ANZCA
FPM

Safety of anaesthesia: A review of anaesthesia-related mortality reporting in Australia and New Zealand

2018-2020

Australian and New Zealand College of Anaesthetists, Mortality Sub-Committee

Dr Simon Jenkins
Editor

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Glossary of acronyms, initialisms and terms

Acronyms and initialisms

ABS	Australian Bureau of Statistics
ACORN	Australian College of Perioperative Nurses
ACT	Australian Capital Territory
ACTAAM	Australian Capital Territory Audit of Anaesthesia Mortality
ACTASM	Australian Capital Territory Audit of Surgical Mortality
AIHW	Australian Institute of Health and Welfare
AMA	Australian Medical Association
AMC	Anaesthetic Mortality Committee
ANZASM	Australian and New Zealand Audit of Surgical Mortality
ANZCA	Australian and New Zealand College of Anaesthetists
ANZAAG	Australian and New Zealand Anaesthetic Allergy Group
ASA	Australian Society of Anaesthetists
ASA-physical status	American Society of Anaesthesiologists Physical Status classification
CEC	Clinical Excellence Commission
CHO	Chief Health Officer
CPD	Continuing Professional Development
CPR	Cardiopulmonary Resuscitation
CVA	Cerebrovascular Accident
ETT	Endotracheal Tube
FANZCA	Fellow of the Australian and New Zealand College of Anaesthetists
HDU	High Dependency Unit
ICD – AM	International Classification of Diseases – Australian Modification
ICU	Intensive Care Unit
MSC	Mortality Subcommittee
NHI	National Health Index
NHMRC	National Health and Medical Research Council
NIBP	Non-invasive Blood Pressure
NMBA	Neuromuscular Blocking Agent
NSW	New South Wales
NT	Northern Territory
NTAAM	Northern Territory Audit of Anaesthesia Mortality
NTASM	Northern Territory Audit of Surgical Mortality
POMRC	Perioperative Mortality Review Committee
PACU	Post-Anaesthesia Care Unit
QAC	Quality Assurance Committee
QLD	Queensland
QPPAMRC	Queensland Perioperative and Periprocedural Anaesthetic Mortality Review Committee
RACS	Royal Australasian College of Surgeons
RANZCOG	Royal Australian and New Zealand College of Obstetricians
SA	South Australia
SAAMC	South Australian Anaesthetic Mortality Committee
SCIDUA	Special Committee Investigating Deaths Under Anaesthesia
SQC	Safety and Quality Committee
SWAPNET	Statewide Anaesthesia and Perioperative Care Clinical Network
TAS	Tasmania
TAAM	Tasmanian Audit of Anaesthesia Mortality
TASM	Tasmanian Audit of Surgical Mortality
TGA	Therapeutic Goods Administration
ToR	Terms of Reference
UWA	University of Western Australia
VIC	Victoria
VCCAMM	Victorian Consultative Council on Anaesthetic Morbidity and Mortality
VPCC	Victorian Perioperative Consultative Council
VSCC	Victorian Surgical Consultative Council
WA	Western Australia
WAAMC	Western Australian Anaesthetic Mortality Committee
WAASM	Western Australian Audit of Surgical Mortality

Table of terms

Terms	Definitions
'Anaesthesia-attributable' death (Category 1)	Reasonable certainty that the death was entirely attributable to the anaesthesia or other factors under the control of the anaesthetist.
'Anaesthesia-related' deaths (Categories 1–3)	Reasonable certainty that the death was caused by both medical/surgical and anaesthesia factors.
Category 1 (of System of Classification)	Reasonable certainty that death was caused by the anaesthesia or other factors under the control of the anaesthetist (i.e. deaths attributable to anaesthesia)
Category 2 (of System of Classification)	Some doubt whether death was entirely attributable to the anaesthesia or other factors under the control of the anaesthetist (i.e. deaths possibly attributable to anaesthesia)
Category 3 (of System of Classification)	Reasonable certainty death was caused by both medical/surgical and anaesthesia factors (i.e. deaths partly attributable to anaesthesia)
Jurisdictions	Refers to all Australian states and territories collectively and New Zealand. Where reference is only to Australian jurisdictions, this is stated.
Perioperative care	Preoperative planning and optimisation, and post-operative monitoring and support.
Regional Audit of Surgical Mortality	Regional jurisdictional audits that make up the Australian and New Zealand Audit of Surgical Mortality (ANZASM). Each audit of surgical mortality is funded by its corresponding jurisdictional department of health (WA, VIC, SA, QLD, TAS, ACT and NT). The ANZASM is managed by RACS.
System of Classification	A system of classification comprised of 8 categories, with corresponding definitions, that provides a framework for use by Australian jurisdictional mortality committees to enhance the uniformity of data collection and correlation for the purposed of the triennial reports.

Foreword

I am pleased to introduce the 12th edition of the *Safety of Anaesthesia: A review of anaesthesia-related mortality reporting in Australia and New Zealand* produced by the Australian and New Zealand College of Anaesthetists (ANZCA).

Since 2016, all Australian jurisdictions have established data collection processes that enable them to contribute to the report.

Owing to limitations in, or redistribution of, healthcare resources during the Covid-19 pandemic, Victoria and the Australian Capital Territory (ACT) were unable to contribute data for this triennial report. Notwithstanding, we are confident the data received from the remaining jurisdictions is representative of trends and patterns in anaesthesia-related mortality.

During the triennial period 2018 to 2020, there were 164 anaesthesia related deaths, 0.0016 per cent of the 10,495,876 anaesthetics delivered.

The results demonstrate that anaesthesia care in Australia and New Zealand continues to be incredibly safe for patients. The results indicate the professionalism of the FANZCA and their commitment to high quality and safe anaesthesia. The results also validate the strength of ANZCA training.

The report contains indicative "case summaries" to assist with reflecting on our clinical practice. The cases have combined different elements described in submitted category 1 deaths to provide realistic examples without compromising confidentiality.

On a final note, I would like to acknowledge all the people who were involved in preparing the report. I would like to thank the Chair of the ANZCA Mortality Subcommittee (MSC), Dr Simon Jenkins, for his dedication, the members of the jurisdictional mortality subcommittees, and the ANZCA staff who contributed to preparing this triennial report.

Professor David Story
ANZCA President

ANZCA Mortality Sub-Committee

This report has been produced by members of the ANZCA MSC. In accordance with its terms of reference (ToR), the MSC is responsible for matters related to anaesthesia-related mortality reporting in Australia and New Zealand, including the "calculation of accurate anaesthesia mortality rates and the preparation of national reports".

At the time of publication, the MSC was composed of:

ANZCA President

Professor David Story

Chairs/co-ordinators of Australian Jurisdictions and New Zealand anaesthesia mortality committees

Chairs/co-ordinators	Representing
Dr Simon Jenkins (Chair MSC)	South Australia
Dr Mike Soares	Western Australia
Dr Philip Blum	Northern Territory
Dr James Troup	Queensland
Dr Carl D'Souza	New South Wales
Dr Carmel McInerney	Australian Capital Territory
Dr Ben Slater	Victoria
Dr Margaret Walker	Tasmania
Dr Kerry Gunn	New Zealand

Other interested parties	Representing
Associate Professor Joanna Sutherland	Chair, ANZCA Safety and Quality Committee
Professor David Scott	ANZCA Director of Professional Affairs – Policy
Ms Dianne Bennett	ANZCA Policy Officer

Executive summary

This is the 12th *Safety of Anaesthesia* report prepared by ANZCA. The report represents a review and analysis of potentially anaesthesia-attributable (Category 1) and anaesthesia-related (Categories 1 to 3) deaths reported in Australia and New Zealand from 2018 to 2020.

The identification of the associated causes of and trends in anaesthesia-related deaths provides context and a better understanding of the reasons for the deaths rendering the report a valuable learning tool for the anaesthesia community. Specifically, the report reveals that the safety of anaesthesia for Australians and New Zealanders remains exceptionally high, with anaesthesia-related mortality occurring rarely.

The Australian state and territory mortality data arise from individual committees that use different tools to gather information, where reporting may be mandatory or voluntary, reporting formats may differ, and the committees may work more closely with or separately from their regional Audit of Surgical Mortality. As the reporting and identifying of anaesthesia-related deaths is different between regions, it must be recognised that some anaesthesia-related deaths may be missed despite the efforts made at individual, state and national levels.

While reporting of regional committees is not standardised, all regions have applied the same classification system to improve consistency in the allocation of cases into the various categories. It should be appreciated that classification of anaesthesia-related deaths relies on expert opinion or consensus and, therefore, remains subjective to some extent. However, the classification system has remained consistent for over three decades, which should minimise the subjective nature of the classification.

Although 2018 and 2019 were "normal" years in healthcare, 2020 presented unique challenges in Australia and New Zealand due to the COVID-19 pandemic. This was an unprecedented public health crisis that disrupted healthcare delivery, stretched resources and tested the resilience of the entire system. The surge in hospital admissions of patients with SARS-CoV-2 infection forced the reprioritisation of resources. Anaesthetic services for elective procedures were dramatically reduced as operating rooms and critical care units were repurposed. Rigorous infection control measures and protocols were introduced to reduce the transmission of SARS-CoV-2 for the safety of patients, staff and the community at large.

The shortage and/or reallocation of resources during the pandemic placed limitations on the ability of some jurisdictions to readily collect anaesthesia-related mortality data. As a result, data for anaesthesia-related deaths in Victoria and the ACT (28 per cent of the Australian population) was unavailable for the 2018–2020 triennium. Notwithstanding this, we are confident that data from the other jurisdictions is reflective of trends in both Victoria and the ACT.

Similar to previous ANZCA Safety of Anaesthesia reports, aspiration, anaphylaxis, and perioperative medical care are again prominent. The case studies presented in the report shed light on the issues surrounding these contributors and present an educational opportunity for enhancing patient safety.

During the triennium, the sum of 164 anaesthesia-related deaths (Categories 1–3 as per the System of Classification) was reported within Australia (from jurisdictions able to provide 2018–20 data). Only 30 were classified as anaesthesia-attributable (Category 1), where it was considered "reasonably certain" that death was caused by anaesthetic factors alone. The proportion of Category 1 deaths remains consistent with previous reports, ranging between 12 per cent and 18 per cent over the previous decade.

The average population of the Australian jurisdictions contributing data to the report was 18.42 million (Australian Bureau of Statistics (ABS) population statistics). Using this figure, the anaesthesia-related mortality was 2.96 per million population per annum. Again, this number is remarkably consistent over the last decade, ranging from 2.73 to 3.29 per million population per annum.

In 2018–2020, according to the Australian Institute of Health and Welfare (AIHW), approximately 10.49 million anaesthetic procedures were recorded in Australia (excluding Victoria and the ACT). Using this denominator, the anaesthesia-related mortality rate was 1 in 63,999 anaesthetics. Although the difference from one report to the next may be small, this number represents a significant improvement since the 2003–05 report (1 in 53,426). The difference between the reduction in number of deaths per procedures performed compared with the relatively stable number of deaths per population is likely explained by the absolute number of procedures being performed, which is increasing more than the population year by year.

We again see a very low number of anaesthetic-related deaths in low-risk American Society of Anaesthesiologists Physical Status Classification (ASA-physical status) 1 and 2 patients – only 4 per cent of all reported deaths in this report. Given previous reports have identified that most procedures in Australia are performed in ASA-physical status 1 and 2 patients, this reinforces that anaesthesia remains extremely safe in low-risk patients, although a warning remains that there is more work to do on the ASA-physical status 3–5 group.

Some of our data indicates that certain areas outside the operating theatre need attention. An increasing number of anaesthesia-related deaths were reported in patients where no correctable causal factor was identified (68 per cent). In 81 per cent of cases, the patient's medical condition was a significant factor in their death. Similarly, advancing age is also an important factor, with 82 per cent of reported deaths being in patients over 70 years old.

Clearly, anaesthetists cannot change a patient's age, but improving perioperative management of chronic disease may reduce their impact upon anaesthetic mortality. Better understanding of perioperative risk may also help guide the highest risk patients towards appropriate non-operative management of their surgical conditions. Improving the perioperative care – preoperative planning and optimisation, and post-operative monitoring and support – remains a high priority for ANZCA.

As is usually the case, emergency procedures are disproportionately represented in anaesthetic-related mortality. Some emergency surgical conditions may put them at greater risk of specific anaesthetic complications that are rare in elective procedures (for example, bowel obstruction increases risk of aspiration). Some emergency surgical conditions may necessitate an operation despite the patients' potentially poorly controlled medical illnesses (for example, surgery for fractured hip). Again, better perioperative care might improve overall outcomes in these groups.

It is encouraging to see that specialist anaesthetists are involved in more than 90 per cent of these cases, rather than trainees or others providing the anaesthetic care. This proportion has increased over time and likely represents specialists being increasingly involved in the highest risk cases, either directly or by close supervision of ANZCA trainees.

Dr Simon Jenkins
Chair, Mortality Sub-Committee

Background

Importance of the report

Fundamentally, the *Safety of anaesthesia* report is an authoritative report on anaesthestic mortality in Australia and New Zealand between 1 January 2018 and 31 December 2020. The results demonstrate that the safety of anaesthesia for Australians and New Zealanders remains exceptionally high, with anaesthesia-related mortality a very rare occurrence. This outcome is indicative of the combination of the professionalism and unwavering dedication of anaesthetists in Australia and New Zealand to ensure the safety of their patients, the superior specialised training and standards for anaesthetists and their initiatives in research and active engagement in quality improvement.

The fundamental purpose of the report is to improve patient safety for the purpose of the delivery of anaesthesia. The report achieves this through its function as an educational tool to identify outgoing, ongoing and emerging patterns in perioperative mortality. With this information, anaesthetists across all jurisdictions can share and compare insights about anaesthesia and learn from each other.

Given there is no legal requirement to publish the report, it represents the commitment of ANZCA and its fellowship to professional transparency and accountability and to the pursuit of continuing quality improvement.

History of the triennial reports

Triennial reports on anaesthesia-related deaths have been underway in Australia for just under 40 years. The National Health and Medical Research Council (NHMRC) had carriage of the inaugural 1985–1987 triennial report and the subsequent one in 1988–1990. The reports had become possible because, by this time, five Australian jurisdictions had begun collecting anaesthesia-related deaths data that could contribute to them.

The first state to begin data collection was NSW, in 1960, followed by South Australia in 1969, Queensland in 1975, Victoria in 1976 and Western Australia in 1978. Collectively, these jurisdictions comprised most of the Australian population. In 1981, New Zealand began collecting data so, by this time, the available data could reasonably be considered reflective of national and bi-national trends in anaesthesia-related deaths.

ANZCA eventually assumed responsibility for the preparation of the reports, beginning with the 1991–1993 edition. Since then, the remaining Australian jurisdictions – Tasmania, the ACT and the Northern Territory (NT) – have also begun collecting and contributing data. While larger jurisdictions have established an independent anaesthetic mortality committees, those with small populations tend to have collaborative processes with the corresponding jurisdictional RACS Audit of Surgical Mortality Committee.

During the 2000–2002 triennium, the Australian government introduced anaesthesia-specific coding for the first time to estimate the total number of anaesthetics delivered nationwide. In that triennium, the anaesthesia-related mortality rate was about one death for every 56,000 anaesthetics. This number has remained remarkably consistent for over two decades.

In any given triennium, there has never been the same mix of jurisdictions contributing to the report, and while all jurisdictions now collect anaesthesia-related mortality data, their ability to contribute data to the triennial reports may fluctuate owing to local reasons. This triennium is no different because, as mentioned above, neither Victoria nor the ACT who have historically contributed data to the reports, were able to do so on this occasion. Notwithstanding these data limitations, we were still able to examine substantial data to identify trends to derive useful information and meaningful lessons.

Figure 1: Timeline of jurisdictions that have contributed data to triennial reports

History of reporting jurisdictions by triennium report

Key findings and recommendations

Key findings

It remains the case that, in Australia and New Zealand, anaesthesia is a very safe process, as reflected in mortality data, which demonstrates the reported death of very few patients. This report shows that the incidence of death attributable to anaesthesia (Category 1) in Australia is low, whether assessed by the number of deaths per million population per year (2.96) or by the number of deaths per number of procedures performed (1:63,999). Anaesthesia continues to be a remarkably low risk intervention, especially in patients who are younger and healthier.

However, one should not forget that anaesthesia-attributable deaths (at 0.002 per cent) comprise only a tiny proportion of overall procedural mortality. The purpose of anaesthesia is not "an end in itself" (Beecher and Todd, 1954) but to support and enable a successful procedure with a good outcome.

For higher risk patients, and for those undergoing high risk procedures, while direct anaesthesia attributable deaths do occur at a relatively higher rate, there are also other important considerations. Anaesthesia "safety" can be invariably interpreted by patients and proceduralists as comprising overall outcomes (excluding technical surgical-related risk) and hence can include broad procedural complications, such as post-operative infections, thrombo-embolic complications and/or myocardial injury. For higher risk patients, these outcomes are likely to be much more relevant to a decision for (or against) surgery than anaesthesia-attributable mortality.

The highest anaesthesia-related mortality risk is seen in older patients, with a significant background of health issues, undergoing emergency surgery. Targeting these patients in risk reduction strategies may provide the greatest opportunity for further improvements in anaesthesia-attributable, as well as overall, mortality. Such strategies might include earlier intervention in emergency settings, slowing the transition to theatre to ensure adequate resuscitation and planning occurs, better decision-making around low value surgeries in high-risk patients and improved overall health management in the community. Regardless, being able to identify those patients at highest risk prior to surgery allows anaesthetists to have a more informed discussion with patients and surgeons in the perioperative setting before embarking on any given procedure.

Thirty deaths were attributable to anaesthesia as Category 1 cases, where it was reasonably certain that death was caused by the anaesthesia or other factors under the control of the anaesthetist. Of those, 15 related to pulmonary aspiration or its sequelae, 9 were attributed to anaphylaxis and 6 related to other factors. With aspiration and anaphylaxis again responsible for most deaths seen, it remains important to ensure anaesthetists guard against these possibilities in their day-to-day work.

An increasing number of deaths appear to have occurred in cases where no correctable factor could be identified, as well as in patients suffering from comorbid medical illness. In some ways, this may be reassuring as it suggests anaesthetists are providing a high quality and the safest possible service even when a death might occur. However, it may be that anaesthetists could do better by early identification of such cases and providing alternative options for care that do not put the patients at risk from such procedures. To this end, ANZCA is providing education offerings in perioperative medicine to develop improved skills to manage this before patients reach the operating theatre.

Recommendations

The ANZCA MSC makes the following recommendations:

1. Healthcare authorities should continue to appreciate that anaesthesia-related mortality is highest in older, sicker patients undergoing emergency surgeries. Resources should be provided for the provision of perioperative care, such as specialist anaesthetists and perioperative physicians and the availability of high acuity post-operative care.
2. Training in perioperative medicine should continue to play an important role in anaesthesia training through ANZCA, and anaesthetists should continue to work collaboratively with other specialists to optimise patients at high risk.
3. Clinicians must engage with their patients and families in collaborative discussion about the likely outcomes of major and emergency surgeries, and the risks involved, to minimise the risk of inappropriate interventions being undertaken.
4. The ANZCA MSC and regional mortality committees should continue to work collaboratively towards obtaining accurate mortality data to inform work that improves safety in anaesthesia.
5. The community should be informed that specialist anaesthesia care in Australia and New Zealand remains extremely safe in most cases, as shown by the very low anaesthesia-related mortality rates in this report.

Methodology

Data sources

- *Australian jurisdictional mortality committees and audit bodies.*

  These groups contribute jurisdictional-specific data for anaesthesia-related deaths in accordance with the System of Classification (Table 1). More information about each jurisdictional mortality committee can be found at pages 40 to 53 and at Appendix D.

- *Australian Institute of Health and Welfare (AIHW)*

  ANZCA requested data pertaining to anaesthesia procedures in Australia from the AIHW. The provided data was classified according to the Australian coding standards of the National Centre for Classification in Health. More information about coding classification of anaesthesia procedures is available at Appendix B.

- *Australian Bureau of Statistics (ABS)*

  Australian population statistics were derived from ABS jurisdictional data for the 2018–2020 period. (ABS data cube 31010do).

System of Classification

Jurisdictional anaesthesia mortality committees use the definitions within the System of Classification (Table 1) to classify reports submitted. Categories 1–3 encompasses cases in which anaesthesia has been deemed directly attributable (Category 1), possibly attributable (Category 2) or partially attributable (Category 3). When discussing Categories 1–3 grouped together, we refer to the cases being 'anaesthesia-related'.

In 1991, the System of Classification was presented to ANZCA by the NHMRC Working Party responsible for preparing the augural report on anaesthesia-related deaths in Australia. The then chairs of the jurisdictional mortality committees agreed to use the System of Classification in ANZCA-prepared reports. Subsequent chairs have continued to use it since then. (See Appendix A for the full version of *Glossary of Terms – Case Classification*).

Table 1: System of Classification – Glossary of Terms

Death attributable to anaesthesia	
Category 1	Where it is reasonably certain that death was caused by the anaesthesia or other factors under the control of the anaesthetist.
Category 2	Where there is some doubt whether death was entirely attributable to the anaesthesia or other factors under the control of the anaesthetist.
Category 3	Where it is reasonably certain death was caused by both medical/surgical and anaesthesia factors.

Explanatory notes:

- The intention of the classification is not to apportion blame in individual cases but to establish the contribution of the anaesthesia factors to the death.
- The above classification is applied regardless of the patient's condition before the procedure. However, if it is considered that the medical condition makes a substantial contribution to the anaesthesia-related death, subcategory H should also be applied.
- If no factor under the control of the anaesthetist is identified which could or should have been done better, subcategory G should also be applied.

Death in which anaesthesia played no part	
Category 4	Death where the administration of the anaesthesia is not contributory and surgical or other factors are implicated.
Category 5	Inevitable death, which would have occurred irrespective of anaesthesia or surgical procedures.
Category 6	Incidental death, which could not reasonably be expected to have been foreseen by those looking after the patient, was not related to the indication for surgery and was not due to factors under the control of the anaesthetist or surgeon.
Unassessable death	
Category 7	Those that cannot be assessed despite considerable data, but where the information is conflicting, or key data is missing.
Category 8	Cases that cannot be assessed because of inadequate data.

Uniformity of jurisdictional data collection

In the late 1990s, to enhance the uniformity of data collection and correlation for the reports, the chairs of the jurisdictional mortality committees agreed to develop and incorporate a glossary of terms into the System of Classification (Appendix A) to:

- Provide a shared understanding of the definition of the categories.
- Provide a framework to analyse cases.
- Promote uniformity of reporting.

The System of Classification – *Case Classification* framework is currently the most thorough and reliable instrument available in Australia to nationally to:

- Collect anaesthesia-related mortality data.
- Generate anaesthesia-related mortality statistics.
- Identify anaesthesia-related mortality trends.

Constraints of jurisdictional data collection

While the framework provided by the System of Classification – *Case Classification* optimises uniformity of data collection and correlation processes that exist within and between Australian jurisdictions and New Zealand, it does not achieve pure uniformity of data as local variables remain, for example:

- Differences in the legislation under which the committees function.
- Mandatory or voluntary reporting.
- Different reporting formats.
- Conjoint ministerially appointed committees vs. collaborative initiative with the jurisdictional Surgical Audit of Perioperative Mortality.
- Classification of anaesthesia-related deaths according to expert opinion or consensus of opinions.
- Interpretation of the categorisation of anaesthesia-related deaths.
- Lack of uniformity between the jurisdictions about which deaths associated with anaesthesia must be reported to a Coroner.
- Lack of uniformity in the relationships between Coroners and AMCs.

Some key legislation differences and similarities between Australian jurisdictions that affect anaesthesia-related mortality data collection are outlined at Appendix D.

Given the primary purpose of data collection for anaesthesia-related deaths is investigative and educational, for the purposes of this report, the ANZCA MSC is comfortable with the inherent and subtle differences in the interpretation of the classification of data between jurisdictions.

Note that owing to these jurisdictional variables, for the purposes of the report certain jurisdictional-specific data points were excluded to achieve analytical legitimacy.

Confidentiality

Confidentiality of information, an absolute requirement for all committees, was ensured by no primary data being examined in the compiling of the report. All information is de-identified prior to receipt and, upon request of individual states, some data points were suppressed to prevent identification.

Category 1 cases

Number of Category 1 deaths reported

Thirty of the reported deaths were deemed directly attributable to anaesthesia as Category 1 cases, where it was "reasonably certain that death was caused by the anaesthesia or other factors under the control of the anaesthetist" (Table 2). Of these, 15 were related to pulmonary aspiration or its sequelae, 9 were attributed to anaphylaxis, and the remaining were listed as pulmonary embolus (2), cardiac ischaemia/arrest (2), post-operative bleeding (1) and respiratory failure (1) (Table 3; Figure 2).

Table 2: No. Cat. 1 deaths reported by Australian jurisdictions 2018–20

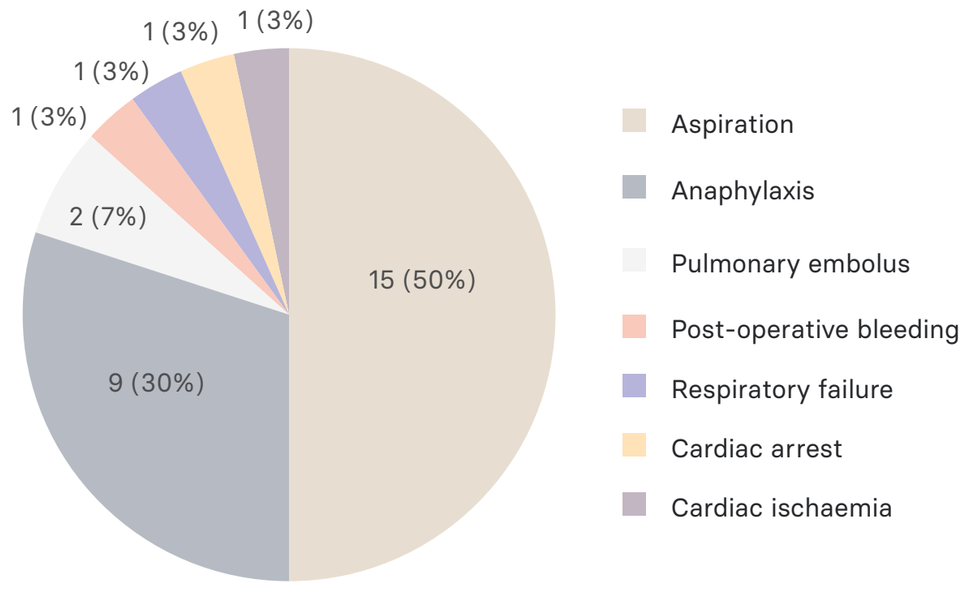
	NSW	Vic	WA	Tas	SA	Qld	NT	ACT	Total
No. Cat. 1 deaths	23	na	3	0	2	2	0	na	30

Table 3: Summary of Cat. 1 deaths reported by Australian jurisdictions 2018–2020*

Sex	Age bracket	Cause of death
Male	20–29	Anaphylaxis
Female	40–49	Anaphylaxis
Male	40–49	Aspiration
Male	50–59	Aspiration
Male	50–59	Aspiration
Male	50–59	Pulmonary embolism
Male	60–69	Anaphylaxis
Male	60–69	Aspiration
Male	60–69	Aspiration
Male	60–69	Aspiration
Female	60–69	Post-operative bleeding
Female	70–79	Anaphylaxis
Female	70–79	Anaphylaxis
Male	70–79	Anaphylaxis
Male	70–79	Anaphylaxis
Male	70–79	Anaphylaxis
Female	70–79	Aspiration
Male	70–79	Aspiration
Male	70–79	Aspiration
Male	70–79	Aspiration
Female	80–89	Anaphylaxis
Female	80–89	Aspiration
Male	80–89	Aspiration
Male	80–89	Aspiration
Male	80-89	Cardiac arrest
Male	80-89	Cardiac ischaemia
Female	80-89	Pulmonary embolism
Male	80-89	Respiratory failure
Female	90-99	Aspiration
Male	90-99	Aspiration
Male	90-99	Aspiration

*NSW/SCIUDA represents 76.67% of the total data listed in Table 3

Figure 2: Summary of Cat. 1 deaths reported by Australian jurisdictions 2018–2020*



*Values may not add to 100% due to rounding.

Pulmonary aspiration

Aspiration occurs when gastric or other fluid is inhaled into the unprotected lungs, causing obstruction of airways and consequent pneumonitis. Airway and cough reflexes are impaired by general anaesthesia, although the use of cuffed endotracheal tubes will largely protect the anaesthetised patient from soiling of the lungs. Gastric fluid is most concerning due to its high acidity leading to a chemical pneumonitis, but the severity of this complication is also believed to be related to the volume of fluid aspirated and the presence of particulate material. Physical blockage of the airways leads to immediate hypoxaemia and subsequent inflammation leads to pneumonia and sepsis that, in the most severe cases, may lead to death.

The presence of significant volumes of high acidity gastric contents occurs after all meals and will usually decrease to minimal volumes within a few hours. Gastric emptying may be delayed by some medications (for example, opioids, GLP-1 agonists, and so on) or by pathological states (for example, bowel obstruction, peritonitis and so on). To manage this risk, anaesthetists will usually use strict fasting protocols in elective or semi-urgent surgery (that is, "low risk" of aspiration) or by using alternative techniques, such as regional anaesthesia or rapid sequence induction (RSI), where fasting is not feasible or gastric emptying may be delayed (that is "high risk" aspiration).

Aspiration of gastric contents is possible at any time during general anaesthesia, up to and including the recovery period. Endotracheal intubation does markedly reduce the risk of aspiration during the maintenance phase of anaesthesia, but the widespread use of supraglottic airways has allowed larger and longer surgeries to be performed without a definitively "protected airway", shifting some cases of aspiration into that period after induction. Similarly, a patient deemed to be at high risk of aspiration at induction will usually remain high risk at the end of the surgery, so the anaesthetist should remain vigilant regarding the possibility of aspiration well into the recovery period.

Kluger and Short (1999) suggested guidelines to reduce the risk of aspiration. These are worth restating here:

1. Experienced anaesthesia assistance available at all times.
2. Intubate all emergency cases.
3. Apply appropriate cricoid pressure with all inductions using neuromuscular blocking agents.
4. Intubate/seriously consider intubation in the following:
    - Delayed gastric emptying (pregnancy, opioids, diabetes mellitus, renal failure).
    - Increased intra-abdominal pressure (obesity, ascites, masses).
    - Extubate high-risk cases awake and on their side. Extubate all others on their side.

In this triennium, fifteen cases were discussed where patients have suffered pulmonary aspiration or its sequelae. The patients ranged in age from their 40s to their 90s. Unfortunately, more detailed information was provided for only three of these cases – one elective admission and two emergency cases. Preoperatively, all three patients were considered at low risk of aspiration and were managed initially with general anaesthesia using supraglottic airway devices.

The patients were fasted preoperatively for what was considered an adequate duration of time. Regurgitation of stomach contents and aspiration occurred at induction in two cases and during maintenance of anaesthesia in the third. All three were managed well in the resuscitative steps immediately following aspiration but subsequently died 24–48 hours after their scheduled operations.

Anaesthetists should be aware that fatal aspiration can and does occur in well-fasted patients, and not just in cases traditionally deemed as “high risk”.

Case example 1

An 84-year-old male had fallen and broken his neck of femur and was admitted to hospital on a Wednesday evening. He suffered from Alzheimer’s dementia and took aspirin and clopidogrel for a previous cerebrovascular accident (CVA) but was otherwise relatively healthy from a cardiovascular and respiratory point of view. He was agitated and confused overnight and struggled with the nursing staff when they tried to assist him.

He was reviewed on the morning following admission by the anaesthetic team and geriatric medicine. Due to perceived difficulty in managing a spinal anaesthetic, and in consultation with his family, general anaesthesia was planned. The team was unable to perform the surgery that day, but he went to theatre as the first case on the Friday.

The anaesthetist administered fentanyl and propofol, inserted a supraglottic airway device, placed the patient on pressure support ventilation and performed a femoral nerve block prior to the start of the operation.

Forty minutes into the procedure, the anaesthetist noted low oxygen saturation and, upon examination of the airway device, found dark fluid arising from the gastric port of the airway device. The device was removed, the pharynx was suctioned and an endotracheal tube (ETT) was placed insitu. Fibre-optic examination of the trachea revealed some soiling of the respiratory tract by the fluid. The operation was completed with the patient on 80 per cent oxygen and saturations of 94 per cent.

While this is not a real case it does illustrate some of the aspects seen in perioperative aspiration events.

Anaesthetic assessment considers the risk of aspiration as a fundamental aspect. Hospitals have strict fasting protocols aimed at minimising this risk. However, risk mitigation strategies are rarely able to ensure absolute 100 per cent safety, particularly when the employment of these strategies may put the patient at risk of other complications.

Understanding that some pulmonary aspiration occurs and sometimes may lead to a patient’s death, anaesthetists can employ several well-known strategies to reduce its risk, from reducing gastric volume and pH to securing the airway with an ETT or avoiding general anaesthesia altogether. However, key to this will be accurate assessment of aspiration risk (noting that emergency patients are at higher risk than elective), application of the appropriate techniques for the circumstances and remembering that aspiration risk continues into the postoperative period as well.

Anaphylaxis

Perioperative anaphylaxis is a rare, unpredictable and potentially life-threatening event. The reported mortality from perioperative anaphylaxis is 1.4 to 4.8 per cent (Pouessel et al, 2024) and it has been one of the leading causes of Category 1 deaths (along with aspiration) in all the previous ANZCA Safety of Anaesthesia reports.

Type 1/IgE mediated hypersensitivity reactions occur in sensitised individuals in response to exposure to an antigen (for example, drug, toxin, food), leading to a clinical picture characterised by tachycardia, hypotension, bronchospasm, rash and/or oedema. The public may be most familiar with peanut or bee allergies but, in anaesthesia, it may be related to any number of different medications, skin preparations or other agents a patient may be exposed to in their operative journey. Other pathways for immune activation also play a part in some reactions, for example, neuromuscular blocking agents (NMBAs) can bind directly to MRGPRX2 receptors on mast cells and cause degranulation. Regardless of the underlying mechanism, the clinical presentation is one of anaphylaxis and the management is the same.

Although patients are routinely asked about allergies and previous anaesthetics in their perioperative journey, the first episode of perioperative anaphylaxis is highly unpredictable. The episode may follow previous “safe” administration of the agent concerned or occur on first exposure. This may be due to community sensitisation by a chemically related compound or activation of the immune system by a different, non-IgE, pathway. An example of this is community sensitisation to NMBAs by exposure to pholcodine-containing cough mixtures.

Pholcodine has recently been removed from sale in Australia and New Zealand (along with most other parts of the world). ANZCA and the Australian and New Zealand Anaesthetic Allergy Group (ANZAAG) were both involved in lobbying the TGA and Medsafe to bring this about. The final piece of evidence linking pholcodine to NMBA anaphylaxis was the ALPHO study which showed a four-fold increased risk of a reaction to an NMBA in patients who had consumed pholcodine in the prior 12 months (Mertes et al, 2023). It is likely there is also sensitisation to sugammadex by consumption of cyclodextrins contained in many food products.

Early diagnosis and prompt treatment, with carefully titrated adrenaline and adequate fluid resuscitation, are essential. The highly variable presentation of the clinical signs of anaphylaxis, particularly while the patient is anaesthetised, can delay diagnosis. Complicating this, resuscitation of a patient who has other comorbid disease, while simultaneously managing their surgery and anaesthetic, can often be more difficult still.

The ANZCA/ANZAAG Perioperative Anaphylaxis Management Guideline and cards (https://www.anzca.edu.au/safety-advocacy/standards-of-practice/perioperative-anaphylaxis-management-guidel) have been designed to be used as a crisis management package in the event of perioperative anaphylaxis and are regularly reviewed and updated.

Perioperative anaphylaxis is one of the ANZCA Continuing Professional Development (CPD) mandated emergency response activities. An online module is available (https://learn.anzca.edu.au/d2l/le/discovery/view/course/7837) and a guideline for running workshops that meet ANZCA Perioperative Anaphylaxis ER requirements (https://www.anzca.edu.au/getattachment/3a73fdb6-a30c-46bb-a984-312f04ac57a1/Anaphylaxis-ER-session-guideline).

The most common causes of perioperative anaphylaxis in Australia and New Zealand are still antibiotics and NMBAs. Other agents that are regularly implicated include chlorhexidine and patent blue. Sugammadex anaphylaxis is increasingly being reported. In Japan, sugammadex is routinely used for reversal of muscle relaxation and it is now one of the top three causes of perioperative anaphylaxis (along with antibiotics and NMBAs) (Takazawa et al, 2023).

Sugammadex anaphylaxis is a particular concern as the use of sugammadex is increasing across Australia and New Zealand. One of the potential pitfalls is that sugammadex anaphylaxis occurs at the end of the case at a time when monitoring and vigilance are often lower as the patient is transferred to the recovery area and care is handed over. This may lead to delayed diagnosis and treatment and poor outcomes.

In this triennium, nine cases of anaphylaxis led to death in patients ranging from their 20s to their 80s. Notably, five cases occurred in patients in their 70s. We have more detailed information in four of these cases: three elective surgeries and one emergency case. All four of these cases occurred at induction of anaesthesia and were judged to be due to the NMBA. All four patients had significant medical illnesses that were assumed to have impacted on the ability to resuscitate the patients adequately. Only one had a known history of allergy, which was to a medication that was avoided at the time of surgery.

Anaesthetists should be aware that anaphylaxis occurs unexpectedly and requires early diagnosis and a rapid response with aggressive resuscitation. Even when managed well, anaphylaxis can still result in death, particularly in patients with other comorbid disease.

Additional cases

Six other Category 1 cases were reported in this triennium. Two patients died from pulmonary embolus, two from cardiac ischaemia or arrest, one from respiratory failure and one from a postoperative haemorrhage.

Complications such as pulmonary embolus and surgical bleeding are not usually attributed to anaesthetic management but are starting to appear in anaesthetic mortality reports. It is unclear from these reports how these three events have been deemed attributable to anaesthesia, but as anaesthetic care spreads into the perioperative management of surgical patients, anaesthetists are becoming more involved in the management of anticoagulant medications both pre- and postoperatively.

Of note is that there were no cases of death reported in this triennium due to failures of airway management. This has previously been a prominent cause of anaesthetic-attributable deaths but has been decreasing over recent years, presumably due to a combination of education and the use of modern airway management tools.

Case example 2

A 42-year-old female was admitted to hospital for a laparoscopic cholecystectomy. She had a routine consultation with the anaesthetist, who noted no significant health issues (other than gallstones), a BMI of 46 and a vague history of a possible rash to penicillin as a child, though she had since received cephalosporins and other antibiotics without issue.

She was administered fentanyl, propofol and rocuronium in a routine induction of anaesthesia, intubated and administered sevoflurane for maintenance. Chlorhexidine skin preparation was used by the surgical team, cefazolin was administered as antibiotic prophylaxis and dexamethasone was used as an antiemetic.

Between five and ten minutes after induction, and just as the surgeons were preparing to make their first incision, the anaesthetist noted high airway pressures and tachycardia of 118bpm. The blood pressure taken immediately after intubation was 133/86 but the non-invasive blood pressure (NIBP) recording had failed to record another since. The surgery was paused while metaraminol was administered and NIBP was repeated.

Five minutes after administration of two doses of metaraminol, the blood pressure was recorded as 65/34, confirmed by the lack of a detectable peripheral pulse. Cardio-pulmonary Resuscitation (CPR) was commenced and adrenaline was administered with a presumptive diagnosis of anaphylaxis.

This is not a real case but it is based upon, and has similarities with, many examples of anaphylaxis reviewed by mortality committees across Australia and New Zealand.

In this scenario, the anaesthetist might have done all the right things – CPR, adrenaline, oxygen, fluids, appropriately skilled assistance – and the patient may have survived with no ill effects. Or there might have been another issue arise that compromised the resuscitation of the patient and they may have died.

Perhaps it is fortunate that the most common triggers for anaphylaxis are administered at the start of the anaesthetic when the patient is being monitored extremely closely and the surgery has not yet commenced. This assists us to make an early diagnosis and manage the problem in isolation. In the middle of a case, where blood loss or other physiologic changes related to the surgery may confuse the picture, diagnosis may be delayed and life supporting measures may well be hampered, leading to poorer outcomes. Or the trigger for the anaphylaxis may be administered at the end of the case, as monitoring is being removed and the patient is transferred out of the operating theatre.

As described above, the reported mortality from perioperative anaphylaxis is 1.4 to 4.8 per cent, which would suggest that (a) most cases of anaphylaxis will survive and (b) there is still room for improvement. Anaesthetists should continue to be reminded of this potentially fatal complication and should remain vigilant until well after the final potential trigger is administered.

Category 1 to 3 cases

Number of Category 1 to 3 deaths reported

The total number of deaths reported and reviewed by the contributing states and territories for the triennium was **2,393**, of which **164** (7 per cent) were considered wholly or partly related to anaesthetic factors (Categories 1, 2 and 3) (Table 4). Anaesthesia was not considered a contributing factor in 2,204 of the 2,393 deaths (Categories 4, 5 and 6) or 92 per cent of all reports considered (Table 5).

Twenty-five (1 per cent%) of the 2,393 deaths reviewed were classified 'unable to assess' due to inadequate or conflicting data (Categories 7 and 8) (Table 5).

Table 4: Total no. deaths in Australia reviewed by jurisdictional AMCs 2018–2020

Year	NSW	Vic	WA	Tas	SA	Qld	NT	ACT	Total
2018	288	na	78	18	4	455	13	na	856
2019	363	na	84	17	5	349	11	na	829
2020	261	na	70	21	9	338	9	na	708
Total	912	na	232	56	18	1,142	33	na	2,393

Considerable variation exists in the nature of jurisdictional AMCs from which this data is collected. The terms of reference of the committees may differ with mandatory/voluntary reporting and reporting of anaesthetic-only cases versus all perioperative mortality. This will directly affect the total number of cases reviewed, which may explain why similar-sized states (for example, WA and SA) can have such large differences in the numbers of cases reviewed.

Other factors may affect total numbers of cases reviewed, such as the engagement of those providing reports to the AMCs. This will be affected by local factors, such as differing levels of engagement from specialist versus non-specialist anaesthesia providers, or differences in reporting from different sites (for example, major metropolitan hospitals, rural sites, private hospitals or office-based sites). Direct comparisons of the number of reports received in Table 2 should not be used to infer differences in perioperative or anaesthetic-related mortality between regions.

Committee members who sit on the regional committees suggest that most anaesthetic-related deaths occurring in these regions are being reported and considered as Category 1, 2 and 3 cases (see Table 5). Despite this, there is potential for some under estimation particularly in regions with voluntary reporting.

As noted above, individual regions are completely independent and have different ToR. However, the subset of cases of anaesthetic-related mortality is common to all the AMCs. Cases considered by the committees use standard definitions to reduce bias in determining the contribution of anaesthetic practice to individual cases (See Table 1).

Table 5: No. anaesthesia-related deaths in Australia as classified by jurisdictional AMCs 2018–2020

	NSW	Vic	WA	Tas	SA	Qld	NT	ACT	Total
Death attributable to anaesthesia									
Category 1	23	na	3	0	2	2	0	na	30
Category 2	11	na	4	0	1	3	1	na	20
Category 3	105	na	0	1	2	6	0	na	114
Sub Total	139	na	7	1	5	11	1	na	164
Death in which anaesthesia played no part									
Category 4	45	na	8	30	3	258	9	na	353
Category 5	689	na	184	23	9	810	23	na	1,738
Category 6	17	na	32	2	1	61	0	na	113
Subtotal	751	na	224	55	13	1,129	32	na	2,204
Unassessable death									
Category 7	9	na	1	0	0	2	0	na	12
Category 8	13	na	0	0	0	0	0	na	13
Sub-total	22	na	1	0	0	2	0	na	25
Total	**912**	**na**	**232**	**56**	**18**	**1,142**	**33**	**na**	**2,393**

Number of anaesthesia-related deaths relative to the Australian population

Grouping together the total number of anaesthesia-related deaths from all jurisdictions submitting data in the triennium, the overall rate of anaesthesia-related mortality for Australia is 2.96 per annum per million population (Table 6). This is comparable to the same metric observed in the past four triennial reports: 2.79 (2006–08), 3.01 (2009–11) and 2.96 (2012–14) and 3.29 (2015–17).

While it is reassuring that the number of deaths per million population has not changed significantly, there may be other factors involved that may suggest improved or reduced overall safety.

Table 6: No. anaesthesia-related deaths in Australia relative to the population 2018–2020

No. of deaths considered anaesthesia-related	164
National population* (excludes Victoria and ACT)	18.42 million
No. of anaesthesia-related deaths per million population, 2018–2020	8.90
No. of anaesthesia-related deaths per million population per annum	2.96

*Average national population estimate is based on ABS jurisdictional population data (3101.0 Australian Demographic Statistics) for the years 2018 to 2020.

*Average population for each jurisdiction 2018 to 2020: NSW 8,115,000; Qld 5,125,000; SA 1,757,000; WA 2,638,000; TAS 536,000; NT 245, 000.

Table 7: No. anaesthesia-related deaths in Australia 2018–2020 compared to previous trienniums

	2003–05	2006–08	2009–11	2012–14	2015–17	2018–20
NSW	53	92	125	156	151	139
Vic	40	21	18	28	58	-
WA	19	7	11	2	8	7
Tas	na	4	0	3	2	1
SA	na	na	2	4	8	5
NT	na	na	na	na	2	1
Qld	na	na	na	7	10	11
ACT	na	na	na	na	0	-
Total	**112**	**124**	**156**	**200**	**239**	**164**

For the period 2018–2020, excluding the jurisdictions unable to provide data, the total number of anaesthesia-related deaths for the triennium was 164. This is slightly fewer than the previous triennium in which, excluding Victoria and the ACT, there were 181 reported deaths.

Most jurisdictions that provided data reported an overall decline in the number of anaesthesia-related deaths. However, most jurisdictions also showed a small increase in the total number of procedures performed across the triennium despite a likely fall in 2020 with Covid-19 restrictions (see Table 7). Small fluctuations in overall anaesthesia-related mortality occur between triennial reports but it is unclear as to whether these fluctuations represent a meaningful difference.

Table 8: No. anaesthesia-related deaths in Australia relative to national population 2018–20 compared to previous reports*

	2003–05*	2006–08*	2009–11*	2012–14*	2015–17*	2018–2020*
Population (x million)	13.68	14.80	17.30	22.52	24.40	18.40
Number of anaesthesia-related deaths	112	124	156	200	239	164
Anaesthesia-related death rate per million population per triennium	8.19	8.37	9.02	8.88	9.87	8.9
Anaesthesia-related death rate per million population per annum	2.73	2.79	3.01	2.96	3.29	2.96

*Refer to *History of reporting jurisdictions* on p.16 for jurisdictions that contributed data for each triennium.

As previously mentioned, each triennial report has had different combinations of jurisdictions contributing data, with the 2015–2017 report being the most complete. However, the overall rate of anaesthesia-related mortality has remained consistently at 3 per million population per year (+/- 10 per cent).

Number of anaesthetics administered in Australia

As with previous reports, data for the total number of 'episodes of anaesthesia care' (denominator) was obtained from the AIHW. The AIHW receives coding (ICD-10) on all medical procedures, including anaesthetic procedures, from coders at all public and private hospitals across Australia.

Hospital coders may apply more than one anaesthesia item and/or code to a single episode of anaesthesia care. The AIHW applies a hierarchy to the received coding to ensure only one code is counted for each episode. The hierarchy follows the Australian Coding Standards (0031) used by the National Centre for Classification in Health (Appendix B).

Between 1 January 2018 and 31 December 2020, the total number of 'episodes of anaesthesia care' nationally, as per AIHW data, was 10,495,876 for the jurisdictions considered (Table 9; Figure 3).

Table 9: Estimated no. anaesthetics administered in each Australian jurisdiction 2018–2020

	NSW	Vic	WA	Tas	SA	Qld	NT	ACT	Total
Number of Anaesthetic procedures **1 Jan 2018 – 31 Dec 2020**	4,366,550	na	1,595,479	312,802	1,046,090	3,076,543	98,289	na	10,495,876

Figure 3: Estimated no. anaesthetics administered in each Australian jurisdiction 2018–2020 (excl. Vic and ACT)

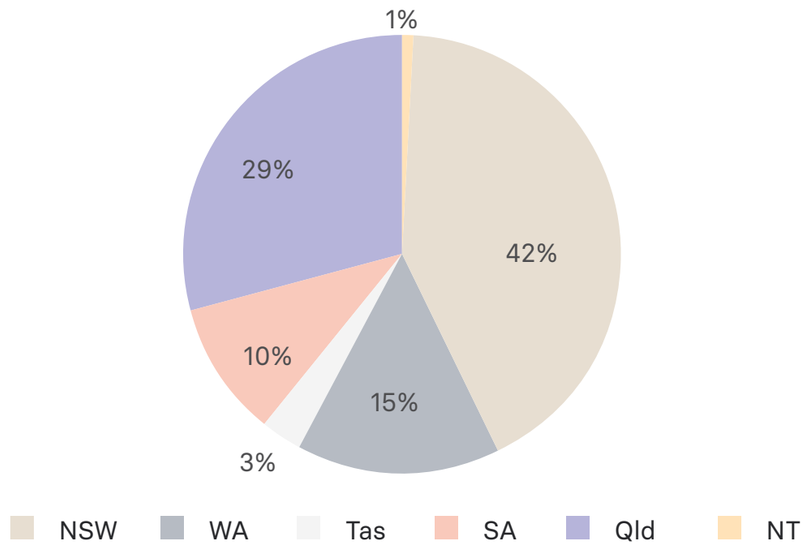


Table 10: No. anaesthesia-related deaths in Australia relative to sum population of Australian jurisdictions that contributed data 2018–2020

Number of deaths considered anaesthesia-related	164
Estimated total number of anaesthetic procedures	10,495,876
Estimated mortality rate in relation to anaesthetic procedures	1:63,999

Along with the growth in population in Australia, the number of episodes of anaesthesia has also grown. Each of the jurisdictions that submitted data had an increased number of anaesthetic procedures performed compared to previous triennia. Table 10 describes the relationship between the number of anaesthetic episodes of care and the number of anaesthetic-related deaths for the 2018–20 triennium. Like previous trienniums, there was considerable variation between regions despite correcting for the number of procedures performed.

Incidence of death in Australia related to anaesthesia

Numerator (number of anaesthesia-related deaths)

To obtain an accurate numerator it is necessary to identify all anaesthesia-related deaths and classify them correctly. As in previous iterations of this report, all participating states and territories had comprehensive procedures in place to assess and record anaesthesia-related mortality. However, there is no way of guaranteeing all anaesthesia-related deaths were reported or classified correctly. On the other hand, all the jurisdictional AMCs felt it was unlikely a large number of cases were missed or classified incorrectly.

The estimated number of deaths is also made less accurate by incomplete data sampling, with not all regions submitting data this triennium. Therefore, the numerator must be considered a best estimate.

Denominator (total number of anaesthesia episodes of care)

The method used to obtain data on the total number of anaesthetic episodes of care was similar to the previous triennium. The denominator is an estimate of the total number of anaesthetic episodes of care reported to the AIHW. While hospitals used robust reporting and ICD-10 coding processes to identify and collect data about the number of anaesthetic episodes of care, there is always the possibility that a small number of anaesthesia episodes of care received incorrect or incomplete coding. Despite this, the proportion of such cases can reasonably be considered so low that the denominator can confidently be considered highly representative of the actual number of anaesthetic episodes of care for the triennium.

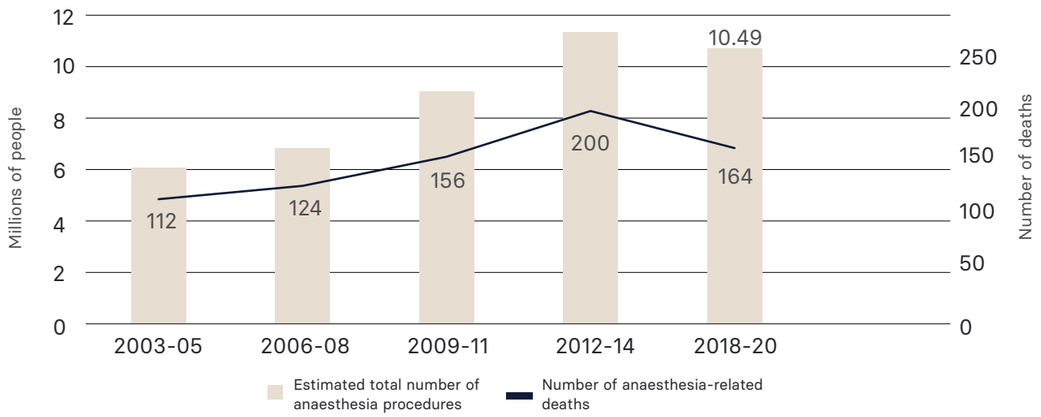
Anaesthesia-related mortality rate

The estimated anaesthesia-related mortality for the six jurisdictions was **1:63.999** procedures (Table 10). This is slightly lower than the estimated anaesthesia-related mortality rate outlined in the previous five triennial reports (Table 11). The reliability of data collection (outlined above) should be considered when interpreting this result.

Table 11: Estimated no. anaesthesia-related deaths in Australia relative to number of procedures 2018–2020 compared to previous trienniums

	2003–05	2006–08	2009-–11	2012–14	2015–17	2018–20
Estimated total number of anaesthesia procedures (x million)	5.98	6.88	9.05	11.40	13.65	10.5
Number of anaesthesia-related deaths	112	124	156	200	239	164
Anaesthesia-related death rate	1:53,426	1:55,490	1:58,039	1:57,023	1:57,125	1:63,999

Figure 4: Estimated no. anaesthesia-related deaths in Australia relative to no. procedures 2018–2020 compared to previous trienniums *



*Unavoidable variation has occurred in the number of jurisdictions that have contributed data for each triennial report. Refer to *History of reporting jurisdictions timeline* on p.16 for the jurisdictions that contributed data for each triennium.

Since 2003, the number of anaesthetic procedures has increased year on year. Due to the omission of Victoria and ACT, this triennium had a reduction in the total number performed. Each region had increased the total number of procedures performed compared with previous trienniums, however.

The number of anaesthetic procedures performed per death reported also increased this triennium. Again, caution should be used in the interpretation of this number due to the potential for incomplete data collection, but the trend towards gradual improvement appears promising.

Figure 4 shows the relationship between the recorded number of anaesthesia-related deaths and the total number of anaesthetic procedures among the contributing jurisdictions to the reports since the 2003–05 triennium. The frequency of Category 1–3 deaths for Australia at 1 per 63,999 procedures performed in this triennium suggests some improvement from previous reports.

As mentioned earlier, each triennium has variability in the jurisdictions that can contribute data. Despite the limitation of neither Victoria nor the ACT being able to contribute data for this report, we are confident reasonable data was received for the triennium to enable the identification of trends in anaesthesia-related deaths.

Level of risk

The ASA-physical status classification was assigned to each reported anaesthesia-related death. The current classification system, which has 5 grades and has been used since 2014, can be found at Appendix C.

The ASA-physical status classification is a tool used globally by anaesthetists to easily grade, analyse and record and a patient's overall preoperative health status to help determine their ability to withstand surgery. While the classification system alone does not predict the perioperative risks, it helps to do so when used in combination with other factors (for example, type of surgery, frailty).

Table 12: No. anaesthesia-related deaths in Australia as reported against ASA-physical status 2018–2020

ASA-physical status	NSW	Vic	WA	Tas	SA	Qld	NT	ACT	Total
1	1	na	0	0	0	0	0	na	**1**
2	6	na	0	0	0	0	0	na	**6**
3	41	na	4	0	4	6	1	na	**56**
4	87	na	2	1	1	5	0	na	**96**
5	4	na	1	0	0	0	0	na	**5**
Total	**139**	**na**	**7**	**1**	**5**	**11**	**1**	**na**	**164**

As with previous reports, most deaths reported in which anaesthesia may have contributed occurred in ASA-physical status 3 and 4 cases (93 per cent of all reported cases) (Table 12). However, most procedures performed over this period were undertaken on ASA-physical status 1 and 2 patients (AIHW data). The risk of a patient dying from anaesthesia-related causes increases with an increasing ASA-physical status classification.

Very few procedures are performed upon patients deemed ASA-physical status 5 (that is, unlikely to survive more than 24 hours, despite surgery), so the number of deaths of patients with this classification is an unreliable indicator of safety in anaesthesia. That patients with the most severe underlying disease remain at the highest risk of anaesthesia-related death is unsurprising.

Incidence of death in patients considered good or fair risk

Table 13: Incidence of anaesthesia-related deaths in Australia in patients considered good or fair risk 2018–20 compared to previous reports

Triennium	Number of ASA Physical Status 1–2 patients	Total number of category 1–3 deaths	Percentage of deaths considered at good or fair risk
2003–05	18	112	16%
2006–08	17	124	14%
2009–11	11	156	7%
2012–14	14	200	7%
2015–17	18	239	8%
2018–2020	7	164	4%

Patients at low risk (ASA-physical status 1 or 2) make up a small number of the overall anaesthesia-related deaths. At 4 per cent in this triennium, this proportion has been trending down over two decades, having fallen from a high of 16 per cent in 2003–05 (Table 13). This may be due to proportionally more procedures being performed in higher risk patients, the reasons for which are unclear.

Causal or contributory factors in anaesthesia-related deaths

The most likely causal or contributory factors in the anaesthetic-related deaths, as per the classification assigned by the jurisdictional committees, are summarised in Table 14.

Table 14: Causal/contributory factors in anaesthesia-related deaths in Australia 2018–2020

	TOTAL
Preoperative	
Assessment	17
Management	1
Total	18
Anaesthesia technique	
Choice or application	5
Airway maintenance	28
Ventilation	2
Circulatory support	1
Total	36
Anaesthesia drugs	
Selection	1
Dosage	7
Adverse event	9
Incomplete reversal	0
Inadequate recovery	0
Total	17
Anaesthesia management	
Crisis management	0
Inadequate monitoring	6
Equipment failure	0
Inadequate resuscitation	2
Hypothermia	0
Total	8
Postoperative	
Management	2
Supervision	0
Inadequate resuscitation	0
Total	2
Organisational	
Inadequate supervision or assistance	2
Poor organisation	3
Poor planning	6
Total	11
Total contributory factors	92
No Correctable Factor	111
Medical Condition of the Patient a Significant Factor	141

This triennium, the main factors that were causal or contributory factors in anaesthesia-related deaths were preoperative assessment, airway maintenance and the underlying medical condition of the patient. Compared with the last triennial report, there has been a reduction in causal factors in preoperative management, anaesthesia drugs, anaesthesia management and postoperative care.

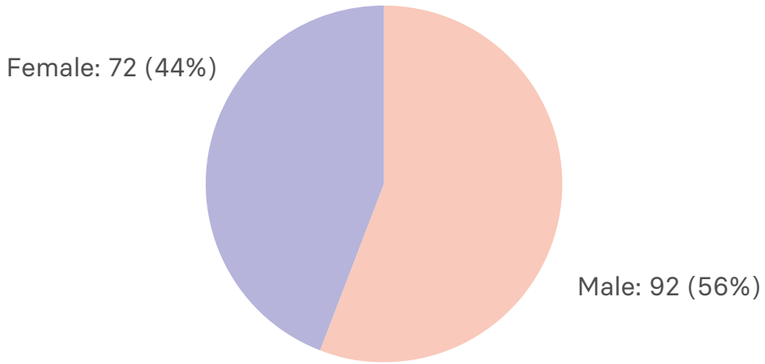
The medical condition of the patient is a major contributor to anaesthesia-related mortality. In this report, it appears to have plateaued at 86 per cent of deaths (compared to 89 per cent in 2015–18, 86 per cent in 2012–14 and 81 percent in 2009–11), having been much lower in earlier reports (28 percent in 2000–02).

In previous Safety of Anaesthesia reports, the marked increase in the lead up to 2010 in the medical condition of the patient being a contributor to anaesthesia-related mortality has been attributed to an expansion in the scope of surgery to include cases with more medical illness overall. In earlier decades, such patients might not have been considered surgical candidates. As the proportion of these patients is essentially unchanged over the last 10 years, there appears little to indicate a more recent change in practice.

The proportion of cases where there has been no correctable causal factor identified continues to increase. In this report, 68 per cent of anaesthesia-related deaths were deemed to have occurred in circumstances where it was believed the anaesthetist could not have done anything to prevent the outcome, compared with 61 per cent in 2015–18 and 57 per cent in 2012–14.

Sex

Figure 5: Sex distribution in anaesthesia-related deaths in Australia 2018–2020



Of the 164 anaesthesia-related deaths for the triennium, 92 (56 per cent) were men and 72 (44 per cent) were women (Table 15). In the previous triennium, 56 per cent were women. Similar variations were seen over previous years, suggesting sex is likely to be of little significance.

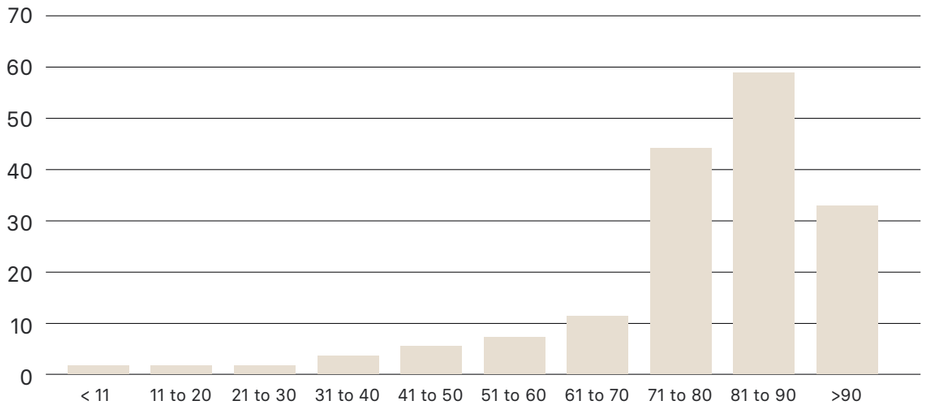
Age

Of the 164 reported anaesthesia-related deaths, 12 per cent (19/164) related to persons 60 years or under, with 3 per cent (5/164) attributed to persons aged 40 years or under (Figure 5).

The number of deaths reported increased with advancing age. Patients older than 71 years accounted for 82 per cent (114/164) of all deaths, with most deaths (36 per cent; 59/164) occurring in the 81–90 years age bracket.

Several factors may explain why more deaths were reported in older patients, including (but not limited to) more procedures and more emergency procedures typically occurring in older patients. Significant factors include that older patients are more likely to have concurrent medical illnesses and are increasingly being offered surgery as overall safety improves.

Figure 6: Age distribution of anaesthesia-related deaths in Australia 2018–2020

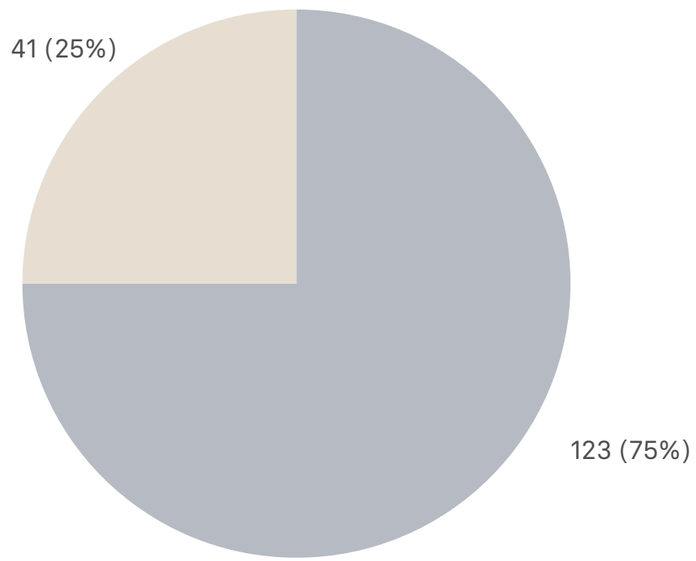


Degree of urgency of surgery

Of the 164 reported anaesthesia-related deaths, based on admission status, 75 per cent (123/164) related to emergency surgery cases and 25 per cent (41/164) related to elective cases (Figure 6). This continues the trend from previous years, in which the less frequently performed emergency surgeries made up a much higher proportion of overall anaesthesia-related deaths. The proportion is similar to recent triennial reports, with 72 per cent in 2015–17, 73 per cent in 2012-14 and 70 per cent in 2009–11.

This information is even more significant when considered in the context of how little emergency surgery is performed compared with elective cases. The proportion of cases coded as ‘emergency’ (compared with ‘non-emergency’) in the 2015–18 triennium was 8 per cent of the total.

Figure 7: Degree of procedural urgency for anaesthesia-related deaths in Australia 2018–2020



Emergency surgery remains a likely risk factor for anaesthesia-related deaths. Elective surgery allows patients and medical staff to carefully consider and plan their procedure, having weighed up the risks and come to a decision together. Conditions requiring emergency surgery, by their very nature, have limited opportunity to plan and tend to balance the risk from performing the procedure with the risk from delaying it.

As stated in the previous report, anaesthetists must continue to be involved in full discussion of the risks of emergency surgery with the patients, families and carers to ensure properly informed consent and end-of-life planning. Advanced care directives should be considered and discussed at this time if the patient has one. Such conversations should be held with the input of surgeons, anaesthetists and other specialists, as needed, to satisfy full understanding of the risks to the patient.

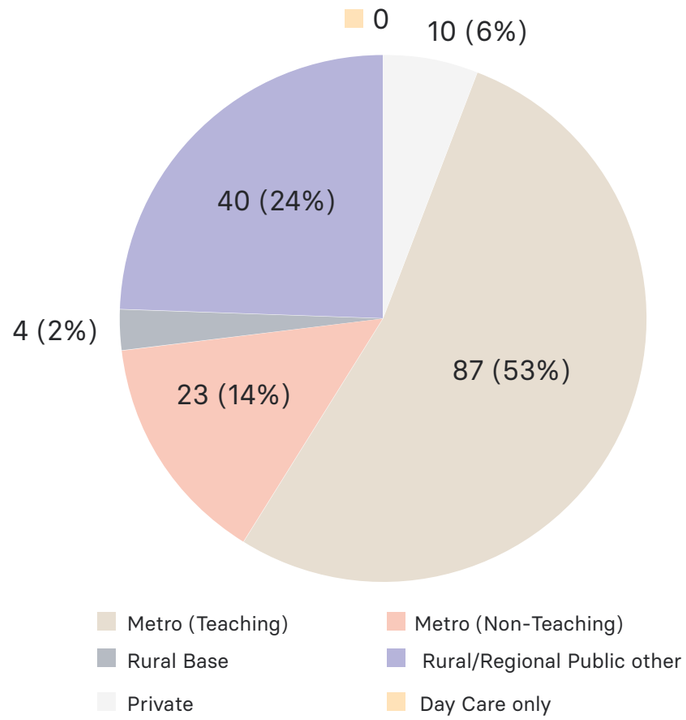
Type of Health Care Facility (HCF)

Of the 164 anaesthesia-related deaths, 67 per cent (110) occurred in metropolitan hospitals, and the majority (53 per cent) of these were in teaching hospitals (Figure 7). Twenty-seven per cent (44) occurred in rurally located hospitals and 6 per cent (10) occurred in private hospitals.

Although the classification of hospitals differs between regions, most deaths occurred in metropolitan teaching hospitals or rural/regional hospitals (77 per cent overall). Most emergency operations occur in teaching hospitals or rural centres, and the metropolitan teaching hospitals are usually the referral centres for higher risk surgical patients to undergo their procedures.

The nature of different types of HCF has changed over the years. Many do not fit neatly into the descriptors listed here. The definitions of the different health care facilities will be revisited in future reports.

Figure 8: Type of HCF in which anaesthesia-related deaths occurred in Australia 2018–2020*



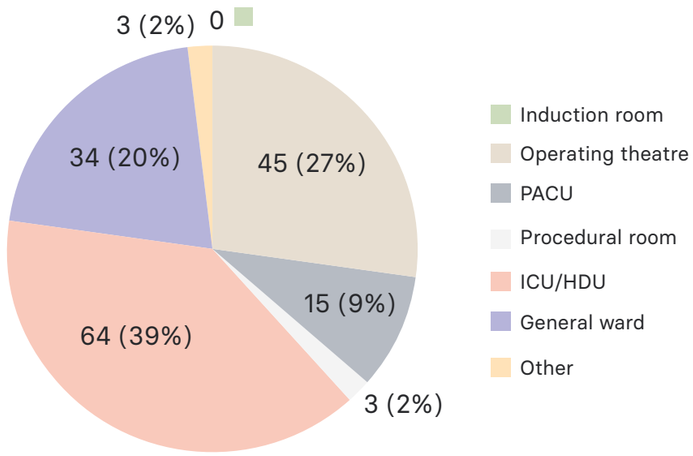
*Values may not add to 100% due to rounding.

Location of event leading to death

The location of the event leading to death, as documented in the triennial reports, is not necessarily in the operating theatre or induction room. Almost 59 per cent of deaths occurred in HDU/ICU or ward settings (Figure 8). This is similar to the previous report in which 50 per cent occurred in ICU/HDU or a ward, and markedly different to the 2014–2017 triennial report in which 94 per cent occurred in the induction room, procedure room, theatre or PACU.

This data point will be reviewed to investigate why there is such a change from previous reports. It appears some jurisdictions may not discriminate between the 'location of event leading to death' and the 'location of death' (which would underestimate events in the operating theatre). Furthermore, a number of these case examples may indicate that the decision to operate could be the event that led to the patient's death in spite of technically excellent provision of anaesthesia and surgery. The location of such events may occur outside the operating theatre.

Figure 9: Location of event leading to anaesthesia-related deaths in Australian HCFs 2018–2020*

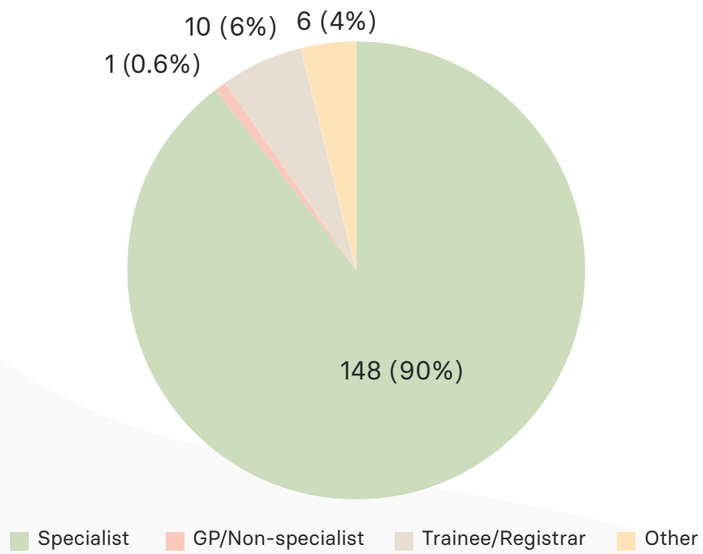


*Values may not add to 100% due to rounding.

Grade of anaesthetist

Ninety per cent of cases reported had specialist anaesthetists involved in their care (90 per cent in 2015–17), while only 6 per cent were managed by trainee anaesthetists or registrars without direct supervision (5 per cent in 2012–14) (Figure 9). This suggests trainees are being supervised by specialists for the higher risk and emergency cases, as would be hoped when carefully managing risk.

Figure 10: Grade of anaesthetist involved in anaesthesia-related deaths in Australia 2018–2020*



*Values may not add to 100% due to rounding.

Type of surgery or procedure

The procedures most likely to be associated with anaesthetic-related mortality were orthopaedic (54 per cent of the total for this triennium). This is consistent with the previous reports. Endoscopic procedures made up a further 11 per cent (increased from 9.6 per cent in 2015–17 and 6.5 per cent in 2012–14), followed by abdominal (13 per cent), cardiothoracic (9 per cent), urological (5 per cent) and vascular surgery (4 per cent) (Table 15).

The increase in anaesthesia-related mortality associated with endoscopic procedures may reflect a general increase in the number of these procedures being performed. Other factors may be that more emergency endoscopy procedures are being performed or that the procedures are being performed on older patients with more comorbidities.

Although the total number of cardiology deaths is small (2 per cent of all anaesthesia-related deaths), this is an area to watch in upcoming reports as procedural cardiology increasingly involves more complex procedures on older patients with higher risk.

The type of procedure should not affect anaesthesia-related mortality *per se*, but the surgical subspecialties listed are more likely than others to present patients with life-threatening emergencies – particularly vascular, cardiothoracic and abdominal surgery – or high-risk patients for urgent surgery (e.g. orthopaedic patients with hip fractures).

Table 15: Type of surgery/procedures associated with anaesthesia-related deaths in Australia 2018–2020

Surgical Categories	Total
Abdominal	21
Cardiothoracic	14
ENT & Head/Neck	1
General (non-abdominal)	1
Gynaecological	3
Maxillofacial	0
Neurosurgery	1
Obstetrics	0
Ophthalmological	0
Orthopaedic	88
Renal	0
Urological	7
Vascular	6
Procedural categories	
Cardiology	3
Endoscopy	18
Radiology	0
Miscellaneous	
Electroconvulsive Therapy	0
Invasive Monitoring	0
Pain Management	0
Resuscitation	0
Other	1
Total	164

Jurisdictional information

All Australian jurisdictions now have data collection and analysis methodologies for anaesthesia-attributable and anaesthesia-related deaths that, subject to local circumstances, provide them with the potential to contribute to the triennial reports.

Owing to differences between New Zealand and federated Australian legislation, variation exists in the data collection and analysis processes between all jurisdictions. Appendix D summarises key legislation similarities and differences between Australian jurisdictions that affect the collection of anaesthesia-related mortality data.

Larger jurisdictions have established independent committees to lead data collection methodologies for anaesthesia-related deaths; jurisdictions with smaller populations are more likely to have collaborative arrangements with the RACS Audit of Surgical Mortality.

Several jurisdictions mandate reporting and some also have a mandated timeframe in which to do so, which ranges widely from, for example, 24 hours in Victoria to within 30 days in Tasmania.

Even jurisdictions in which the reporting of deaths is technically voluntary may be rendered mandatory by hospital credentialing processes for anaesthetists. Similarly, while participation by anaesthetists in audits of anaesthesia-related deaths is also technically voluntary in some jurisdictions, by virtue of credentialling requirements, participation may be rendered mandatory, for example, Tasmania.

Committee

The New Zealand Perioperative Mortality Review Committee (POMRC)

The New Zealand Perioperative Review of death after surgery follows a different model to Australia for assessing cause and quantification of cause. The New Zealand assessment involves the whole period to 30 days after a surgical procedure involving general or major regional anesthesia. As the model involves assessment across the whole country, the dataset covers any death, including a transfer between different hospitals, or to the community after an intervention (post discharge).

The assessment is aided by all New Zealand patients having a unique identifier (the NHI), independent of hospital or health care provider. All data is collected within an ICD-12 AM coding structure to a National Minimum dataset, which is provided to the POMRC. Assessment of deaths can, therefore, be undertaken by hospital or region, or by operation or categories of operation, analysed longitudinally and presented as a dashboard of death. This allows trends and movements outside 95 per cent confidence interval limits to be recognised and investigated in greater detail.

In the 2019 period, the POMRC undertook an analysis of mortality after acute laparotomy in New Zealand using the dataset as described above. The investigation focused on the differential outcomes of Māori and non-Māori in post-operative mortality.

Every year in Aotearoa New Zealand, more than 5600 people are admitted to hospital for an emergency laparotomy. The POMRC found that, out of those admitted for emergency laparotomy, the incidence is 40.2 per cent higher in Māori than non-Māori and evidence shows the gap is widening. In reviewing emergency laparotomy cases, the POMRC found that, compared with non-Māori, Māori:

- Are younger.
- Reside in the most deprived neighbourhoods.
- Have more emergency laparotomies.
- Present to the emergency department more often.
- Have a higher burden of comorbidities, especially diabetes and smoking.
- Have higher severity of disease.
- Have a higher risk of complications following emergency laparotomy surgery.
- Have a higher mortality rate.
- Have a lower rate of colorectal cancer at the time of laparotomy but are less likely to have localised cancer.
- Have some differences in the indications for laparotomy and procedures performed.

Large differences in socioeconomic deprivation and age at procedure between Māori and non-Māori reflect inequities in exposures and life opportunities that impact Māori health.

The take-home message for the POMRC's eighth report is that health equity gaps exist within our surgical systems between Māori and non-Māori. This is a timely finding given the Commission's recent report titled *A window on the quality of Aotearoa New Zealand's health care 2019: A view on Māori health equity*, which highlights several areas where change is needed in the health system.

In the following year a review of the POMRC was undertaken to align it better with the other Mortality Review Committees. This continues in 2024 and the future reporting of the POMRC is currently on hold awaiting a decision on health priorities.

Dr Kerry Gunn FANZCA
Perioperative Mortality Review Committee

Australian Capital Territory

Committee

Australian Capital Territory Audit of Anaesthesia Mortality (ACTAAM)

2018–2020 Developments/issues

No data was available for the 2018–2020 triennial report owing to resource limitations.

History

The ACTAAM data review began in February 2014. Anaesthesia audits are conducted alongside the ACT Audit of Surgical Mortality (ACTASM), which began in October 2010 and involve most surgical craft groups.

RACS and ACT Health jointly fund the ACTASM Project Manager position.

ACTASM and ANZCA collaborate in the collection of anaesthetic-related surgical mortality.

Reporting and review of anaesthesia-related deaths

While participation in ACTASM is mandatory for surgeons, for anaesthetists it is voluntary. The number of anaesthetists who have agreed to participate is about 50 per cent.

All deaths associated with a surgical procedure must be reported within 30 days by the hospital to the ACTASM Project Manager. Surgeons, or their registrar delegates, complete the Surgical Case Form wherein the surgeon may indicate if anaesthetic considerations need to be addressed. Anaesthetists may also self-report. When anaesthesia is a possible component of a patient's death, the treating anaesthetist must complete an anaesthetic case form.

First-line assessment of the de-identified Anaesthetic Case Form occurs by the anaesthetic representative on the ACTASM Committee or another local fellow who has volunteered to be an assessor.

If concern exists about local first-line assessment, then the anaesthetic representative on ACTASM and the chairs (or their nominee) of the ANZCA Regional Committees and the Australian Society of Anaesthetists (ASA) will decide on whether external review is appropriate.

Second-line assessment of the patients' notes occurs by assessors from other states with reciprocal assessment by ACT Fellows, as requested.

Legislative protection

Information collected by ACTASM is protected by Commonwealth privilege under part VC of the *Health Insurance Act 1973* and may only be used for quality assurance purposes.

Dr Carmel McInerney, FANZCA
Co-ordinator ACT Audit of Anaesthesia Mortality

New South Wales

Committee

NSW Special Committee Investigating Deaths Under Anaesthesia (SCIDUA)

Overview

The NSW SCIUDA is an expert committee established under Section 20 of the *Health Administration Act 1982*. Established in 1960, SCIDUA is the longest serving committee of its kind in the world and has contributed to the impressive reduction in mortality attributable to anaesthesia in Australia.

SCIUDA's terms of reference include all deaths occurring while under, as a result of, or within 24 hours after the administration of anaesthesia or sedation, to peer review so as to identify any areas of clinical management where other methods may have led to a more favourable result. Deaths are notified by public and private hospitals and self-notified by medical practitioners.

From 1 September 2012, SCIUDA began examining sedation-related deaths in NSW. The committee also contributed to the development of the NSW Health Education and Training Institute eLearning module for NSW Health Nursing Staff, *Procedural Conscious Sedation*. The module explores the three standards that support high-quality care for patients receiving procedural sedation.

Committee composition

The members of SCIDUA are practicing anaesthetists from a broad range of clinical settings, appointed by the Secretary, NSW Health, under delegation by the Minister for Health. Committee members are appointed for a fixed term of five years, at the end of which, eligible members may be reappointed for a further term. The Clinical Excellence Commission (CEC) provides administrative support to SCIDUA, with the chief executive attending meetings in an observer capacity.

Purpose and function

The NSW *Public Health Act 2010* requires health practitioners responsible for the administration of the anaesthetic or sedative drug, where a patient died while under, or as a result of, or within 24 hours after the administration of, an anaesthetic or sedative drug, for a medical, surgical or dental operation or procedure, to report the death to the secretary, NSW Health.

SCIDUA is the regulatory body responsible for investigating these deaths and undertakes to:

- Register, investigate and classify deaths occurring during or within 24 hours of a procedure performed under anaesthesia or sedation.
- Examine information acquired and identify any issues of management which were instrumental in the patient's death.
- Report the committee's findings confidentially to the medical practitioner/s involved in the patient's care.
- Report annually to the Minister for Health, drawing attention to any matters that require action to improve the safety of anaesthesia and sedation in NSW.
- Acquaint the medical profession in general, and anaesthetists in particular, with any matters to which special attention needs to be paid to ensure the safety of anaesthesia and sedation.
- Make available the expertise of its members to the CEC in pursuit of systemic improvements to patient care in the fields of anaesthesia and sedation.

Reporting and review of anaesthesia-related deaths

Anaesthesia-related deaths should be reported to SCIDUA using the fillable PDF (available online under the "Reporting of deaths" subheading) and email to:

CEC-SCIDUA@health.nsw.gov.au

https://www.cec.health.nsw.gov.au/Review-incidents/mortality-review-authorised-committees/scidua

All reported deaths are individually reviewed by the two-member triage sub-committee, who will classify the death or request further information from the reporting health practitioner.

Once the deaths are triaged, the chair reviews the outcomes of the cases. All anaesthesia-related deaths are discussed at the next SCIDUA committee meeting and classified using the nationally recognised Anaesthetic Mortality Classification system.

A confidential reply by the chair is then emailed to the health practitioner conveying suggestions the committee may have raised for improving outcomes, techniques or approaches (correctable factors) in each particular clinical situation.

The committee reports annually to the Minister for Health on the results of its deliberations and provides aggregate data to the National Committee on Anaesthetic Mortality, triennially.

Legislative protection

All of the committee's proceedings, documents and correspondence are considered as specially privileged information and protected under Section 23 of the *Health Administration Act 1982*.

All communications between the reporting medical practitioner and the committee are strictly confidential.

Annual reports

The SCIDUA 2021 Report is available at:

https://www.cec.health.nsw.gov.au/Review-incidents/mortality-review-authorised-committees/scidua/reporting-and-publications

Dr Carl De Souza FANZCA
Chair, SCIDUA in NSW

Northern Territory

Committee

Northern Territory Audit of Anaesthesia Mortality (NTAAM)

Overview

In 2016, the Northern Territory (NT) began contributing data to the anaesthesia-related deaths mortality report. This is the first triennium for which the NTAAM has provided three complete years of data.

Committee composition

The NTAAM is conducted alongside the NT Audit of Surgical Mortality (NTASM). RACS and the NT Health Service jointly fund a NTASM Surgical Audit Officer and a Perioperative Clinical Audit and Quality Manager.

Reporting and review of anaesthesia-related deaths

Participation in NTASM is mandatory for surgeons. While involvement by anaesthetists is voluntary, most anaesthetists at the five NT hospitals – Royal Darwin Hospital, Darwin Private Hospital, Alice Springs Hospital, Gove District Hospital and Katherine District Hospital – have signed the participation form. The 35 anaesthetists in the Northern Territory participated in the audit for a total population of 245,000.

All deaths related to a surgical procedure, including those that occur within 48 hours of the procedure, are reported to the NTASM Project Manager. Surgeons, or their registrar delegates, complete the Surgical Case Form wherein the surgeon may indicate if there are anaesthetic considerations to be addressed. Anaesthetists may also self-report, which anticipates that other areas where anaesthesia services are provided will participate.

As the NT is a small jurisdiction, to maintain impartiality, all first-line assessment of the de-identified Anaesthetic Case Forms are passed via the NTASM Project Officer to the Tasmanian Audit of Surgical Mortality (TASM). TASM then tasks a local fellow, who has volunteered, to be an assessor.

NT anaesthetists have volunteered to be first line assessors for TASM.

Second-line assessment of NT patient notes occurs by assessors from Tasmania with reciprocal assessment of Tasmanian patient notes by NT fellows, as requested.

TASM has agreed to collate NT de-identified data for the ANZCA triennium reports.

Legislative protection

Information collected by NTASM is protected by Commonwealth privilege under part VC of the *Health Insurance Act 1973* and may only be used for quality assurance purposes.

Dr Phil Blum, FANZCA
Co-ordinator NTAAM

Queensland

Committee

Queensland Perioperative and Periprocedural Anaesthetic Mortality Review Committee (QPPARMC)

History

On 21 May 2012, the QPPAMRC was established as a Quality Assurance Committee (QAC) following a request from the Statewide Anaesthesia and Perioperative Care Clinical Network (SWAPNET). The QPPAMRC is sponsored by the Clinical Excellence Division, Department of Health.

Objectives

QPPAMRC was established to:

a. Collect and analyse clinical information regarding perioperative and periprocedural anaesthetic mortality in Queensland to identify statewide specific trends.

b. Make recommendations to the Minister for Health on standards and quality indicators for perioperative and periprocedural anaesthetic clinical care to enable health providers in Queensland to improve safety and quality.

c. Assist with the adoption of such standards in both public and private sectors.

Composition

Position	Nominated by
Senior Specialist Anaesthetist (Chair)	Queensland Health
Specialist Anaesthetist	Australian and New Zealand College of Anaesthetists (Qld branch)
Specialist Anaesthetist	ASA
Specialist Anaesthetist	Australian Medical Association (AMA)
Specialist Anaesthetist	Private Hospitals Association
Chair or nominated delegate	SWAPNET
GP Rural Generalist / specialist anaesthetist	SWAPNET
Specialist Surgeon	RACS (Qld branch)
Trauma Surgeon	Faculty of Medicine, University of Queensland
Anaesthetic Assistant (technician or nurse)	Statewide Anaesthesia and Perioperative Care Clinical Network
Forensic Pathologist	Royal College of Pathologists of Australasia

Legislation

The QPPAMRC is a QAC established under Part 6, Division 1 of the *Hospital and Health Boards Act 2011* (the Act). The purpose of the Division is to improve the safety and quality of health services by providing protections for quality assurance committees established under the Act.

The QPPAMRC privacy policy guides QPPAMRC activity and ensures that the:

QPPAMRC operates in accordance with sections 81–92 of the Act.

Information held by the QPPAMRC is managed in accordance with the Act and, where relevant, the *Information Privacy Act 2009*.

QPPAMRC members and relevant personnel are aware of their responsibilities in relation to privacy and confidentiality.

Dr James Troup FANZCA
Chair, QPPAMRC

South Australia

Committee

South Australian Anaesthetic Mortality Committee (SAAMC)

Overview

The SAAMC was re-established in 2010 after several years' hiatus in the mid-2000s. The committee's role is to review anaesthesia-related patient mortality from health services in SA with the intention of improving the quality of care provided by anaesthesia. SAAMC receives voluntary reports primarily from anaesthetists, but also from those performing the procedures. Engagement with the anaesthesia community in SA peaked in the 2015-17 triennium, falling again in 2018-20. Efforts to improve voluntary reporting are ramping up again post-COVID.

Committee composition

In 2018, membership of the SAAMC consisted of the following:

Three nominations each from:

- ANZCA
- ASA.

One nomination each from:

- South Australian Department of Health and Ageing
- College of Intensive Care Medicine
- RACS
- Australian College of Perioperative Nurses (ACORN)
- Australian College of Rural and Remote Medicine.

Reporting and review of anaesthesia-related deaths

Reports to the SAAMC are voluntary. Most reports are received from the anaesthetist involved with the case, with a few reports received from the surgeon or proceduralist. SAAMC encourages reporting of deaths within 48 hours of an anaesthetic, or perioperative deaths in which complications related to the anaesthesia may have contributed. Cases are de-identified and reviewed by the committee based upon information provided in the confidential reports and classified according to the standard.

Feedback is provided to the individual reporting the case through a confidential letter from the chair. We do not have a method to verify whether all anaesthesia-related deaths are reported to the committee but are confident that a representative sample of the cases within SA is contained in the data. We are confident that other reporting sources, such as the South Australian Audit of Surgical Mortality, are also reviewing similar perioperative mortality, such that major cases are not overlooked.

Legislative protection

SAAMC has qualified privilege under part 7 of the *Health Care Act 2008*.

Dr Simon Jenkins FANZCA
Chair, SAAMC

Tasmania

Committee

Tasmanian Audit of Anaesthesia Mortality (TAAM).

History, purpose and function.

Since 2008–09, mortality data in Tasmania has been collected and reviewed by the TAAM, which is run under the auspices of the Management Committee of the Tasmanian Audit of Surgical Mortality (TASM), established in 2003.

The RACS conducts the TASM and TAAM under its commitment to ensuring the highest standard of safe and comprehensive surgical care through excellence in surgical education, training, professional development, and support.

TASM supports the peer review process undertaken for mortality review of surgical cases in Tasmanian public and private hospitals**.**

TAAM functions in conjunction with TASM for several reasons, including:

- Sharing of resources: i.e. staff, office space, consumables and software.
- Approval for funding from the Tasmanian Government for a joint surgical-anaesthesia audit was easier to secure – funding was already in place for the surgical audit and, in comparison, the anaesthesia audit is small (the start-up costs for the surgical audit were met by RACS.
- Ease of identifying cases – the surgical audit office is notified of all deaths occurring in Tasmania within 30 days of a surgical procedure. As such, the capture rate for post-surgical deaths is high.

Committee composition

The TASM and TAAM audit is co-ordinated by a Management Committee consisting of representatives from the:

- Tasmanian Department of Health
- Tasmanian Health Service regions (North-West, North, and South)
- ANZCA
- Royal Australian and New Zealand College of Obstetricians and Gynaecologists (RANZCOG)
- RACS.

Reporting and review of anaesthesia-related deaths

Participation in a mortality audit is a requirement of the state government for all medical practitioners employed in the public sector and in most private hospitals. All anaesthetists in Tasmania are now aware of and happy to participate in the audit. The review process is based on a first-line assessment of the initial de-identified reporting proforma by a volunteer assessor. If case note review is requested by the first-line assessor, it will be performed by a second-line assessor.

The system works particularly well in a small population because it:

- Allows greater engagement of Fellows in the audit process.
- Encourages wider participation and awareness of the audit.
- Ensures anonymity is maintained.
- Allows fellows to gain CPD points for the case reviews.
- Facilitates more timely feedback than having a small committee reviewing all cases at intervals during the year.

TASM Terms of reference (Approved September 2016)

Determine a response to any serious issues identified relating to inappropriate or inadequate practise, or to indications of major system issues.

Analyse adverse event information from surgical care with the objective of recommending quality improvement initiatives.

Assist in formulating action areas to prevent or reduce the likelihood of severity future adverse events in surgical and anaesthetic care.

Promote systemic improvements in the safety and quality of health care in the Tasmanian health system both in hospitals and other health care settings.

Review recommendations and actions taken to respond to relevant safety and quality issues as identified and disseminate recommendations to health services state-wide.

Support and promote the need for a peer review process of surgical mortality cases.

TASM Safety and Quality Committee terms of reference

To provide leadership and strategic direction for the development and implementation of the Tasmanian Audit of Surgical Mortality (TASM).

To participate in a cross-jurisdictional/national perioperative mortality audit process to establish standardised reporting protocols and analytical methodology for comparison of surgical and anaesthesia mortality among the states and territories in Australia.

To promote the use of the independent audit of surgical and anaesthesia mortality among all Tasmanian surgeons and anaesthetists.

To compare surgical and anaesthesia mortality outcomes in Tasmania with other Australian states and territories and with international standards.

In collaboration with the cross-jurisdictional/national project, to develop best practice standards and guidelines for surgical and anaesthetic practice in hospitals based on scientific knowledge of clinical efficacy.

To assist in the wide dissemination of best practice standards and guidelines for surgical and anaesthetic practice in hospitals, as provided by the cross-jurisdictional/national body.

To provide direction and support for first level evaluations of perioperative mortality reported on a voluntary basis by participating surgeons and anaesthetists.

To co-ordinate the transfer of de-identified information (case notes) to the cross-jurisdictional/national body for surgical and anaesthetic mortality data evaluated as warranting second level audit.

To analyse and review data obtained in relation to the safety and quality of services with the objective of recommending quality improvement initiatives for surgical and anaesthetic care.

To promote systemic improvements in the safety and quality of healthcare in the Tasmanian health system both in hospitals and other healthcare settings.

To publish journal articles, educate surgeons and anaesthetists, and/or provide information to the general public deemed appropriate by the committee, in each case using de-identified data.

To communicate as may be necessary or appropriate with any other committee declared by the minister under section 4(1) of the Health Act, 1997, to be a quality assurance committee for the purposes of that act in relation to any matter, which falls within the functions of either committee.

To report in accordance with the above terms of reference.

Legislative protection

Information collected by TASM is protected by Commonwealth Privilege under part VC of the Health Insurance Act 1973 (Cth) and may only be used for quality assurance purposes. The information is also protected from disclosure to any person outside the Management Committee by Tasmanian Government qualified privilege under the section four of the Health Act 1997 (Tas).

Under the Coroner's Act 1995 (Tas), a reportable death is defined as a death that occurs during a medical procedure, or after a medical procedure where the death may be causally related to that procedure, and a medical practitioner would not, immediately before the procedure was undertaken, have reasonably expected the death.

Dr Margaret Walker FANZCA
Coordinator, TAAM of the TASM

Victoria

Committee

Victorian Perioperative Consultative Council (VPCC)

VPCC is a legislated, independent and multidisciplinary body within the Department of Health, the role of which is to identify and review cases relating to perioperative morbidity and mortality in Victoria to detect patterns of preventable harm. The VPCC makes recommendations and reports to health care organisations, professional bodies, the Victorian Department of Health and the Minister of Health.

Committee objectives

VPCC objectives are to:

- Conduct study, research and analysis into the incidence and causes of perioperative mortality and morbidity in Victoria where perioperative mortality and morbidity means adverse events (including death) that may occur immediately prior to, during or immediately after surgery.
- Conduct study, research and interpret information on and in relation to perioperative care in Victoria to improve outcomes for patients before, during and after surgery. This includes providing information to the Secretary and on the requirements for, and the planning of, perioperative care.
- Provide to health service providers information on perioperative care and strategies to improve perioperative care.

Key developments/challenges during 2017–2020

In 2019, the VPCC was established, replacing the previous Victorian Consultative Council on Anaesthetic Morbidity and Mortality (VCCAMM) and the Victorian Surgical Consultative Council (VSCC).

The systems for recording and reviewing cases were largely paper-based and the transition to an electronic system was only completed in 2022.

Owing to the Covid pandemic in Victoria in 2020 and 2021, the Victorian Department of Health experienced challenges with staffing and access to records. The prioritisation of available resources resulted in an inability to finalise reviews of code cases for the 2018–20 triennium. As such, the VPCC (VCCAMM) was unable to provide data for this period.

Committee membership

Members of the council are appointed by the Minister for Health for a three-year term and may serve multiple terms if re-nominated and subsequently reappointed.

VPCC 2019 – 2020

David Watters (Chairperson)
Andrea Kattula (Deputy Chairperson)
Philip McCahy (ex officio – VASM)
Allison Evans
Denice Spence
Graeme Campbell
Liat Watson
Marinis Pirpiris

Paula Foran
Phillipa Hore
Andrew Jeffreys
David Story
Heinrich Bouwer
Jo Bourke
Rebecca Donald
Wendy Brown

Governing legislation

The VPCC operates in accordance with Sections 33–43 of the *Public Health and Wellbeing Act 2008* (amended in 2022).

Report and review process

Anaesthetists and anaesthetic departments must report anaesthesia-related death or illness within 28 days including:

- A death that occurs during an operation or procedure (or within 24 hours of its completion) performed with the assistance of sedative, analgesic, local or general anaesthetic drugs or any combination of these.
- A death that may result (either partially or totally) from an incident during or after such an operation or procedure, even if more than 24 hours have elapsed since its completion.
- Any event related to an anaesthetic procedure that causes a life-threatening incident, temporary or permanent disability, or significant distress. Morbidity is categorised as 'major' or 'minor' according to its outcome.

Reports to the VPCC are received via a web portal and include:

- Direct reports.
- Coronial referrals (eDepositions and direct reports).
- Victorian Audit of Surgical Mortality (VASM).
- Sentinel Event reports.

Received reports are triaged and reviewed by the anaesthetic and surgical subcommittees. Detailed case information is sourced from hospitals (VCCAMM also sourced directly from practitioners), as needed. Cases and themes are discussed, and recommendations and reports are made to health care organisations, professional bodies, the Department and the Minister of Health.

The VPCC's access to clinical and case-related information is confidential and protected by legislation. Any external reporting, for the benefit of the health care community, is not identifiable and often aggregated.

An annual report is published, and triennial data is reported to the ANZCA MSC.

Professor David Scott, FANZCA
Chair, VPPC

Western Australia

Committee name

Western Australian Anaesthetic Mortality Committee (WAAMC)

Key developments/challenges during the triennium

Dr Jay Bruce has stepped down as the Chair of the WAAMC and Dr Mike Soares has taken over as the new Chair.

WA government – limitation of membership to maximum 10 years in any capacity.

Changes to investigators:

- Appointment of Dr John Martyr as Chief investigator
- Appointment of Dr Christine Grobler to Deputy investigator.

Changes to committee membership:

- Members retired; Mr Mark Newman, Dr Kenneth Williams, Dr Liezel Bredenkamp, Dr Tran-Lee Kaing, Dr Thomas Ledowski.
- New appointments; Dr Anna Clare, Dr Celine Baber, Dr Maya Calver, Dr Frank Chang, Mr Stephen Rodrigues, Assoc Prof Andrew Toner, Dr Silke Brinkmann.

Commencement of online reporting system using REDCAP data base.

Continued collaboration with the Western Australian Audit of Surgical Mortality (WAASM) with expansion of cases consider, including those in which the surgeon identifies "possible" anaesthetic contribution to the death.

Decision that reports from any coronial enquiry are not able to be disclosed to the WA AMC without consent from the family.

Awaiting review of the Act to allow changes to committee membership, in particular reinstating the ASA representative, having ICU and perioperative medicine representatives.

Difficulty obtaining and linking denominator data on number and types of anaesthetics given to assess mortality rates.

History

WAAMC was established in 1978 by proclamation of the *Health Act Amendment Act 1978*. The Public Health Act under which the functions of the AMC and the investigators are governed was updated in 2019 and is now the *Health (Miscellaneous Provisions) Act 1911*.

Committee objectives

Assessments of cases reportable under *Health (Miscellaneous Provisions) Act 1911*: Where a person died within the period of 48 hours following the administration of an anaesthetic agent or as the result of any complications arising from the administration of an anaesthetic. These are referred by the Chief Health Officer (CHO) to the investigator for assessment, cases which the investigators consider may be in categories 1–3 or if he/she is unable to make a definitive assessment are reviewed by the AMC.

The AMC must determine whether in the opinion of the committee the death might have been avoided and may add to its determination any constructive comments the committee considers advisable for the future assistance and guidance of medical practitioners, dental practitioners, nurses and midwives.

The determination of the committee must be notified in writing by the chair to the medical practitioner or dental practitioner (if any), or nurse or midwife (if any), who was attending the deceased at the time of the occurrence of the death or who attended the deceased before the occurrence of the death if the committee considers that person should be informed of that determination.

Provide the CHO with a yearly summary of the cases and assessments.

Provide information, education and instruction in anaesthetic theory and practice as it may deem necessary or advisable from time to time for the assistance and guidance in avoiding and preventing anaesthetic morbidity or mortality.

Key reporting criteria

Death of persons under anaesthetic must be reported to the CHO**:** All deaths occurring within 48 hours of commencement of an anaesthetic ***or*** deaths where the anaesthetic is thought to have been a contributing factor ***or*** as the result of any complications arising from the administration of an anaesthetic must be reported to the CHO. The timing is considered to be from the commencement/induction of the anaesthetic.

Committee membership

The committee consists of 12 members appointed by the Minister of Health with deputy members appointed as needed. In addition to the committee, the Minister appoints specialist anaesthetists as the investigator and deputy investigator. For any particular meeting, a quorum consists of six of the committee members including the chair.

The members are nominated by, and represent, the following bodies:

- A medical practitioner specialising in anaesthetics nominated by ANZCA (WA branch) – the chair of the committee.
- A medical practitioner specialising in anaesthetics nominated by ANZCA (WA branch) – nomination received from the ASA WA branch.
- A medical practitioner specialising in anaesthetics nominated by the AMA (WA branch).
- A medical practitioner specialising in anaesthetics nominated by The Department of Health, CHO.
- A professor of anaesthesia at University of Western Australia (UWA).
- A professor of clinical pharmacology at UWA.
- A specialist surgeon nominated by the state branch of RACS.
- A specialist obstetrician and gynecologist nominated by the state branch of the Australian council of RANZCOG.
- Two general practitioners with a special interest in anaesthesia, nominated by the state branch of the Royal Australian College of General Practitioners.
- A dental practitioner nominated by the state branch of the Australian Dental Association.
- A registered midwife nominated by the state branch of the Royal Australian Nursing Federation.

The minister also appoints is an investigator and his/her deputy who are to be medical practitioners who specialise in anaesthetics

Legislation

The *Health (Miscellaneous Provisions) Act 1911*, Subsection Child health and preventive medicine Part XIII, 2019 update, governs the functions of the AMC and the investigators.

There are provisions within the legislation regarding protections for confidentiality and liability

(6) For the purposes of this section all information, records of interviews, reports, statements, memoranda or other particulars ... shall be confidential and shall not be communicated or divulged, either in whole or in part, to any person other than the Chairperson of the AMC, or by the chair or any other member of the committee, except for the purposes and in accordance with the provisions of Part XIIIC.

Information, records of interviews, reports, statements, memoranda and other particulars referred to in subsection (6) are not admissible in any court or before any tribunal, board or person in any action, cause or inquiry of any kind whatsoever.

No person, corporate body, association, or institution shall be liable in any action for damages or other relief by reason of the furnishing to the investigator, or to the AMC, of any information, record, report, statement, memorandum or particulars referred to in subsection (6).

Nothing in this section shall prejudice or otherwise affect any of the provisions of the *Coroners Act 1996*, or of any other Act so far as the same relates to prosecutions for indictable and other offences and the obtaining and adducing of evidence relative thereto, but this section shall be read and construed as separate and distinct from the provisions of those Acts.

The report of the investigator to the chair is in the form of a medical report with identification of persons and places removed. The chair knows the name of the anaesthetist as he or she has to write to the anaesthetist after the meeting. When the committee has completed its deliberations, the material must be returned to the Executive Director of Public Health for safe custody.

The reports of the investigator and the determinations of the committee may be disseminated for educational purposes, provided that persons involved are not identifiable.

Reporting and assessment processes

The report, written to the CHO, regarding the death is referred to the Investigator(s) who review the case and enquire into the circumstances of the death. The investigator may request further information if needed. This is usually in the form of the hospital file. The investigator may also interview the anaesthetist or any other persons likely to assist in the investigation.

If a case is identified to the WAAMC, by a third party the anaesthetist involved in the patient management will be asked to send a report. If the investigator clearly considers the case *not* to be classified in categories 1-3 (not likely to have been due, in whole or part, to anaesthetic factors), the reporting anaesthetist is notified of this in writing and the finding will be reported to the CHO. If the investigator is of the opinion that the death is likely to have been due in some measure to anaesthetic or surgical factors, he or she prepares a case report for the chair of the committee.

In all cases which the investigator considers may be in categories 1-3 or if he/she is unable to come to a definite conclusion, the de-identified documents related to the case are considered by the AMC and a consensus opinion is reached regarding the cause of death and whether the conduct of the anaesthetic or surgery played any part. The chair of the committee will then write to the anaesthetist involved regarding the assessment of the case

Dr Mike Soares FANZCA
Chair, WAAMC

References

A review of ASA-physical status – historical perspectives and modern developments. D. Mayhew, V. Mendonca, B. V. S. Murthy 15 January 2019 https://associationofanaesthetists publications.onlinelibrary.wiley.com/doi/10.1111/anae.14569.

Assignment of ASA-physical status relates to anesthesiologists' experience: a survey-based national-study Korean J Anesthesiol. 2019 Feb; 72(1): 53–59.

2018 Nov 14. doi: 10.4097/kja.d.18.00224.

Alessandro De Cassai, Annalisa Boscolo, Tommaso Tonetti, Irina Ban, and Carlo Ori.

ASA-Physical Status Classification System:
https://www.asahq.org/standards-and-guidelines/asa-physical-status-classification-system.

Australian and New Zealand College of Anaesthetists: Anaesthesia Related Mortality in Australia 1991 – 1993. Editor: B F Horan.

Australian and New Zealand College of Anaesthetists: Anaesthesia Related Mortality in Australia 1994 – 1996. Editor: N J Davis.

Australian and New Zealand College of Anaesthetists: Safety of Anaesthesia in Australia 1997 – 1999. Editor: P Mackay.

Australian and New Zealand College of Anaesthetists: Safety of Anaesthesia in Australia 2000 – 2002. Editor: Dr Neville Gibbs. Assistant Editor: Dr Christopher Borton.

Australian and New Zealand College of Anaesthetists: Safety of Anaesthesia in Australia 2003 – 2005. Editor: Dr Neville Gibbs.

Australian and New Zealand College of Anaesthetists: Safety of Anaesthesia in Australia 2006 – 2008. Editor: Dr Neville Gibbs.

Australian and New Zealand College of Anaesthetists: Safety of Anaesthesia in Australia 2009 – 2011. Editor: Associate Professor Larry McNicol.

Australian and New Zealand College of Anaesthetists: Safety of Anaesthesia in Australia 2012 – 2014. Editor: Associate Professor Larry McNicol.

Australian and New Zealand College of Anaesthetists: Safety of Anaesthesia in Australia 2015 – 2017. Editor: Dr Simon Jenkins.

Beecher HK, Todd DP. Study of the deaths associated with anesthesia and surgery: based on a study of 599, 548 anaesthesia in ten institutions 1948-1952, inclusive. *Ann Surg.* 1954;140(1):2-35.

Kluger MT & Short TG. Aspiration during anaesthesia: a review of 133 cases from the Australian Anaesthetic Incident Monitoring Study (AIMS). Anaesthesia, 1999; 54: 19-26.

Mertes PM, Petitpain N, Tacquard C, et al. Pholcodine exposure increases the risk of perioperative anaphylaxis to neuromuscular blocking agents: the ALPHO case- control study. Br J Anaesth 2023; 131: 150e8.

Pouessel G, Tacquard C, Tanno LK, Mertes PM, Lezmi G. Anaphylaxis mortality in the perioperative setting: epidemiology, elicitors, risk factors and knowledge gaps. Clin Exp Allergy 2024; 54: 11e20.

Takazawa T, Horiuchi T, Nagumo K, et al. The Japanese Epidemiologic Study for Perioperative Anaphylaxis, a prospective nationwide study: allergen exposure, epidemiology, and diagnosis of anaphylaxis during general anaesthesia. Br J Anaesth 2023; 131: 159e69.

Appendices

Appendix A: Glossary of terms – case classification

Deaths attributable to anaesthesia	
Category 1	Where it is reasonably certain that death was caused by the anaesthesia or other factors under the control of the anaesthetist.
Category 2	Where there is some doubt whether death was entirely attributable to the anaesthesia or other factors under the control of the anaesthetist.
Category 3	Where it is reasonably certain that death was caused by both surgical and anaesthesia factors.
Explanatory notes The intention of the classification is not to apportion blame in individual cases but to establish the contribution of the anaesthesia factors to the death. The above classification is applied regardless of the patient's condition before the procedure. However, if it is considered that the medical condition makes a substantial contribution to the anaesthesia-related death subcategory H should also be applied. If no factor under the control of the anaesthetists is identified which could or should have been done better subcategory G should also be applied.	
Deaths in which anaesthesia played no part	
Category 4	Surgical death where the administration of the anaesthesia is not contributory and surgical or other factors are implicated.
Category 5	Inevitable death, which would have occurred irrespective of anaesthesia or surgical procedures.
Category 6	Incidental death, which could not reasonably be expected to have been foreseen by those looking after the patient, was not related to the indication for surgery and was not due to factors under the control of anaesthetist or surgeon.
Unassessable deaths	
Category 7	Those that cannot be assessed despite considerable data but where the information is conflicting or key data is missing.
Category 8	Cases that cannot be assessed because of inadequate data.
CASUAL OR CONTRIBUTORY FACTORS IN CATEGORY A DEATH	
Note that it is common for more than one factor to be identified in the case of anaesthesia attributable death.	

SUBCATEGORIES	
A. Preoperative	
(i) Assessment	This may involve failure to take an adequate history or perform an adequate examination or to undertake appropriate investigation or consultation or make adequate assessment of the volume status of the patient in an emergency. Where this is also a surgical responsibility the case may be classified in category 3 above.
(ii) Management	This may involve failure to administer appropriate therapy or resuscitation. Urgency and the responsibility of the surgeon may also modify this classification.
B. Anaesthesia technique	
(i) Choice or application	There is inappropriate choice of technique in circumstances where it is contraindicated or by the incorrect application of a technique, which was correctly chosen.
(ii) Airway maintenance, including Pulmonary Aspiration	There is inappropriate choice of artificial airway or failure to maintain or provide adequate protection of the airway or to recognise misplacement or occlusion of an artificial airway.
(iii) Ventilation	Death is caused by failure of ventilation of the lungs for any reason. This would include inadequate ventilator settings and failure to reinstitute proper respiratory support after deliberate hypoventilation (for example, bypass).
(iv) Circulatory support	Failure to provide adequate support where there is haemodynamic instability, in particular in relation to techniques involving sympathetic blockade.

C. Anaesthesia drugs	
(i) Selection	Administration of a wrong drug or one that is contraindicated or inappropriate. This would include 'syringe swap' errors.
(ii) Dosage	This may be due to incorrect dosage, absolute or relative to the patient's size, age and condition and in practice is usually an overdose.
(iii) Adverse drug reaction	This includes all fatal drug reactions both acute such as anaphylaxis and the delayed effects of anaesthesia agents such as the volatile agents.
(iv) Inadequate reversal	This would include relaxant, narcotic and tranquillising agents where reversal was indicated.
(v) Incomplete recovery	For example, prolonged coma.
D. Anaesthesia management	
(i) Crisis management	Inadequate management of unexpected occurrences during anaesthesia or in other situations, which, if uncorrected, could lead to death.
(ii) Inadequate monitoring	Failure to observe minimum standards as enunciated in the ANZCA professional documents or to undertake additional monitoring when indicated, for example, use of a pulmonary artery catheter in left ventricular failure.
(iii) Equipment failure	Death as a result of failure to check equipment or due to failure of an item of anaesthesia equipment.
(iv) Inadequate resuscitation	Failure to provide adequate resuscitation in an emergency situation.
(v) Hypothermia	Failure to maintain adequate body temperature within recognised limits.
E. Postoperative	
(i) Management	Death as a result of inappropriate intervention or omission of active intervention by the anaesthetist or a person under their direction (for example, recovery or pain management nurse) in some matter related to the patient's anaesthesia, pain management or resuscitation.
(ii) Supervision	Death due to inadequate supervision or monitoring. The anaesthetist has ongoing responsibility but the surgical role must also be assessed.
(iii) Inadequate resuscitation	Death due to inadequate management of hypovolaemia or hypoxaemia or where there has been a failure to perform proper cardiopulmonary resuscitation.
F. Organisational	
(i) Inadequate supervision, inexperience or assistance	These factors apply whether the anaesthetist is a trainee, a non-specialist or a specialist undertaking an unfamiliar procedure. The criterion of adequacy of supervision of a trainee is based on the ANZCA professional document on supervision of trainees.
(ii) Poor organisation of the service	Inappropriate delegation, poor rostering and fatigue contributing to a fatality.
(iii) Failure of interdisciplinary planning	Poor communication in perioperative management and failure to anticipate need for high dependency care.
G. No correctable factor identified	
Where the death was due to anaesthesia factors but no better technique could be suggested.	
H. Medical condition of the patient	
Where the death was due to anaesthesia factors but no better technique could be suggested.	

Appendix B: Australian Coding Standard 0031 (ACS 0031)

Classification consideration

If more than one anaesthetic from block [1910] cerebral anaesthesia and/or block [1909] conduction anaesthesia is administered during a 'visit to theatre' (including different anaesthetics for different procedures), assign only one code from each block using the following hierarchies (listed from highest priority to lowest):

[1910] Cerebral anaesthesia

I. General anaesthesia (92514-XX)

II. Sedation (92515-XX)

[1909] Conduction anaesthesia

I. Neuraxial block (92508-XX)

II. Regional blocks (92509-XX, 92510-XX, 92511-XX and 92512-XX)

III. Intravenous regional anaesthesia (92519-XX)

[1333] Analgesia and anaesthesia during labour and caesarean section

I. Neuraxial block during labour (92506-XX)

II. Neuraxial block during labour and delivery procedure (92507-XX)

For the purposes of this report, 'episodes of anaesthesia care' applied only when anaesthesia was provided for a surgical, diagnostic, or other interventional procedure. 'Episodes of anaesthesia care' excluded isolated nerve blocks because of the probability that nerve blocks, identified outside the hierarchy, would have been for analgesia alone. This methodology was applied to previous editions of the report.

The methodology possibly misses nerve blocks used solely to provide anaesthesia for a small proportion of surgical procedures. The number of such cases would most likely be small in relation to the total number of cases and have little effect on the overall anaesthetic mortality rate, however.

Appendix C: ASA-physical status classification system

ASA-physical status classification	Definition
ASA Class I	Normal healthy patient
ASA Class II	Patient with mild systemic disease
ASA Class III	Patient with severe systemic disease
ASA Class IV	Patient with severe systemic disease that is a constant threat to life
ASA Class V	Moribund patient who is not expected to survive without the surgery

Appendix D: Legislation similarities and differences between AMCs

Jurisdiction	Year data collection began	Independent/ collaborative Committee	Mandatory/ voluntary reporting of a death	Legislated timeframe to report a death
ACT	2014	Collaborates with ACTASM	**Voluntary**	Within 30 days to the ACTASM Project Manager.
NSW	1960	Independent	**Mandatory** Legislation mandates the health practitioner to notify and provide additional information on the death, as requested. Strong self-reporting culture amongst anaesthetists, with public hospitals also screening for anaesthesia deaths to provide a list of names to SCIDUA for cross-checking purposes.	No legislated time frame to report to SCIUDA.
NT	2016	Collaborates with NTASM	**Mandatory** All surgeons must report deaths within 48hrs to NTASM. The reports are sent to the involved anaesthetist for comment and review.	Within 48 hours to NTASM.
QLD	1975 to 2006 Reestablished 2012	Independent	**Voluntary**	No legislated timeframe to report to QPPAMRC.
SA	1969	Independent	**Voluntary**	No legislated timeframe to report to SAAMC.
TAS	2009	Collaborates with TASM	Technically voluntary, but is mandated by hospitals where anaesthesia is performed as part of anaesthetists' credentialling process by each health care facility.	Within 30 days to TASM.
VIC	1976	Independent	**Mandatory** All surgery-related deaths must be reported to VASM as part of RACS mandatory CPD compliance. This requirement only applies to surgeons. Direct reporting to VPCC is voluntary.	Coroner must be notified within 24 hours.
WA	1978	Collaborates with WAASM	**Mandatory**	CHO must be notified within 48 hours (of induction of anaesthetic).