.7	47.4	39.1	53.1	46.9
During admission	51.4	52.6	60.9	46.9	53.1
Unknown	2.9	0.0	0.0	0.0	0.0
Infection Acquired During Admission (%)[1]					
Acquired preoperatively	5.6	10.0	0.0	26.7	29.4
Surgical-site infection	0.0	5.0	7.1	0.0	5.9
Acquired postoperatively	77.8	75.0	85.7	53.3	58.8
Other invasive-site infection	0.0	10.0	7.1	20.0	5.9
Unknown	16.7	0.0	0.0	0.0	0.0
Infection Type (%)[2]					
Pneumonia	28.6	36.8	30.4	34.4	40.6
Intra-abdominal sepsis	5.7	31.6	21.7	31.3	28.1
Septicaemia	37.1	21.1	39.1	18.8	21.9
Other source	28.6	10.5	8.7	15.6	9.4
Unknown	0.0	0.0	0.0	0.0	0.0
Antibiotic Regime Appropriate (%)[2]					
Yes	88.6	92.1	95.7	96.9	93.8
No	0.0	0.0	0.0	0.0	0.0
Not applicable	8.6	7.9	4.3	3.1	6.3
Unknown	2.9	0.0	0.0	0.0	0.0
Delay Initiating Treatment (%)[2]					
Yes	5.7	5.3	8.7	6.3	9.4
No	85.7	94.7	91.3	93.8	90.6
Unknown	8.6	0.0	0.0	0.0	0.0

Notes: Data are from closed cases as of 27 October 2023.
[1] Data are proportional to closed cases as of 27 October 2023 where a clinically significant infection was acquired following admission.
[2] Data are proportional to closed cases as of 27 October 2023 where a clinically significant infection was reported

Table Q: Proportion of cases that reported a clinically significant infection, according to specialty and year of patient death

Specialty (%)	2018	2019	2020	2021	2022
Overall	31.0	38.0	25.6	34.4	34.4
Cardiothoracic Surgery	20.0	0.0	25.0	20.0	33.3
General Surgery	43.9	55.6	26.5	43.2	47.4
Neurosurgery	19.0	16.7	15.4	14.3	12.5
Orthopaedic Surgery	16.7	33.3	30.8	33.3	38.5
Otolaryngology Head and Neck	N/A	100.0	0.0	N/A	0.0
Plastic Surgery	50.0	50.0	75.0	0.0	N/A
Urology	42.9	60.0	100.0	66.7	0.0
Vascular Surgery	26.3	37.5	12.5	33.3	33.3

Note: Data are from closed cases as of 27 October 2023.

Table R: Admission profile for cases with a clinically significant infection notified to ACTASM, according to year of patient death

	2018 (n=35)	2019 (n=38)	2020 (n=23)	2021 (n=32)	2022 (n=32)
Patient Status (%)					
Private	2.9	2.6	4.3	6.3	0.0
Public	97.1	97.4	82.6	93.8	96.9
Veteran	0.0	0.0	4.3	0.0	3.1
Unknown	0.0	0.0	0.0	0.0	0.0
Admission Status (%)					
Elective	14.3	21.1	26.1	15.6	6.3
Emergency	85.7	78.9	73.9	84.4	93.8
Hospital Status (%)					
Co-location	0.0	2.6	0.0	0.0	0.0
Private	0.0	2.6	4.3	0.0	0.0
Public	97.1	94.7	95.7	100.0	100.0

Notes: Data are from closed cases where a clinically significant infection was reported as of 27 October 2023.
[1] According to AIHW peer group classification.[8]

Table S: Patient demographics for cases with a clinically significant infection notified to ACTASM, according to year of patient death

	2018 (n=35)	2019 (n=38)	2020 (n=23)	2021 (n=32)	2022 (n=32)
Age (years)[1]	78 (72–85)	82 (73–83)	79 (71–85)	77 (67–83)	71 (64–84)
Sex, male:female (%)	62.9:37.1	57.9:42.1	52.2:47.8	62.5:37.5	56.3:43.8
Length of Stay (days)[1]	7 (4–13)	9 (3–18)	11 (3–24)	11 (3–20)	9 (4–17)
Indigenous (%)					
Yes	2.9	0.0	0.0	6.3	3.1
No	94.3	100.0	100.0	93.8	96.9
Unknown	2.9	0.0	0.0	0.0	0.0
ASA Grade (%)[2]					
1	0.0	0.0	0.0	0.0	3.1
2	0.0	5.3	4.3	3.1	12.5
3	25.7	31.6	30.4	34.4	21.9
4	40.0	44.7	52.2	53.1	62.5
5	11.4	10.5	8.7	9.4	0.0
6	2.9	0.0	4.3	0.0	0.0
Unknown	20.0	7.9	0.0	0.0	0.0
Comorbidities (%)[3]					
Advanced malignancy	22.9	18.4	21.7	21.9	12.5
Age	71.4	73.7	69.6	59.4	50.0
Cardiovascular	62.9	52.6	56.5	71.9	34.4
Diabetes	40.0	26.3	26.1	21.9	18.8
Hepatic	5.7	5.3	17.4	0.0	9.4
Neurological	25.7	21.1	39.1	21.9	6.3
Obesity	8.6	13.2	4.3	9.4	9.4
Other	22.9	31.6	13.0	15.6	31.3
Renal	22.9	28.9	39.1	21.9	12.5
Respiratory	34.3	28.9	34.8	31.3	40.6
Perceived risk of death, surgeon (%)[4]					
Minimal	3.6	3.4	0.0	0.0	0.0
Small	14.3	10.3	10.5	8.7	20.8
Moderate	21.4	27.6	52.6	26.1	25.0
Considerable	50.0	55.2	31.6	65.2	41.7
Expected	10.7	3.4	5.3	0.0	12.5
Unknown	0.0	0.0	0.0	0.0	0.0
Perceived risk of death, assessor (%)[4]					
Minimal	5.7	2.6	0.0	0.0	3.1
Small	2.9	10.5	13.0	9.4	6.3
Moderate	25.7	34.2	30.4	21.9	34.4
Considerable	60.0	42.1	52.2	56.3	50.0
Expected	5.7	10.5	4.3	12.5	6.3
Unknown	0.0	0.0	0.0	0.0	0.0

Notes: Data are from closed cases as of 27 October 2023.
[1] Data are medians (25th, 75th percentiles).
[2] American Society of Anesthesiologists physical status classification.[7]
[3] Proportions not mutually exclusive.
[4] Overall perceived risk of patient death as determined by surgeon or assessor.

DVT prophylaxis

Table T: DVT prophylaxis strategies reported for ACTASM cases, according to year of patient death

	2018 (n=113)	2019 (n=100)	2020 (n=90)	2021 (n=93)	2022 (n=93)
DVT Prophylaxis Used (%)					
Yes	88.5	87.0	91.1	89.2	92.5
No	10.6	13.0	8.9	10.8	7.5
Unknown	0.9	0.0	0.0	0.0	0.0
Type of DVT Prophylaxis (%)[1]					
Heparin (any form)	80.0	82.8	79.3	86.7	84.9
Warfarin	1.0	1.1	1.2	1.2	3.5
Aspirin	10.0	4.6	11.0	12.0	7.0
Sequential compression device	50.0	44.8	37.8	39.8	26.7
TED stockings	22.0	28.7	22.0	33.7	34.9
Other	4.0	3.4	3.7	8.4	7.0
Reason DVT Prophylaxis Not Used (%)[2]					
Active decision to withhold	25.0	15.4	37.5	30.0	42.9
Not appropriate	75.0	69.2	62.5	60.0	57.1
Not considered	0.0	15.4	0.0	10.0	0.0
Not stated	0.0	0.0	0.0	0.0	0.0
DVT Prophylaxis Strategy Appropriate (%)[3]					
Yes	85.7	80.0	66.7	79.6	80.6
No	0.0	1.0	1.1	2.2	0.0
Unknown	14.3	19.0	32.2	18.3	19.4

Abbreviations: DVT = deep vein thrombosis; TED = thromboembolic deterrent.
Notes: Data are from closed cases as of 27 October 2023.
[1] Data are proportional to closed cases as of 27 October 2023 where the use of DVT prophylaxis was reported; data are not mutually exclusive.
[2] Data are proportional to closed cases as of 27 October 2023 where DVT prophylaxis was applied; data are not mutually exclusive.
[3] Data are proportional to closed cases as of 27 October 2023.

Postoperative complications

Table U: Postoperative complications profile for ACTASM cases, according to year of patient death

	2018 (n=94)[1]	**2019** (n=77)[1]	**2020** (n=74)[1]	**2021** (n=69)[1]	**2022** (n=75)[1]
Cases with Postoperative Complications (%)[2]	36.2	33.8	27.0	24.6	28.0
Postoperative Complications (n)[3]	42	33	23	20	31
Procedure-related sepsis (%)	4.8	9.1	13.0	5.0	6.5
Significant postoperative bleeding (%)	14.3	9.1	13.0	15.0	9.7
Endoscopic perforation (%)	2.4	0.0	4.3	0.0	0.0
Tissue ischaemia (%)	21.4	21.2	8.7	15.0	22.6
Vascular graft occlusion (%)	7.1	3.0	4.3	0.0	9.7
Other (%)[4]	50.0	45.5	47.8	40.0	35.5
Anastomotic leak (%)[3]	0.0	12.1	8.7	25.0	16.1
Delay Recognising Complication (%)[5]					
Yes	2.9	0.0	10.0	5.9	9.5
No	94.1	100.0	90.0	94.1	90.5
Unknown	2.9	0.0	0.0	0.0	0.0

Notes: Data are from closed cases as of 27 October 2023.
[1] Number of cases where at least one operation during admission was reported.
[2] Data are proportional to closed cases as of 27 October 2023 where at least one operation during admission was reported.
[3] Data are proportional to the number of postoperative complications reported from closed cases as of 27 October 2023; data are not mutually exclusive.
[4] 'Other' comprised of neurological, respiratory, cardiovascular, gastrointestinal and surgical wound complications not easily categorised with other types of complications.
[5] Data are proportional to closed cases as of 27 October 2023 where the occurrence of postoperative complications was reported.

Table V: Proportion of cases within each specialty that had at least one postoperative complication, according to year of death

Postoperative complications (%)	Cardiothoracic Surgery	General Surgery	Neurosurgery	Orthopaedic Surgery	Otolaryngology Head & Neck Surgery	Plastic Surgery	Urology	Vascular Surgery	Overall
2022									
Yes	66.7	26.9	0.0	8.3	100.0	N/A	50.0	41.7	28.0
No	33.3	73.1	100.0	91.7	0.0	N/A	50.0	58.3	72.0
2021									
Yes	80.0	15.4	22.2	11.1	N/A	0.0	50.0	40.0	24.6
No	20.0	84.6	77.8	88.9	N/A	100.0	50.0	60.0	75.4
2020									
Yes	25.0	39.1	8.3	0.0	N/A	50.0	0.0	40.0	27.0
No	75.0	60.9	91.7	100.0	N/A	50.0	100.0	60.0	73.0
2019									
Yes	50.0	40.0	7.1	28.6	0.0	0.0	0.0	53.3	33.8
No	50.0	60.0	92.9	71.4	100.0	100.0	100.0	46.7	66.2
2018									
Yes	60.0	36.0	9.5	11.8	N/A	0.0	83.3	72.2	36.2
No	40.0	60.0	90.5	88.2	N/A	100.0	16.7	27.8	62.8

Notes: Data are from closed cases as of 27 October 2023.

Critical care unit usage

Table W: Use of CCU facilities for ACTASM cases, according to year of patient death

	2018 (n=113)	**2019** (n=100)	**2020** (n=90)	**2021** (n=93)	**2022** (n=93)
CCU Used (%)					
Yes	73.5	77.0	70.0	74.2	75.3
No	26.5	23.0	30.0	25.8	24.7
CCU Should Have Been Used (%)[1]					
ICU	3.3	4.3	0.0	0.0	0.0
HDU	3.3	4.3	3.7	0.0	0.0
Surgical Team Satisfied with CCU Care (%)[2]					
Yes	98.8	93.5	96.8	95.7	98.6
No	1.2	6.5	3.2	4.3	1.4

Abbreviations: CCU = critical care unit; ICU = intensive care unit; HDU = high dependency unit.
Notes: Data are from closed cases as of 27 October 2023.
[1] Data are proportional to closed cases as of 27 October 2023 where CCU facilities were not used.
[2] Data are proportional to closed cases as of 27 October 2023 where CCU facilities were used.

Causes of death

Table X: Most frequent reported causes of death (as reported by surgeons), according to specialty and year of patient death

Specialty	2018	2019	2020	2021	2022
Overall	Multiple organ failure, septicaemia, respiratory failure	Multiple organ failure, septicaemia, respiratory failure	Multiple organ failure, septicaemia, respiratory failure	Multiple organ failure, septicaemia, respiratory failure	Multiple organ failure, cardiac arrest, septicaemia
Cardiothoracic Surgery	Multiple organ failure, carcinoma, sudden death cause unknown	Respiratory failure, heart failure, multiple organ failure	Respiratory failure, multiple organ failure, pneumonia	Cardiac arrest, cerebrovascular accident, ischaemic heart disease	Cerebrovascular accident, multiple organ failure, cardiac arrest
General Surgery	Septicaemia, multiple organ failure, aspiration pneumonia	Multiple organ failure, septicaemia, aspiration pneumonia	Multiple organ failure, septicaemia, diffuse brain injury	Multiple organ failure, septicaemia, respiratory failure	Multiple organ failure, septicaemia, respiratory failure
Neurosurgery	Cerebral infarction, diffuse brain injury, brain death	Diffuse brain, subarachnoid haemorrhage, transient cerebral ischaemia	Intracranial haemorrhage, diffuse brain injury, brainstem infarction	Diffuse brain injury, subarachnoid haemorrhage, brain stem infarction	Cerebrovascular accident, respiratory arrest, severe head injury
Orthopaedic Surgery	Aspiration pneumonia, multiple organ failure, respiratory failure	Multiple organ failure, septicaemia, aspiration pneumonia	Multiple organ failure, septicaemia, respiratory failure	Multiple organ failure, aspiration pneumonia, septicaemia	Aspiration pneumonia, respiratory failure, multiple organ failure
Otolaryngology Head & Neck Surgery	N/A	N/A	Unknown	N/A	Unknown
Plastic Surgery	Septicaemia, congestive heart failure, secondary pulmonary hypertension	Pneumonia, surgical/medical care complications	Septicaemia, aspiration pneumonia, respiratory failure	Multiple organ failure, pneumonia, ischaemic heart disease	N/A
Urology	Respiratory failure, multiple organ failure, acute myocardial infarction	Septicaemia, respiratory failure, multiple organ failure	Cardiac arrest	Septicaemia, respiratory failure, renal failure	Carcinoma, cardiac arrest, haemorrhagic shock
Vascular Surgery	Multiple organ failure, cardiac arrest, renal failure	Multiple organ failure, renal failure, respiratory failure	Multiple organ failure, respiratory failure, intestinal ischaemia	Respiratory failure, acute myocardial infarction, cardiac failure	Multiple organ failure, cardiac arrest, intestinal ischaemia

Notes: Data are from closed cases as of 27 October 2023; no cases were reported to ACTASM during 1 January 2018–31 December 2022 for Obstetrics & Gynaecology, Ophthalmology, Oral/Maxillofacial Surgery and Paediatric Surgery that had completed the evaluation process as of 27 October 2023.

Peer review outcomes

Table Y: Proportion of cases where CMIs were identified by assessors, according to specialty and year of patient death

Cases with CMIs (%)	2018	2019	2020	2021	2022
Overall	26.5	23.0	24.4	22.6	30.1
Specialty					
Cardiothoracic Surgery	0.0	30.0	37.5	40.0	33.3
General Surgery	19.5	19.4	20.6	29.5	26.3
Neurosurgery	14.3	22.2	30.8	0.0	25.0
Orthopaedic Surgery	16.7	8.3	7.7	33.3	23.1
Otolaryngology Head & Neck Surgery	N/A	0.0	0.0	N/A	50.0
Plastic Surgery	50.0	0.0	0.0	0.0	N/A
Urology	71.4	60.0	0.0	16.7	0.0
Vascular surgery	52.6	31.3	43.8	33.3	58.3

Abbreviation: CMI = clinical management issue.
Notes: Data are from the highest level of assessment undertaken for closed cases as of 27 October 2023; data are proportional to closed cases as of 27 October 2023; no cases were reported to ACTASM during 1 January 2018–31 December 2022 for Obstetrics & Gynaecology, Ophthalmology, Oral/Maxillofacial Surgery and Paediatric Surgery that had completed the evaluation process as of 27 October 2023.

Table Z: ACTASM cases with CMIs, according to year of patient death

	2018 (n=113)	**2019** (n=100)	**2020** (n=90)	**2021** (n=93)	**2022** (n=93)
Cases with CMIs Present (%)	26.5	23.0	24.4	22.6	30.1
Total CMIs (n)	47	31	27	28	34
CMI Severity (%)[1]					
Consideration	53.2	48.4	48.1	50.0	55.9
Concern	34.0	35.5	37.0	42.9	32.4
Adverse event	12.8	16.1	14.8	7.1	5.9
Unknown	0.0	0.0	0.0	0.0	5.9
CMI Outcome (%)[1]					
Made no difference	19.1	25.8	14.8	21.4	23.5
May have contributed to death	74.5	48.4	81.5	67.9	52.9
Caused death of patient otherwise expected to survive	2.1	22.6	3.7	10.7	8.8
Unknown	4.3	3.2	0.0	0.0	14.7
CMI Preventability (%)[1]					
Definitely	23.4	32.3	3.7	35.7	23.5
Probably	51.1	29.0	66.7	46.4	35.3
Probably not	25.5	35.5	25.9	10.7	35.3
Definitely not	0.0	3.2	0.0	3.6	0.0
Unknown	0.0	0.0	3.7	3.6	5.9
CMI Associated with (%)[1,2]					
Audited surgical team	53.2	71.0	63.0	60.7	64.7
Another clinical team	36.2	19.4	29.6	42.9	26.5
Hospital	6.4	3.2	7.4	7.1	5.9
Other	6.4	3.2	14.8	3.6	8.8

Abbreviations: CMI = clinical management issue.
Notes: Data are from the highest level of assessment undertaken for closed cases as of 27 October 2023.
[1] Data are proportional to the total CMIs reported by assessors from the highest level of assessment undertaken for closed cases as of 27 October 2023.
[2] Data not mutually exclusive.

Table AA: Most frequent reported types of CMIs, according to specialty and year of patient death

Specialty	2018	2019	2020	2021	2022
Overall	Decision to operate, delay in recognising complication, delay in diagnosis	Decision to operate, adverse factors in management, inappropriate/ incorrect therapy	Wrong surgical approach used, delay in transfer to tertiary hospital, adverse factors in management, postoperative bleeding after radiological procedure, better to have done different procedure	Decision to operate, delay to surgery, delay in transfer to surgeon by physicians	Decision to operate, better to have done different procedure, preoperative assessment inadequate
Cardiothoracic Surgery	N/A	Adverse factors in management, poor communication, heart complication, inadequate preoperative assessment	Wrong surgical approach used, delay in recognising complications, monitoring problems during general anaesthetic	Decision to operate, delay to surgery, incorrect/ inappropriate therapy	Decision to operate, preoperative assessment inadequate, poor documentation, theatre-acquired infection
General Surgery	Decision to operate, delay in recognising complication, Adverse factors in management, poor communication, drug related complication, failure to heal wound after laparoscopic operation, septicaemia, inadequate postoperative assessment, delay in patient presenting	Delay to surgery, incorrect/ inappropriate therapy, pancreatic complication, anastomotic leak, colonic complication of laparoscopic operation, failure to assess patient, operation would have been better delayed, delay in investigating the patient, surgeon too junior, failure to treat malnutrition, transfer should not have occurred, overdose of narcotics	Delay in transfer to tertiary hospital, delay to surgery, wrong surgical approach used, better to have done different procedure, aspiration pneumonia, postoperative bleeding after open surgery, pulmonary embolus, injury to left hepatic duct during open surgery, operation would have been better delayed	Delay to surgery, decision to operate, delay in transfer to surgeon by physicians	Better to have done different procedure, preoperative assessment inadequate, delay to surgery, decision to operate, delay in diagnosis, aspiration pneumonia during anaesthetic, re-bleed after open operation, failure to communicate with senior staff, failure to insert a drain

Neurosurgery	Delay in diagnosis, delay in transfer to tertiary hospital, delays	Incorrect/ inappropriate therapy, communication failures, cerebrovascular accident due to arterial injury following open surgery, vascular complication of open surgery, vascular complication of radiological operation	Communication failures, delay in transfer to tertiary hospital, better to have done different procedure, wrong surgical approach used	N/A	Better to have done different procedure, wrong surgical approach used, decision to operate, arterial occlusion after endoscopic operation
Orthopaedic Surgery	Preoperative assessment inadequate, delay in recognising complications, failure of communication	Preoperative assessment inadequate	Earlier operation desirable - no theatre available	Delay in diagnosis, anaesthesia related, failure to use critical care unit postoperatively	Aspiration pneumonia, poor documentation, anticoagulation causing postoperative bleeding
Otolaryngology Head & Neck Surgery	N/A	N/A	N/A	N/A	N/A
Plastic Surgery	N/A	N/A	N/A	N/A	N/A
Urology	N/A	N/A	N/A	N/A	N/A
Vascular Surgery	Decision to operate, poor documentation, delay in diagnosis, failure to use critical care unit postoperatively, preoperative assessment inadequate, delay in recognising complication, failure of communication, wrong surgical approach used, delays, delay to surgery, Adverse factors in management, incorrect use of drains or catheters, general complications of treatment, incorrect/ inappropriate therapy, inadequate postoperative assessment, failure to obtain a postmortem	Decision to operate, delay in recognising complication, delays, adverse factors in management, inappropriate/ incorrect therapy, wrong operations performed	Adverse factors in management, postoperative bleeding after radiological operation, wrong operation performed, poor documentation, general complications of treatment, anaesthesia related, drug related complication	Incorrect use of drains or catheters, postoperative bleeding after open surgery, failure to recognise severity of illness	Decision to operate, delay in diagnosis, preoperative assessment inadequate, better to have done different procedure, delay in transfer to tertiary hospital, delay in transfer to surgeon by physicians, arterial complication of open surgery, care unsatisfactory, fluid balance unsatisfactory

Abbreviations: CCU = clinical care unit, N/A = not applicable.
Notes: Data are from closed cases as of 27 October 2023; no cases were reported to ACTASM during 1 January 2018–31 December 2022 for Obstetrics & Gynaecology, Ophthalmology, Oral/Maxillofacial Surgery and Paediatric Surgery that had completed the evaluation process as of 27 October 2023.

Pathway of care

Table BB: Areas for improvement in the surgical management pathway as determined by assessors, according to year of patient death

	2018 (n=113)	2019 (n=100)	2020 (n=90)	2021 (n=93)	2022 (n=93)
Preoperative Management (%)					
Yes	10.6	11.0	8.9	15.1	8.6
No	65.5	69.0	72.2	61.3	72.0
Not applicable	22.1	20.0	18.9	23.7	19.4
Unknown	1.8	0.0	0.0	0.0	0.0
Decision to Operate (%)					
Yes	10.6	8.0	2.2	9.7	4.3
No	68.1	71.0	80.0	69.9	77.4
Not applicable	19.5	20.0	17.8	20.4	18.3
Unknown	1.8	1.0	0.0	0.0	0.0
Operation Type (%)					
Yes	4.4	10.0	6.7	5.4	5.4
No	73.5	67.0	73.3	71.0	76.3
Not applicable	20.4	23.0	20.0	23.7	18.3
Unknown	1.8	0.0	0.0	0.0	0.0
Operation Timing (%)					
Yes	8.8	5.0	3.3	8.6	6.5
No	69.0	71.0	76.7	67.7	75.3
Not applicable	20.4	24.0	20.0	23.7	18.3
Unknown	1.8	0.0	0.0	0.0	0.0
Intraoperative Management (%)					
Yes	6.2	10.0	5.6	4.3	10.8
No	70.8	67.0	72.2	71.0	68.8
Not applicable	21.2	22.0	22.2	24.7	20.4
Unknown	1.8	1.0	0.0	0.0	0.0
Experience of Deciding Surgeon (%)					
Yes	1.8	1.0	2.2	3.2	0.0
No	78.8	75.0	77.8	74.2	80.6
Not applicable	17.7	24.0	20.0	22.6	19.4
Unknown	1.8	0.0	0.0	0.0	0.0
Experience of Operating Surgeon (%)					
Yes	1.8	2.0	2.2	3.2	1.1
No	76.1	74.0	74.4	72.0	78.5
Not applicable	20.4	24.0	23.3	23.7	20.4
Unknown	1.8	0.0	0.0	1.1	0.0
Postoperative Management (%)					
Yes	9.7	8.0	6.7	6.5	4.3
No	65.5	69.0	74.4	69.9	75.3
Not applicable	23.0	22.0	18.9	23.7	20.4
Unknown	1.8	1.0	0.0	0.0	0.0

Note: Data are from the highest level of assessment undertaken for closed cases as of 27 October 2023.

Patient transfer

Table CC: Proportion of cases reported to ACTASM where patient transfer occurred, according to specialty and year of patient death

Transferred (%)	2018 (n=113)	2019 (n=100)	2020 (n=90)	2021 (n=93)	2022 (n=93)
Overall	29.2	35.0	28.9	33.3	38.7
Specialty (%)[1]					
Cardiothoracic Surgery	60.0	30.0	12.5	20.0	22.2
General Surgery	19.5	36.1	23.5	18.2	39.5
Neurosurgery	52.4	33.3	84.6	57.1	68.8
Orthopaedic Surgery	16.7	33.3	23.1	33.3	23.1
Otolaryngology Head and Neck	N/A	0.0	0.0	N/A	50.0
Plastic Surgery	0.0	0.0	0.0	0.0	N/A
Urology	14.3	40.0	0.0	16.7	0.0
Vascular Surgery	36.8	43.8	18.8	100.0	33.3

Notes: Data are from closed cases as of 27 October 2023; no cases were reported to ACTASM during 1 January 2018–31 December 2022 for Obstetrics & Gynaecology, Ophthalmology, Oral/Maxillofacial Surgery and Paediatric Surgery that had completed the evaluation process as of 27 October 2023.
[1] Data proportional to the total number of closed cases reported for each specialty as of 27 October 2023.

Table DD: Quality and appropriateness of patient transfer, according to year of patient death

	2018	2019	2020	2021	2022
Delay in transfer (%)					
Yes	18.2	20.0	30.8	6.5	8.3
No	78.8	74.3	69.2	90.3	91.7
Unknown	3.0	5.7	0.0	3.2	0.0
Appropriate Transfer (%)					
Yes	84.8	94.3	100.0	96.8	97.2
No	12.1	0.0	0.0	0.0	2.8
Unknown	3.0	5.7	0.0	3.2	0.0
Transfer Information Sufficient (%)					
Yes	93.9	91.4	96.2	96.8	94.4
No	3.0	2.9	3.8	0.0	5.6
Unknown	3.0	5.7	0.0	3.2	0.0
Transfer Level of Care Appropriate (%)					
Yes	93.9	91.4	96.2	96.8	97.2
No	3.0	2.9	0.0	0.0	2.8
Unknown	3.0	5.7	3.8	3.2	0.0

Note: Data are from closed cases where patient transfer was reported as of 27 October 2023.

Table EE: Demographics for cases reported to ACTASM where patient transfer occurred, according to year of patient death

	2018 (n=33)	2019 (n=35)	2020 (n=26)	2021 (n=31)	2022 (n=35)
Age (years)[1]	74 (64–81)	78 (73–84)	68 (57–81)	78 (69–83)	70 (63–79)
Sex, male:female (%)	66.7:33.3	57.1:42.9	46.2:53.8	61.3:38.7	63.9:36.1
Length of Stay (days)[1]	4 (2–8)	4 (2–10)	4 (2–12)	5 (2–10)	4 (2–13)
Indigenous (%)					
Yes	0.0	0.0	3.8	6.5	5.6
No	100.0	100.0	96.2	93.5	94.4
Unknown	0.0	0.0	0.0	0.0	0.0
Admission Type (%)					
Elective	0.0	2.9	3.8	3.2	0.0
Emergency	100.0	97.1	96.2	96.8	100.0
Unknown	0.0	0.0	0.0	0.0	0.0
Patient Status (%)					
Private	6.1	5.7	0.0	0.0	0.0
Public	93.9	94.3	100.0	100.0	100.0
Veteran	0.0	0.0	0.0	0.0	0.0
Unknown	0.0	0.0	0.0	0.0	0.0
ASA Grade (%)[2]					
1	6.1	0.0	3.8	0.0	2.8
2	0.0	2.9	3.8	0.0	5.6
3	21.2	14.3	19.2	35.5	25.0
4	45.5	42.9	46.2	51.6	58.3
5	18.2	25.7	23.1	12.9	8.3
6	3.0	0.0	0.0	0.0	0.0
Unknown	6.1	14.3	3.8	0.0	0.0
Comorbidities (%)[3]					
Advanced malignancy	9.1	17.1	3.8	12.9	2.8
Age	51.5	62.9	42.3	54.8	41.7
Cardiovascular	51.5	60.0	46.2	61.3	44.4
Diabetes	18.2	37.1	15.4	22.6	16.7
Hepatic	9.1	2.9	0.0	0.0	11.1
Neurological	21.2	25.7	11.5	16.1	11.1
Obesity	15.2	14.3	11.5	3.2	8.3
Other	18.2	25.7	3.8	6.5	22.2
Renal	21.2	22.9	19.2	12.9	11.1
Respiratory	21.2	28.6	7.7	25.8	36.1

Perceived risk of death, surgeon (%)[4]					
Minimal	3.8	0.0	0.0	0.0	0.0
Small	3.8	3.7	4.8	8.0	20.7
Moderate	23.1	18.5	28.6	20.0	20.7
Considerable	46.2	70.4	57.1	68.0	51.7
Expected	23.1	7.4	9.5	4.0	6.9
Unknown	0.0	0.0	0.0	0.0	0.0
Perceived risk of death, assessor (%)[4]					
Minimal	3.0	0.0	0.0	3.2	0.0
Small	0.0	2.9	3.8	3.2	8.3
Moderate	30.3	20.0	19.2	25.8	36.1
Considerable	39.4	62.9	65.4	61.3	41.7
Expected	27.3	14.3	11.5	6.5	13.9
Unknown	0.0	0.0	0.0	0.0	0.0

Notes: Data are from closed cases where patient transfer was reported as of 27 October 2023.
[1] Data are medians (25th, 75th percentiles).
[2] American Society of Anesthesiologists physical status classification.[7]
[3] Proportions are not mutually exclusive.
[4] Overall perceived risk of patient death as determined by surgeon or assessor.

Table FF: Rural versus metropolitan status for hospitals involved in patient transfer, according to year of patient death

Transferring Hospital	Receiving Hospital (%)			
2018	**Metropolitan**	**Rural**	**Remote**	**Unknown**
Metropolitan	45.5	0.0	0.0	0.0
Rural	0.0	0.0	0.0	0.0
Remote	0.0	0.0	0.0	0.0
Unknown	54.5	0.0	0.0	0.0
2019				
Metropolitan	45.7	0.0	0.0	0.0
Rural	0.0	0.0	0.0	0.0
Remote	0.0	0.0	0.0	0.0
Unknown	54.3	0.0	0.0	0.0
2020				
Metropolitan	26.9	0.0	0.0	0.0
Rural	11.5	0.0	0.0	0.0
Remote	0.0	0.0	0.0	0.0
Unknown	61.5	0.0	0.0	0.0
2021				
Metropolitan	35.5	0.0	0.0	0.0
Rural	32.3	0.0	0.0	0.0
Remote	0.0	0.0	0.0	0.0
Unknown	32.3	0.0	0.0	0.0
2022				
Metropolitan	50.0	0.0	0.0	0.0
Rural	36.1	0.0	0.0	0.0
Remote	0.0	0.0	0.0	0.0
Unknown	13.9	0.0	0.0	0.0

Note: Data are from closed cases where patient transfer was reported as of 27 October 2023.

Table GG: Public versus private status for hospitals involved in patient transfer, according to year of patient death				
Transferring Hospital	**Receiving Hospital (%)**			
2018	**Public**	**Private**	**Co-location**	**Unknown**
Public	36.4	3.0	0.0	0.0
Private	3.0	3.0	0.0	0.0
Co-location	0.0	0.0	0.0	0.0
Unknown	54.5	0.0	0.0	0.0
2019				
Public	37.1	0.0	0.0	0.0
Private	2.9	5.7	0.0	0.0
Co-location	0.0	0.0	0.0	0.0
Unknown	54.3	0.0	0.0	0.0
2020				
Public	34.6	0.0	0.0	0.0
Private	3.8	0.0	0.0	0.0
Co-location	0.0	0.0	0.0	0.0
Unknown	61.5	0.0	0.0	0.0
2021				
Public	67.7	0.0	0.0	0.0
Private	0.0	0.0	0.0	0.0
Co-location	0.0	0.0	0.0	0.0
Unknown	32.3	0.0	0.0	0.0
2022				
Public	80.6	0.0	0.0	0.0
Private	5.6	0.0	0.0	0.0
Co-location	0.0	0.0	0.0	0.0
Unknown	13.9	0.0	0.0	0.0

Note: Data are from closed cases where patient transfer was reported as of 27 October 2023.

Evaluation of care

Table HH: Results of ACTASM evaluation of cases where patient transfer occurred and CMI demographics of transferred and non-transferred ACTASM cases 2022

	Transferred	Non-transferred
Total CMIs (n)	18	16
CMI Severity (%)[1]		
Consideration	50.0	62.5
Concern	33.3	31.3
Adverse event	5.6	6.3
Unknown	11.1	0.0
CMI Outcome (%)[1]		
Made no difference	16.7	31.3
May have contributed to death	61.1	43.8
Caused death of patient otherwise expected to survive	5.6	12.5
Unknown	16.7	12.5
CMI Preventability (%)[1]		
Definitely	11.1	37.5
Probably	44.4	25.0
Probably not	33.3	37.5
Definitely not	0.0	0.0
Unknown	11.1	0.0
CMI Associated with (%)[1,2]		
Audited surgical team	72.2	56.3
Another clinical team	27.8	25.0
Hospital	0.0	12.5
Other	5.6	12.5

Abbreviation: CMI = clinical management issue.
Notes: Data are from the highest level of assessment undertaken for closed cases as of 27 October 2023.
[1] Data are proportional to the total CMIs reported by assessors from the highest level of assessment undertaken for closed cases as of 27 October 2023.
[2] Data not mutually exclusive.

Table II: Proportion of transferred cases where CMIs were identified by assessors, according to specialty and year of patient death

Cases with CMIs (%)	2018	2019	2020	2021	2022
Overall	18.2	14.3	30.8	25.8	41.7
Specialty					
Cardiothoracic Surgery	0.0	0.0	0.0	0.0	0.0
General Surgery	2.4	2.8	8.8	11.4	15.8
Neurosurgery	9.5	0.0	23.1	0.0	25.0
Orthopaedic Surgery	0.0	8.3	0.0	11.1	7.7
Otolaryngology Head & Neck Surgery	N/A	0.0	0.0	N/A	50.0
Plastic Surgery	0.0	0.0	0.0	0.0	N/A
Urology	14.3	20.0	0.0	0.0	0.0
Vascular Surgery	10.5	12.5	12.5	33.3	25.0

Abbreviation: CMI = clinical management issue.
Notes: Data are from the highest level of assessment undertaken for closed cases as of 27 October 2023 where patient transfer occurred; data are proportional to closed cases as of 27 October 2023.

Table JJ: Results of ACTASM evaluation of cases where patient transfer occurred, according to year of patient death

	2018 (n=33)	2019 (n=35)	2020 (n=26)	2021 (n=31)	2022 (n=36)
Cases with CMI Present (%)	18.2	14.3	30.8	25.8	41.7
Total CMIs (n)	7	8	8	10	18
CMI Severity (%)[1]					
Consideration	14.3	50.0	62.5	40.0	50.0
Concern	71.4	50.0	37.5	50.0	33.3
Adverse event	14.3	0.0	0.0	10.0	5.6
Unknown	0.0	0.0	0.0	0.0	11.1
CMI Outcome (%)[1]					
Made no difference	0.0	25.0	25.0	30.0	16.7
May have contributed to death	100.0	62.5	62.5	50.0	61.1
Caused death of patient otherwise expected to survive	0.0	0.0	12.5	20.0	5.6
Unknown	0.0	12.5	0.0	0.0	16.7
CMI Preventability (%)[1]					
Definitely	0.0	50.0	0.0	40.0	11.1
Probably	71.4	25.0	62.5	30.0	44.4
Probably not	28.6	25.0	25.0	20.0	33.3
Definitely not	0.0	0.0	0.0	10.0	0.0
Unknown	0.0	0.0	12.5	0.0	11.1
CMI Associated with (%)[1,2]					
Audited surgical team	42.9	62.5	37.5	60.0	72.2
Another clinical team	42.9	25.0	25.0	40.0	27.8
Hospital	0.0	0.0	25.0	20.0	0.0
Other	14.3	12.5	37.5	0.0	5.6

Abbreviation: CMI = clinical management issue.
Notes: Data are from the highest level of assessment undertaken for closed cases as of 27 October 2023 where patient transfer occurred.
[1] Data are proportional to the total CMIs reported by assessors from the highest level of assessment undertaken for closed cases as of 27 October 2023.
[2] Data not mutually exclusive.

Table KK: Most frequent reported types of CMIs for cases where patient transfer occurred, according to specialty and year of patient death

Specialty	2018	2019	2020	2021	2022
Overall	Delay in diagnosis, adverse factors in management, delay to surgery, delay in recognising complication, failure of communication, delay in transfer to tertiary hospital	Adverse factors in management, delay in recognising complications, deep vein thrombosis, colonic complication of laparoscopic operation, wrong operation performed, transfer should not have occurred, preoperative assessment inadequate, overdose of narcotics	Delay in transfer to tertiary hospital, postoperative bleeding after radiological operation, better to have done different procedure	Incorrect use of drains or catheters, decision to operate, wrong surgical approach used, adverse factors in management, delay in diagnosis, delay to surgery, postoperative bleeding after open surgery, failure to recognise severity of illness	Better to have done different procedure, decision to operate, wrong surgical approach used, delay in diagnosis, delay in transfer to tertiary hospital, preoperative assessment inadequate, arterial occlusion after endoscopic operation, anticoagulation causing postoperative bleeding, delay in transfer to surgeon by physicians, problems with appropriate staffing, failure to communicate with senior staff, failure to insert a drain, care unsatisfactory (not otherwise specified)
Cardiothoracic Surgery	N/A	N/A	N/A	N/A	N/A
General Surgery	Adverse factors in management	Colonic complication of laparoscopic operation, transfer should not have occurred, overdose of narcotics	Delay in transfer to tertiary hospital, better to have done different procedure	Decision to operate, adverse factors in management, wrong surgical approach used, incorrect use of drains or catheters, delay to surgery	Better to have done different procedure, decision to operate, preoperative assessment inadequate, failure to communicate with senior staff, failure to insert a drain
Neurosurgery	Delay in transfer to tertiary hospital, delay in diagnosis	N/A	Delay in transfer to tertiary hospital, better to have done different procedure, wrong surgical approach used	N/A	Better to have done different procedure, wrong surgical approach used, decision to operate, arterial occlusion after endoscopic operation

Orthopaedic Surgery	N/A	Preoperative assessment inadequate	N/A	Delay in diagnosis	Anticoagulation causing postoperative bleeding
Otolaryngology Head & Neck Surgery	N/A	N/A	N/A	N/A	N/A
Plastic Surgery	N/A	N/A	N/A	N/A	N/A
Urology	N/A	N/A	N/A	N/A	N/A
Vascular Surgery	Delay to surgery, delay in recognising complication, failure of communication	Delay in recognising complication, adverse factors in management, wrong operation performed	Postoperative bleeding after radiological operation	Incorrect use of drains or catheters, postoperative bleeding after open surgery, failure to recognise severity of illness	Delay in diagnosis, better to have done different procedure, delay in transfer to tertiary hospital, delay in transfer to surgeon by physicians, care unsatisfactory (not otherwise specified)

Abbreviation: N/A = not applicable.
Notes: Data are from closed cases as of 27 October 2023 where patient transfer occurred; no cases were reported to ACTASM during 1 January 2018–31 December 2022 for Obstetrics & Gynaecology, Ophthalmology, Oral/Maxillofacial Surgery and Paediatric Surgery that had completed the evaluation process as of 27 October 2023.

Unplanned returns to theatre

Table LL: Patient demographics for cases notified to ACTASM where a URTT was reported, according to year of patient death

	2018 (n=16)	2019 (n=23)	2020 (n=14)	2021 (n=11)	2022 (n=14)
Age (years)[1]	78 (74–84)	67 (57–77)	77 (70–81)	68 (53–74)	73 (65–77)
Length of Stay (days)[1]	6 (3–8)	6 (3–14)	10 (4–19)	17 (10–25)	10 (5–20)
Sex (% male:female)	68.8:31.3	65.2:34.8	50.0:50.0	81.8:18.2	42.9:57.1
Indigenous (%)					
Yes	0.0	0.0	0.0	0.0	0.0
No	93.8	100.0	100.0	100.0	100.0
Unknown	6.3	0.0	0.0	0.0	0.0
ASA Grade (%)[2]					
1	0.0	0.0	0.0	0.0	0.0
2	6.3	8.7	14.3	27.3	28.6
3	50.0	34.8	50.0	45.5	28.6
4	43.8	34.8	28.6	27.3	35.7
5	0.0	21.7	7.1	0.0	7.1
6	0.0	0.0	0.0	0.0	0.0
Unknown	0.0	0.0	0.0	0.0	0.0
Comorbidities (%)[3]					
Advanced malignancy	18.8	13.0	14.3	0.0	14.3
Age	62.5	39.1	42.9	27.3	42.9
Cardiovascular	62.5	26.1	42.9	36.4	14.3
Diabetes	31.3	13.0	21.4	9.1	7.1
Hepatic	0.0	8.7	14.3	0.0	7.1
Neurological	18.8	13.0	14.3	18.2	0.0
Obesity	18.8	13.0	14.3	9.1	21.4
Other	12.5	17.4	14.3	0.0	35.7
Renal	25.0	13.0	28.6	9.1	7.1
Respiratory	43.8	17.4	21.4	18.2	50.0
Perceived risk of death, surgeon (%)[4]					
Minimal	0.0	4.3	0.0	18.2	7.1
Small	25.0	17.4	14.3	54.5	35.7
Moderate	31.3	26.1	57.1	18.2	21.4
Considerable	25.0	52.2	28.6	9.1	35.7
Expected	12.5	0.0	0.0	0.0	0.0
Unknown	6.3	0.0	0.0	0.0	0.0
Perceived risk of death, assessor (%)[4]					
Minimal	0.0	8.7	0.0	9.1	7.1
Small	6.3	13.0	14.3	36.4	21.4
Moderate	62.5	30.4	50.0	45.5	42.9
Considerable	18.8	43.5	35.7	9.1	28.6
Expected	12.5	4.3	0.0	0.0	0.0
Unknown	0.0	0.0	0.0	0.0	0.0

Abbreviation: URTT = unplanned return to theatre.
Notes: Data are from closed cases as of 27 October 2023.
[1] Data are medians (25th, 75th percentiles).
[2] American Society of Anesthesiologists physical status classification.7
[3] Proportions not mutually exclusive.
[4] Overall perceived risk of patient death as determined by surgeon or assessor.

Table MM: Proportion of cases notified to ACTASM where a URTT was reported, according to specialty and year of patient death

Cases with URTT (%)	2018	2019	2020	2021	2022
Overall	14.3	23.5	15.7	11.8	15.1
Specialty (%)[1]					
Cardiothoracic Surgery	0.0	20.0	12.5	0.0	11.1
General Surgery	9.8	16.7	8.8	4.5	15.8
Neurosurgery	4.8	27.8	23.1	28.6	6.3
Orthopaedic Surgery	5.6	8.3	0.0	0.0	23.1
Otolaryngology Head & Neck Surgery	N/A	0.0	0.0	N/A	0.0
Plastic Surgery	0.0	0.0	25.0	0.0	N/A
Urology	14.3	20.0	0.0	33.3	0.0
Vascular Surgery	47.4	50.0	37.5	16.7	25.0

Abbreviation: URTT = unplanned return to theatre.
Notes: Data are from closed cases as of 27 October 2023; no cases were reported to ACTASM during 1 January 2018–31 December 2022 for Obstetrics & Gynaecology, Ophthalmology, Oral/Maxillofacial Surgery and Paediatric Surgery that had completed the evaluation process as of 27 October 2023.
[1] Data are proportional to the total number of closed cases reported for each specialty as of 27 October 2023.

Table NN: Admission profile for cases notified to ACTASM where a URTT was reported, according to year of patient death

	2018 (n=16)	2019 (n=23)	2020 (n=14)	2021 (n=11)	2022 (n=14)
Patient Status (%)					
Private	6.3	0.0	14.3	0.0	0.0
Public	93.8	100.0	85.7	100.0	100.0
Veteran	0.0	0.0	0.0	0.0	0.0
Unknown	0.0	0.0	0.0	0.0	0.0
Admission Status (%)					
Elective	56.3	30.4	35.7	45.5	14.3
Emergency	43.8	69.6	64.3	54.5	85.7
Unknown	0.0	0.0	0.0	0.0	0.0
Hospital Status (%)					
Co-location	0.0	4.3	0.0	0.0	0.0
Private	0.0	0.0	14.3	0.0	0.0
Public	100.0	95.7	85.7	100.0	100.0

Abbreviation: URTT = unplanned return to theatre.
Notes: Data are from closed cases where a URTT was reported as of 27 October 2023.
[1] According to AIHW (Australian Institute of Health and Welfare) classification.[9]
[2] According to AIHW (Australian Institute of Health and Welfare) peer group classification.[8]

Table 00: ACTASM evaluation of cases with a reported URTT that had CMIs identified by assessors, according to year of patient death

	2018 (n=16)	**2019** (n=23)	**2020** (n=14)	**2021** (n=11)	**2022** (n=14)
Cases with CMI Present (%)	50.0	39.1	42.9	18.2	50.0
Total CMIs (n)	12	14	6	3	10
CMI Severity (%)[1]					
Consideration	66.7	64.3	66.7	0.0	50.0
Concern	25.0	28.6	33.3	100.0	30.0
Adverse event	8.3	7.1	0.0	0.0	20.0
Unknown	0.0	0.0	0.0	0.0	0.0
CMI Outcome (%)[1]					
Made no difference	8.3	14.3	16.7	33.3	10.0
May have contributed to death	75.0	57.1	83.3	66.7	40.0
Caused death of patient otherwise expected to survive	0.0	28.6	0.0	0.0	30.0
Unknown	16.7	0.0	0.0	0.0	20.0
CMI Preventability (%)[1]					
Definitely	41.7	35.7	16.7	33.3	30.0
Probably	41.7	28.6	83.3	66.7	40.0
Probably not	16.7	35.7	0.0	0.0	20.0
Definitely not	0.0	0.0	0.0	0.0	0.0
Unknown	0.0	0.0	0.0	0.0	10.0
CMI Associated with (%)[1,2]					
Audited surgical team	75.0	57.1	50.0	100.0	70.0
Another clinical team	25.0	14.3	33.3	33.3	20.0
Hospital	0.0	7.1	16.7	0.0	10.0
Other	8.3	7.1	0.0	0.0	30.0

Abbreviations: CMI = clinical management issue; URTT = unplanned return to theatre.
Notes: Data are from the highest level of assessment undertaken for closed cases as of 27 October 2023 where a CMI was reported.
[1] Data are proportional to the total CMIs reported by assessors from the highest level of assessment undertaken for closed cases as of 27 October 2023.
[2] Data are not mutually exclusive.

Table PP: Most frequent reported types of CMIs for cases with a reported URTT, according to specialty and year of patient death

Specialty	2018	2019	2020	2021	2022
Overall	Decision to operate, adverse factors in management, general complications of treatment, inadequate post operative assessment, poor documentation, failure of communication, wrong surgical approach used, incorrect use of drains or catheters, preoperative assessment inadequate, delay in diagnosis	Decision to operate, preoperative assessment inadequate, pancreatic complication, cerebrovascular accident due to arterial injury following open surgery, anastomotic leak after open surgery, colonic complication of laparoscopic operation, vascular complication of radiological operation, operation would have been better deferred or delayed, failure of communication, failure to treat malnutrition, incorrect/ inappropriate therapy, transfer should not have occurred, overdose of narcotics	Wrong surgical approach used, adverse factors in management, communication failures, wrong operation performed, delay in transfer to tertiary hospital	Postoperative bleeding after open surgery, failure to recognise severity of illness, cardiac monitoring inadequate	Better to have done different procedure, wrong surgical approach used, delay in transfer to tertiary hospital, poor documentation, delay in diagnosis, aspiration pneumonia during anaesthetic, theatre acquired infection, re-bleed after open operation, care unsatisfactory (not otherwise specified)
Cardiothoracic Surgery	N/A	N/A	Wrong surgical approach used	N/A	Poor documentation, theatre acquired infection
General Surgery	Adverse factors in management, decision to operate	Pancreatic complication, anastomotic leak after open surgery, colonic complication of laparoscopic operation, operation would have been better delayed, failure to treat malnutrition, transfer should not have occurred, overdose of narcotics, incorrect/ inappropriate therapy	Wrong surgical approach used	Cardiac monitoring inadequate	Better to have done different procedure, aspiration pneumonia during anaesthetic, re-bleed after open operation
Neurosurgery	N/A	Cerebrovascular accident due to arterial injury following open surgery, vascular complication of radiological operation	Delay in transfer to tertiary hospital, communication failures	N/A	Wrong surgical approach used
Orthopaedic Surgery	N/A	Preoperative assessment inadequate	N/A	N/A	N/A

Otolaryngology Head & Neck Surgery	N/A	N/A	N/A	N/A	N/A
Plastic Surgery	N/A	N/A	N/A	N/A	N/A
Urology	N/A	N/A	N/A	N/A	N/A
Vascular Surgery	Pre-operative assessment inadequate Wrong surgical approach used, decision to operate, poor documentation, delay in diagnosis, general complications of treatment, inadequate post operative vascular assessment, failure of communication, incorrect use of drains or catheters	Decision to operate, incorrect/ inappropriate therapy	Adverse factors in management, wrong operation performed	Postoperative bleeding after open surgery, failure to recognise severity of illness	Delay in diagnosis, delay in transfer to tertiary hospital, better to have done different procedure, care unsatisfactory (not otherwise specified)

Abbreviations: N/A = not applicable.
Notes: Data are from closed cases as of 27 October 2023 where a clinically significant infection was reported; no cases were reported to ACTASM during 1 January 2018–31 December 2022 for Obstetrics & Gynaecology, Ophthalmology, Oral/Maxillofacial Surgery and Paediatric Surgery that had completed the evaluation process as of 27 October 2023.

References

1. Benson T. The history of the Read Codes: the inaugural James Read Memorial Lecture 2011. Inform Prim Care. 2011;19(3):173-82.
2. Robinson D, Schulz E, Brown P, Price C. Updating the Read Codes: user-interactive maintenance of a dynamic clinical vocabulary. J Am Med Inform Assoc. 1997;4(6):465-72.
3. Schulz EB, Barrett JW, Price C. Read Code quality assurance: from simple syntax to semantic stability. J Am Med Inform Assoc. 1998;5(4):337-46.
4. McFarlane HJ, van der Horst N, Kerr L, McPhillips G, Burton H. The Scottish Audit of Surgical Mortality: a review of areas of concern related to anaesthesia over 10 years. Anaesthesia. 2009;64(12):1324-31.
5. R Development Core Team. R: A language and environment for statistical computing. 4.2.1 ed. Vienna, Austria: R Foundation for Statistical Computing; 2022.
6. R Studio Team. RStudio: Integrated Development Environment for R. 2022.2.0.443 ed. Massachusetts, U.S.: RStudio, PBC; 2022.
7. Mayhew D, Mendonca V, Murthy BVS. A review of ASA physical status – historical perspectives and modern developments. Anaesthesia. 2019;74(3):373-9.
8. Health AIo, Welfare. Australian hospital peer groups. Canberra: AIHW; 2015.
9. Health AIo, Welfare. Rural, regional and remote health: a guide to remoteness classifications. Canberra: AIHW; 2004.

Notes

Royal Australasian College of Surgeons

Australian Capital Territory Audit of Surgical Mortality

Royal Australasian College of Surgeons