



Safety of Anaesthesia

A review of anaesthesia-related mortality reporting in Australia and New Zealand
2012-2014

Report of the Mortality Sub-Committee
convened under the auspices of the Australian
and New Zealand College of Anaesthetists

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Foreword



Anaesthesia in Australia and New Zealand has never been safer for our patients. This is due to constant improvements in anaesthetists' skills and knowledge, the development of increasingly effective monitoring and interventions, and the ongoing evaluation of outcomes. *Safety of Anaesthesia: A review of anaesthesia-related mortality reporting in Australia and New Zealand 2012-2014* is the 10th triennial report of anaesthesia-related mortality from ANZCA, and continues almost 30 years of reporting in this area.

This report contains data from six Australian states (New South Wales, Victoria, Western Australia, Tasmania, South Australia and Queensland). This represents a large proportion of the Australian population and can thus be considered a reasonable estimate of anaesthetic mortality for this period, covering 11.4 million episodes of anaesthesia. It equates to an anaesthesia mortality rate of just under three deaths per million population per annum, which is very similar to the figures for the previous two trienniums (2006-11) – even though these covered fewer states. The anaesthesia-related mortality per episode of anaesthesia was 1:57,023. For New Zealand, the Perioperative Mortality Review Committee (POMRC) provided data on 30-day mortality.

A consistent trend has been an increase in the proportion of these deaths which are considered to be related to the patient's underlying medical condition, and a reduction in contributory factors from anaesthesia. This reflects improvements in anaesthesia practice standards but also the increasing age and complexity of cases being managed. The elderly and emergency cases continue to be at higher risk. Identified in the New Zealand POMRC reports is the heightened risk of 30-day mortality in patients operated on out of normal working hours, whether elective or emergency.

Areas of anaesthetic practice in interventional medicine, such as endoscopy and radiology, are identified as high risk, as in the previous triennium. This is an ongoing area of concern for the college. Deaths due to anaphylaxis and cardiac arrest continue to occur, and reflect the importance of maintaining ongoing training in skilled diagnosis and resuscitation.

Reporting and critical review of perioperative mortality is a responsibility of our profession. The efforts of all involved in compiling this new report, in particular its editor, Associate Professor Larry McNicol, the mortality committees, and the reporting anaesthetists are gratefully acknowledged along with the support from coroners' offices.

This is an important document. Please read it thoroughly and consider the findings in your practice and the hospitals that you work in.

Professor David A Scott
President, ANZCA

Mortality Sub-Committee

The Mortality Sub-Committee members who produced this report include the president of the Australian and New Zealand College of Anaesthetists (ANZCA), the chairs or co-ordinators of functioning state mortality committees, and other interested parties as listed:

ANZCA President	
Professor David A Scott	
Chairs or co-ordinators of functioning (2016) Australian state/territory and New Zealand anaesthesia mortality committees	
Chairs/co-ordinators	Representing
Dr David Pickford	New South Wales
Dr Jennifer (Jay) Bruce	Western Australia
Associate Professor Larry McNicol	Victoria
Dr Margaret Walker	Tasmania
Dr Simon Jenkins	South Australia
Dr James Troup	Queensland
Dr Carmel McInerney	Australian Capital Territory
Dr Leona Wilson	New Zealand
Other interested parties	
Dr Philip Blum	Northern Territory
Dr Phillipa Hore	Chair, ANZCA Safety and Quality Committee
Dr Peter Roessler	ANZCA Director of Professional Affairs, Policy
ANZCA Safety and Quality Coordinator	
Ms Karen Gordon-Clark	

Details on each jurisdiction, including (where available) terms of reference, legislative protection and information regarding coronial legislation, can be found in the state, territory and national information section, starting on page 20.

Executive summary

Key data points



1. This is the 10th triennial report of anaesthesia-related mortality in Australia (the first being for the triennium 1985-87¹⁻⁹). The format is similar to previous reports, and now contains data from all six states of Australia (New South Wales, Victoria, Western Australia, Tasmania South Australia and Queensland). The ANZCA Mortality Sub-Committee has supported these states in their collection of data and encouraged the establishment or re-establishment of anaesthesia mortality reporting in other Australian states and territories and in New Zealand. The South Australian Anaesthetic Mortality Committee (SAAMC) was re-established in 2010 and the Queensland Perioperative and Periprocedural Anaesthetic Mortality Review Committee (QPPAMRC) was re-established in 2012. The Australian Capital Territory (ACT) and the Northern Territory (NT) are making good progress but have no data on anaesthesia related deaths for this period.
2. While this report contains data from all six states, it is incomplete in that data from 2012 is unavailable from Queensland. However, the data collected includes the vast majority of the population of Australia and is therefore likely to provide a reasonable estimate of anaesthetic mortality for this period. The New Zealand Perioperative Mortality Review Committee (POMRC) was established in 2010. It is a multidisciplinary committee with access to broader data, and although it is unable to provide specific anaesthesia mortality data using the Australian classification system, it provides very useful information on all-cause 30 day perioperative mortality.
3. The ACT Regional Committees of the Australian and New Zealand College of Anaesthetists (ANZCA) and NT are working with the ACT/NT Audits of Surgical Mortality (Royal Australasian College of Surgeons) to develop anaesthesia mortality reporting similar to the model established in Tasmania. There is also positive progress in both South Australia and Victoria involving alternative models of case referral. The South Australian Audit of Perioperative Mortality (SAAPM) refers to the South Australian Anaesthetic Mortality Committee (SAAMC). The Victorian Audit of Surgical Mortality (VASM) refers to the Victorian Consultative Council on Anaesthetic Mortality and Morbidity (VCCAMM). This is very likely to improve access to potential anaesthesia related deaths.
4. Given that all state anaesthesia mortality committees use the same classification system, it is likely that there is some consistency in the allocation of cases into the various categories. However, it should be appreciated that classification of anaesthesia-related deaths relies on expert opinion or consensus, and therefore remains subjective to some extent. It is also possible the state mortality committees may vary in their interpretation of the categorisation of anaesthesia-related deaths. The methodology for identifying potential anaesthesia-related deaths is variable across the jurisdictions and **therefore it must be recognised that some anaesthesia-related deaths may be missed** despite the efforts made at individual, state and national levels. It should also be noted that the cases reported to the state Audits of Surgical Mortality will be those under the care of a surgeon; those involving other proceduralists may be missing from cases submitted, and hence a further source of data variation.
5. During the triennium, 200 anaesthesia-related deaths (categories one, two and three) were reported from the six states. However, **only 23 cases (12 per cent) were classified as category one (where it was it considered “reasonably certain” that death was caused by anaesthesia factors alone)**. In 19 cases there was “some doubt” (category two), and in the remaining **158 cases, “medical, surgical and anaesthesia factors were implicated” (category three)**. This demonstrates a continued reduction in the percentage of category one deaths in the last four triennial reports. In 2003-05, category one deaths were 21 per cent of the total anaesthesia-related deaths, reducing to 15 per cent in 2006-08, 14 per cent in 2009-11 and 12 per cent in 2012-14.

6. During the triennium, the combined population for the six states was about 22.52 million (Australian population statistics, and noting exclusion of Qld population for 2012)¹⁰. Using this figure, **the anaesthesia-related mortality rate for all six states was 2.96 deaths per million population per annum**. It is noteworthy that the anaesthesia-related death rate per million is very similar in all triennial reports since 1997-99.

7. During the triennium there were about 11.40 million individual episodes of anaesthesia care in the six states. This figure was obtained from the Australian Institute of Health and Welfare (AIHW)¹¹. The AIHW data were obtained from coders at all public and private hospitals. A coding hierarchy was used to ensure only one anaesthesia item number was counted per episode of anaesthesia care^{10,11}. Using this denominator, **the anaesthesia-related mortality rate was 1:57,023 for the six states included in this report**. This is similar to the figure for the five states (NSW, SA, Tas, Vic, WA) for the previous triennium (2009-2011; 1:58,039^{10,12}).

8. The accuracy of the number of episodes of anaesthesia care (the denominator) obtained from the AIHW is supported by the relatively constant ratio between the **number of episodes of anaesthesia care per annum and the population** of each state. The ratio was consistent across all six states (NSW 0.17, Vic 0.19, WA 0.18, Tas 0.17, SA 0.19, Qld. 0.18).

9. Only a very small proportion of the deaths, 14/200 cases (7 per cent) occurred in patients considered low risk (ASA-P 1-2)¹³. Hence 93 per cent of anaesthesia-related deaths occurred in patients assessed as higher risk (ASA-P 3-5).

10. In comparison to the previous triennium, the average number of causal or contributory factors per anaesthesia-related death was very similar at 1.03 (compared to 1.01). An interesting trend over the past decade has been a progressive reduction in the ratio of the number of anaesthetic causal or contributory factors per death. This was 2.42 in 2000-02, 1.58 in 2003-05, 1.30 in 2006-08, 1.01 in 2009-11 and 1.03 in 2012-2014. Over the same period, there has been a progressive increase in the percentage of deaths in which the patient's chronic medical condition (H) was deemed to have contributed to the death. This was 28 per cent in 2000-02, 58 per cent in 2005-05, 72 per cent in 2006-08, 81 per cent in 2009-11, and 86 per cent in 2012-14. **These data are consistent with the likelihood that there has been a progressive reduction in preventable anaesthesia-related mortality over this period, and that the most important factor is the severity of the patient's underlying medical condition (H)**. It is also noteworthy that the number of deaths in which no correctable factor could be identified (G) has progressively increased, from 20 per cent in 2000-02, 33 per cent in 2003-05, 49 per cent in 2006-08, 58 per cent in 2009-11 and 57 per cent in 2012-2014. **This finding indicates that a larger percentage of anaesthetic-related deaths occurred despite optimal anaesthetic management within our current knowledge**. As in the recent reports, these figures were heavily influenced by a large number of

cases from NSW classified 3GH. This classification typically describes extremely high-risk patients, in which the stress of surgery and anaesthesia most likely contributed to or hastened death, but in which the death was assessed as non-preventable, other than by withholding the surgery and anaesthesia.

11. Fifty-five per cent of all deaths were females.

12. **The majority of anaesthesia-related deaths occurred in older patients**. 87 per cent of deaths were in patients over the age of 60 years, 79 per cent of deaths were in patients over the age of 70 years, 52 per cent were in patients over the age of 80 years and 20 per cent were in patients over the age of 90 years.

13. 73 per cent of the anaesthesia-related deaths (146/200) occurred in patients having procedures classified as urgent or emergent. This is similar to the previous report (2009-11) in which 70 per cent of anaesthesia-related deaths occurred in relation to urgent or emergent procedures. **Therefore, urgent or emergent surgery remains a major risk factor for anaesthesia-related deaths**.

14. The majority of deaths occurred in metropolitan teaching and larger regional hospitals (78 per cent). This was not unexpected because these hospitals treat the majority of urgent and emergency patients. They also undertake the bulk of the more complex procedures, which are usually performed on older, sicker patients, often with a higher risk.

15. The vast majority of fatal events, 88 per cent, occurred in the operating theatre or procedure room (175 cases out of 199, excluding WA from which not all data was available). The most common location of death was intensive care or high dependency unit (36 per cent), followed by the operating or procedure room (29 per cent), the general ward (20 per cent) and the post-anaesthesia care unit (11 per cent).

16. By far the majority of deaths (89 per cent) involved specialist anaesthetists (178/200 as data for WA was not reported). This finding is expected as most anaesthetics in Australia are provided by specialist anaesthetists, especially for patients undergoing major procedures in teaching hospitals. Four cases involved non-specialist/GPs, 13 were anaesthesia trainees, and in three cases there was no anaesthetist in attendance. **It is of some concern that at least one death occurred when the proceduralist was the only attending medical practitioner**.

17. The types of surgery most frequently associated with anaesthesia-related death were orthopaedics (56 per cent), abdominal surgery (10 per cent), cardiothoracic (9 per cent), and vascular (6 per cent). As in the 2009-11 report, **an emerging trend is the increased frequency of anaesthesia-related deaths in endoscopy and interventional procedures** in cardiology/radiology (8 per cent). Of note, **some of these did not involve an anaesthetist at all**.

18. As in the last report, we have included a brief clinical summary of the 23 deaths classified as category one (where it is “reasonably certain” death was caused by anaesthesia or other factors under the control of the anaesthetist). There were **seven deaths due to anaphylaxis, six cases involved pulmonary aspiration and six deaths were due to cardiac arrest**. In two of the aspiration cases and five of the cardiac arrests, it was noted there was inappropriate choice or application of technique and in some cases inadequate crisis management. Two of the cases of cardiac arrest occurred during procedures performed by non-anaesthetists. There were **two deaths from hypoxia due to loss of the airway and two fatal strokes from inadvertent arterial placement of central venous catheters**.

Key findings

1. Notwithstanding the effect of jurisdictional differences in methodology for case reporting and classification, this report indicates that **anaesthesia mortality rates in modern Australia are low**, whether assessed by the number of anaesthesia deaths per million population per annum (2.96) or by the number of anaesthesia-related deaths per number of anaesthesia procedures per annum (one in 57,023). The emerging pattern is that **anaesthesia risk is now extremely low in patients who are fit and well** (ASA-P 1 – 2).
2. **Most anaesthesia-related deaths occur in older, sicker patients having non-elective surgery**. Further reductions in mortality may be achieved by reviewing the timing of surgery to allow better optimisation of such patients. **There may have been some cases in which the decision to operate was inappropriate or futile. It is increasingly important to engage the patient and their carers in detailed discussion about their surgical condition, the treatment options, and their wishes, including any advanced care directives and end of life care planning**. This should be undertaken collaboratively between anaesthetists, surgeons, and other specialists in perioperative medicine, geriatrics and intensive care.
3. **It is important to maintain the very high standards of anaesthesia training, enhanced by continuous professional development** using interactive workshops and simulation training in airway management, anaphylaxis and resuscitation and other crisis management scenarios. However, the fact that some deaths, **such as those due to drug anaphylaxis, are currently deemed unpreventable re-enforces the ongoing need for research to develop better, safer alternatives**.
4. Specifically, the pursuit of safer drugs should include the option of making neuromuscular blocking agents less likely to trigger anaphylaxis **by removing or reducing community exposure to pholcodine** with its attendant risk of cross sensitisation to NMBAs.

Recommendations

The ANZCA Mortality Sub-Committee makes the following recommendations:

1. Healthcare authorities should recognise that anaesthesia mortality is higher in older, sicker patients having major or urgent surgery. If the decision is made to proceed, appropriate perioperative resources should be provided, including appropriate levels of specialist anaesthetist care and supervision and high dependency facilities (ANZCA professional document **PS59: Statement on Roles in Anaesthesia and Perioperative Care**).
2. Healthcare authorities and clinicians must take account of the wishes of elderly and often frail patients and their carers, in collaborative discussion about the potential outcomes from emergency anaesthesia and surgery. This should include consideration of any existing advanced care directives and end of life care plans and aim to reduce the risk of inappropriate and potentially futile intervention.
3. The Therapeutic Goods Administration (Australia) and Medsafe (New Zealand) should be approached to remove or restrict community exposure to pholcodine, an ingredient (with no proven efficacy) contained in over the counter cough mixtures, in light of further evidence of its role of increasing the risk of anaphylaxis to neuromuscular blocking agents due to cross sensitisation.
4. There should be no option for any single operator proceduralist to administer sedation or anaesthesia (ANZCA professional document **PS09: Guidelines on Sedation and/or Analgesia for Diagnostic and Interventional Medical, Dental or Surgical Procedures**).
5. The ANZCA Mortality Sub-Committee and the anaesthesia mortality committees in all states and territories of Australia should continue to work collaboratively to establish and maintain robust methodologies to obtain accurate anaesthesia mortality data.
6. Patients, healthcare authorities, anaesthetists, other medical specialists and healthcare workers should recognise the role of current anaesthesia training, research, accreditation, continuing professional development and education in achieving and maintaining the highest standards of safety and quality in the practice of anaesthesia in Australia and New Zealand.
7. The broader community should be informed that modern anaesthesia care is very safe as indicated by the very low anaesthetic mortality rates in Australia and the ongoing aim to avoid all anaesthesia-related deaths.

Associate Professor Larry McNicol
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Editor
Chair, ANZCA Mortality Sub-Committee

Clinical aspects of category one anaesthesia-related deaths

For the first time, in the previous and the ninth triennial anaesthesia mortality report⁹, we included clinical information from the 22 deaths (category one) where it is reasonably certain that the death was caused by anaesthesia or other factors under the control of the anaesthetist. The inclusion of this information was deemed appropriate in order to highlight the major clinical issues involved in the deaths directly related to anaesthesia and it is anticipated this has been achieved without compromise to confidentiality. In this report, we have again included some brief clinical details for the 23 category one deaths. In this the 10th triennial anaesthesia mortality report for the period 2012-14, of the 23 direct (category one) anaesthesia related deaths, seven were due to **anaphylaxis**, six involved pulmonary **aspiration**, six involved **cardiac arrest** of which five were attributed to inappropriate choice or application of technique and inadequate crisis management. One of these involved a non-anaesthetist single operator undertaking a medical procedure under sedation. Another cardiac arrest was due to local anaesthesia toxicity during a procedure performed by a non-anaesthetist. There were two deaths caused by hypoxia due to failure to secure an **airway**, and two deaths were due to **stroke** as a complication of inadvertent arterial placement of central venous catheters.

ANAPHYLAXIS (SEVEN)

There were seven deaths from anaphylaxis, of which five involved suxamethonium and two were caused by rocuronium. An additional death involved an unexplained cardiac arrest at induction which may have been due to anaphylaxis. Most of these cases were diagnosed rapidly and involved profound hypotension leading to cardiac arrest. Crisis management was appropriate on most occasions and included early and escalating administration of adrenaline and fluids. Three of these patients were obese and one also had known cardiac disease. In at least three cases, transoesophageal echocardiography was deployed during attempted resuscitation.

NOTE: Anaphylaxis was the most common cause of "primary anaesthesia mortality" and may be regarded as one of the less preventable causes of anaesthesia-related deaths.

However there is emerging evidence that exposure to pholcodine in over the counter cough medicines carries a risk of sensitisation to neuromuscular blocking agents and hence there is a strong case for reducing this exposure to a substance with no proven efficacy through regulation of the pharmaceutical industry¹⁴.

ASPIRATION (SIX)

There were six deaths due to pulmonary aspiration, all of which occurred in the setting of emergency surgery, and in five cases involved patients who were critically ill. Two cases involved a poor choice of technique in that a rapid sequence induction was not performed.

NOTE: Pulmonary aspiration continues to be a leading cause of anaesthesia related death and attention to detail in the choice and application of technique is imperative to mitigate this risk, especially in elderly frail patients.

CARDIAC ARREST (SIX)

There were five deaths involving cardiac arrest resulting from inappropriate choice or application of anaesthesia technique. Two cases involved patients who were critically unwell and three others were elderly and at least two of them had significant cardiac morbidity. Contributory factors included inappropriate choice of technique, drug dosage and inadequate monitoring.

NOTE: Patients who are critically unwell or elderly and frail are at increased risk of perioperative cardiac arrest. Choices regarding the level of monitoring and drug dosage are paramount.

AIRWAY RELATED DEATHS (TWO)

There were two deaths from hypoxia resulting from failure to establish and maintain an airway. One involved a complex patient with a previous tracheostomy who required emergency surgery. After initially successful intubation, airway bleeding ensued after which the airway was unable to be maintained. The other case involved a repeat endoscopic procedure during which there was unexpected loss of the airway which could not be restored despite supraglottic, laryngoscopic and surgical airway techniques.

NOTE: Unexpected loss of the airway remains an ever present risk and all anaesthetists must continue to undertake regular crisis management training in airway management techniques including can't intubate/can't oxygenate scenarios.

STROKE (TWO)

There were two procedure-related deaths from stroke caused by inadvertent arterial placement of central venous catheters, and in at least one of these cases, the diagnosis was delayed.

NOTE: The decision to insert a central venous catheter should take account of a risk benefit analysis on a case-by-case basis. The major risks include vascular injury and bloodstream infection. The traditional indications include assessment of volume status, secure venous access and a safe method for infusion of vasoactive agents. However, it should be noted that there is increasing doubt about the utility of central venous pressure as a marker of volume status. Attention to detail during insertion of central venous catheters must take account of the appropriate methods to prevent inadvertent arterial placement and active management of inadvertent arterial puncture¹⁵.

Methods

Data collection

Confidentiality of information, an absolute requirement for all committees, was ensured by no primary data being examined in the compiling of the report.

1. State coroners' acts, other public health legislation and the collection of data

Information relating to the various coroners' acts and jurisdictional public health legislation and state mortality committee terms of reference can be found in the state, territory and national information section, page 20.

2. Uniformity in analysing reports

To uphold uniformity between the states in analysing reports, the chairs of the state-based mortality committees have continued to use the agreed Glossary of Terms – Case Classification form wherever possible. The use of this classification system was developed in March 2000, and has been in use in all states since 2006. See **Appendix 1** to view the form in its entirety.

System of classification

The system of classification and the term “death attributable to anaesthesia” is defined in **Table 1** and the report focuses on deaths in which anaesthesia played a part, that is, categories one, two and three. For the most part, the term “anaesthesia-attributable” has been replaced with “anaesthesia-related” in this and other reports. It should be noted that this classification system is also used to classify morbidity by the Victorian Consultative Council on Anaesthetic Mortality and Morbidity (VCCAMM). VCCAMM is the only state committee to collect data on morbidity as well as mortality.

Table 1: System of classification by state-based anaesthesia mortality committees

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:	
<ul style="list-style-type: none"> • 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 are missing.
Category 8	Cases that cannot be assessed because of inadequate data.

Findings for NSW, Vic, WA, Tas, SA and Qld

Number of deaths classified

The total number of deaths reviewed by the six states for the triennium was **1851**, of which **200** were considered to be wholly or partly related to anaesthetic factors (categories one, two and three **Table 2**). Of the **1851** cases reviewed, **42** were classified “unassessable” due to inadequate or conflicting data (category seven or eight, **Table 1**).

Table 2: Number of deaths classified by each committee

	Total Classified	Category 1	Category 2	Category 3	Total Anaesthesia-related
NSW	811	12	13	131	156
Vic	72	9	1	18	28
WA*	226	0	0	2	2
Tas	55	0	1	2	3
SA	32	1	1	2	4
Qld**	655	1	3	3	7
Total	1851	23	19	158	200

The disparity in total cases classified reflects both population differences and different requirements and methodology for reporting in different states (see state, territory and national information on page 20). The differences between states in relation to the various categories may represent some subjectivity in classification. There is less subjectivity, however, in relation to category one cases.

* The WA data are based on deaths reported during the triennium. The data from the other states are based on deaths that occurred during the triennium.

** The Qld data does not include 2012.

Number of anaesthesia-related deaths in relation to population

Table 3: Number of anaesthesia-related deaths during the 2012-14 triennium, in relation to the population* of NSW, Vic, WA, Tas, SA and Qld

No. of deaths considered anaesthesia-related	200
Population of NSW, Vic, WA, Tas, SA and Qld	(22.52 million)
No. of anaesthesia-related deaths per million population, 2012-14	8.88
No. of anaesthesia-related deaths per million population per annum	2.96

* Estimated averaged resident population for 2012-14 (Australian Bureau of Statistics)¹⁰ [NSW 7.40, Vic 5.73, WA 2.50, Tas 0.53, SA 1.67 and Qld 4.69 (x million)].

** 2012 Qld population data has not been included.

The number of anaesthesia-related deaths per million population at 2.96 is very similar to the previous reports, 3.01 (2009-11)⁹, 2.79 (2006-08)⁸ and 2.73 (2003-05)⁷.

Table 4: Number of anaesthesia-related deaths in comparison with previous reports

	1997-99 ⁹	2000-02 ¹⁰	2003-05 ¹¹	2006-08 ¹²	2009-11 ¹³	2012-14 ¹⁴
NSW	56	67	53	92	125	156
Vic	32	39	40	21	18	28
SA and NT	11	2	-	-	-	-
SA	-	-	-	-	2	4
WA	11	16	19	7	11	2
Qld	20	12	-	-	-	7
Tas	-	-	-	4	0	3
Total	130	137	112	124	156	200

Table 5: Number of anaesthesia-related deaths in relation to population in comparison to previous reports

	1997-99*	2000-02*	2003-05*	2006-08**	2009-11***	2012-14#
Population (x million)	13.40	13.75	13.68	14.80	17.30	22.52
Number of anaesthesia-related deaths	130	137	112	124	156	200
Anaesthesia-related death rate per million population per triennium	9.70	9.96	8.19	8.37	9.02	8.88
Anaesthesia-related death rate per million population per annum	3.23	3.32	2.73	2.79	3.01	2.96

Population source – Australian Bureau of Statistics

* NSW, Vic, WA

** NSW, Vic, WA, Tas

*** NSW, Vic, WA, Tas, SA

NSW, Vic, WA, Tas, SA and Qld

It is noteworthy that the anaesthesia-related death rate per million population per annum is very similar in all triennial reports since 1997-99⁵.

Number of anaesthetics administered

As in the previous reports, the total number of “episodes of anaesthesia care” (denominator) was obtained from the Australian Institute of Health and Welfare (AIHW)¹¹. The AIHW receives coding (ICD-10) on all medical procedures, including anaesthetic procedures, from coders at all public and private hospitals in Australia. As there is often more than one anaesthesia item and code for any single episode of anaesthesia care, AIHW applied a hierarchy to ensure that only one code was counted for each episode. The total number of episodes of care between January 1, 2012 and December 31, 2014 inclusive was then obtained. This information is presented in **Table 6**.

Hierarchy used by “coders”

This hierarchy follows the Australian coding standards of the National Centre for Classification in Health¹².

ACS 0031

Classification, point one:

If more than one anaesthetic from block [1910] cerebral anaesthesia and/or block [1909] conduction anaesthesia is administered in 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) :

[1333] Analgesia and anaesthesia during labour and caesarean section

- I. Neuraxial block during labour (9250610-XX)
- II. Neuraxial block during labour and delivery procedure (9250710-XX)

[1910] Cerebral anaesthesia

- I. General anaesthesia (92514-XX)
- II. Sedation (92515-XX)

[1909] Conduction anaesthesia

- I. Neuraxial block (92508-XX)
- II. Regional blocks (codes 92509-XX, 92510-XX, 92511-XX, 92512-XX)
- III. Intravenous regional anaesthesia (92519-XX)

For the purposes of this report “episodes of anaesthesia care” applied only when anaesthesia was being provided for a surgical, diagnostic, or other interventional procedure. It excludes isolated nerve blocks because it is likely that the majority of nerve blocks identified outside the hierarchy used would have been performed for analgesia alone. It is possible that this methodology misses nerve blocks that were used to provide the sole anaesthesia for a small proportion of surgical procedures. However, it is likely that the number of such cases would be small in relation to the total number of cases, and would have little effect on the overall anaesthetic mortality rate. This approach was the same as the previous report.

Table 6: Estimated number of anaesthetics administered in the six states and the estimated anaesthesia mortality rate per number of procedures

	NSW	Vic	WA	Tas	SA	Qld [#]	Total
No. Anaesthetics January 1, 2012 – December 31, 2014***	3,816,770	3,314,423	1,367,071	277,405	949,603	1,679,322	11,404,594
No. Anaesthetic- related deaths (triennium)	156	28	2	3	4	7	200
No. Anaesthetics per death	24,466	118,372	683,535	92,468	237,401	239,903	57,023

* AIHW¹¹ www.aihw.gov.au

** Australian Hospital Statistics, January 1, 2012 – December 31, 2014. Procedures in ICD-10-AM groupings: 1333; 9250610-9250799; 1909; 9250810-9251999; 1910; 9251410-9251599. These include general, neuraxial, and combined anaesthetic procedures, intravenous regional anaesthesia, and sedation; total public and private from NSW, VIC, WA, Tas, SA and Qld.

Qld data does not include No. Anaesthetics January 1 – December 31, 2012

It is important to recognise that 1 in 57,023 is likely to under-estimate the overall anaesthesia mortality rate.

This is related to skewed data due to the large discrepancy in the number of total cases reviewed by each state and hence the number classified as anaesthesia related. The wide range of anaesthesia mortality rates across the states is most likely due to regional variability in the methodology of case collection, reporting and interpretation of the classification system, rather than actual differences in mortality. The national figures are dominated by NSW, where there are a much larger number of cases reviewed and this is likely to lead to higher numbers being considered as anaesthesia related. It is likely to include many cases of emergency surgery for fractured neck of femur, which may not be so frequently reviewed in other states. In Victoria, there are much lower numbers of total cases reviewed, which may indicate a higher likelihood of missed cases, and hence potential for under estimation of anaesthesia-related mortality. Similarly, in the other states (SA, Tas, WA, Qld), the actual numbers of anaesthesia related deaths are very low and hence if any cases have been missed, the underestimation of anaesthesia mortality rates is exaggerated.

Incidence of death 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 reports, all five states participating had comprehensive procedures in place to assess and record anaesthesia-related mortality. Nevertheless, there is no way of ascertaining whether all anaesthesia-related deaths were reported or classified correctly. Therefore the numerator must be considered a best estimate. On the other hand, it was felt by all state committees that it was unlikely a large number of cases were missed or classified incorrectly.

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. This method uses ICD-10 codes identified at individual hospital levels and reported to the AIHW. While this method is considered to be the most accurate available in Australia at present, the possibility of a small proportion of incorrect or incomplete coding must be considered. Therefore, the denominator is also a best estimate.

ANAESTHESIA-RELATED MORTALITY RATE

The estimated anaesthesia-related mortality for the six states was 1:57,023 procedures. This is very similar to the rate for the last four triennial reports. (Table 7).

Table 7: Estimated anaesthesia-related mortality in relation to number of procedures compared to previous reports

	2000-02*	2003-05**	2006-08***	2009-11***	2012-14#
Estimated total number of anaesthesia procedures (x million)	7.65	5.98	6.88	9.05	11.40
Number of anaesthesia-related deaths	122	112	124	156	200
Anaesthesia-related death rate	1:56,000	1:53,426	1:55,490	1:58,039	1:57,023

* All Australian states

** NSW, Vic, WA

*** NSW, Vic, WA, Tas

**** NSW, Vic, WA, Tas, SA

NSW, Vic, WA, Tas, SA and Qld

Level of risk

The level of risk was stratified using the American Society of Anesthesiologists (ASA) physical status classification¹³.

Table 8: Level of risk of patients by ASA physical status

ASA physical status	NSW	Vic	WA	Tas	SA	Qld	Total
1	0	0	0	0	0	0	0
2	7	5	0	0	2	0	14
3	54	12	2	1	1	1	71
4	87	11	0	2	1	6	107
5	8	0	0	0	0	0	8
Total	156	28	2	3	4	7	200

Only a very small proportion, 14/200 cases (7 per cent) occurred in patients considered low risk (ASA-P 1-2)¹³. Hence 93 per cent of anaesthesia-related deaths occurred in patients assessed as higher risk (ASA-P 3-5)¹³.

Incidence of death in patients considered to be good or fair risk

Table 9: Incidence of death in patients considered to be good or fair risk

Triennium	Number of ASA P 1-2 patients	Total number of category 1-3 deaths	Percentage of deaths considered at good or fair risk
1991-93	30	116	0.26
1994-96	13	135	0.1
1997-99	19	130	0.15
2000-02	26	137	0.19
2003-05	18	112	0.16
2006-08	17	124	0.14
2009-11	11	156	0.07
2012-14	14	200	0.07

This table demonstrates the progressive downward trend in the number of deaths occurring in patients at good or fair risk, and this was only 7 per cent of deaths in this triennium (2012-14) which is the same as in the 2009-11. This is consistent with the trend towards higher anaesthesia-related mortality in older, sicker patients.

Causal or contributory factors in anaesthesia-related deaths – see Appendix 1

The classifications by the state committees of the most likely causal or contributory factors in the anaesthetic-related deaths are summarised in **Table 10**.

Table 10: Causal or contributory factors in anaesthesia-related deaths

	NSW	Vic	WA	Tas	SA	Qld	Total
A PREOPERATIVE	26	10	0	4	0	4	44
I. assessment	19	4	0	2	0	1	
II. management	7	6	0	2	0	3	
B ANAESTHESIA TECHNIQUE	22	12	1	2	0	8	45
I. choice or application	7	3	1	1	0	3	
II. airway maintenance	9	8	0	1	0	2	
III. ventilation	1	1	0	0	0	1	
IV. circulatory support	5	0	0	0	0	1	
C ANAESTHESIA DRUGS	20	12	0	0	2	3	37
I. selection	5	1	0	0	0	1	
II. dosage	10	5	0	0	2	2	
III. adverse event	5	6	0	0	0	0	
IV. incomplete reversal	0	0	-	0	0	0	
V. inadequate recovery	0	0	0	0	0	0	
D ANAESTHESIA MANAGEMENT	19	10	0	2	2	6	39
I. crisis management	4	4	0	1	1	2	
II. inadequate monitoring	11	1	0	0	0	2	
II. equipment failure	0	0	0	0	0	0	
IV. inadequate resuscitation	4	5	0	1	1	2	
V. hypothermia	0	0	0	0	0	0	
E POST-OPERATIVE	9	3	0	0	0	1	11
I. management	5	3	0	0	0	1	
II. supervision	3	0	0	0	0	0	
III. inadequate resuscitation	1	0	0	0	0	0	
F ORGANISATIONAL	11	11	0	0	1	4	27
I. inadequate supervision or assistance	3	4	0	0	0	2	
II. poor organisation	1	3	0	0	1	1	
III. poor planning	7	4	0	0	0	1	
Total contributory factors	107	58	1	8	5	26	205
G NO CORRECTABLE FACTOR	110	3	1	0	0	0	114
H MEDICAL CONDITION OF THE PATIENT A SIGNIFICANT FACTOR	146	16	1	2	2	4	171

In comparison to the previous triennium, the average number of causal or contributory factors per anaesthesia-related death was very similar at 1.03 (compared to 1.01). An interesting trend over the past decade has been a progressive reduction in the ratio of the number of anaesthetic causal or contributory factors per death. This was 2.42 in 2000-02, 1.58 in 2003-05, 1.30 in 2006-08, 1.01 in 2009-11 and 1.03 in 2012-14. Over the same period, there has been a progressive increase in the percentage of deaths in which the patient's chronic medical condition (H) was deemed to have contributed to the death. This was 28 per cent in 2000-02, 58 per cent in 2005-05, 72 per cent in 2006-08, 81 per cent in 2009-11, and 86 per cent in 2012-14. These data are consistent with the likelihood that there has been a progressive reduction in preventable anaesthesia-related mortality over this period, and that the most important factor is the severity of the patient's underlying medical condition (H). It is also noteworthy that the number of deaths in which no correctable factor could be identified (G) has progressively increased, from 20 per cent in 2000-02, 33 per cent in 2003-05, 49 per cent in 2006-08, 58 per cent in 2009-11 and 57 per cent in 2012-14. This finding indicates that a larger percentage of anaesthetic-related deaths occurred despite optimal anaesthetic management within our current knowledge. As in the previous report, these figures were heavily influenced by a large number of cases from NSW classified 3GH. This classification typically describes extremely high-risk patients, in which the stress of surgery and anaesthesia most likely contributed to or hastened death, but in which the death was assessed as non-preventable, other than by withholding the surgery and anaesthesia.

Gender

Fifty-five per cent of all deaths were females.

Age

Table 11: Age distribution in anaesthesia-related deaths

Age (years)	NSW	Vic	WA	Tas	SA	Qld	Total
< 11	0	0	0	0	0	0	0
11 - 20	1	2	0	0	0	0	3
21 - 30	0	0	0	0	0	0	0
31 - 40	2	3	0	1	0	0	6
41 - 50	4	1	0	0	0	0	5
51 - 60	6	4	1	0	1	0	12
61 - 70	11	5	0	0	0	0	16
71 - 80	40	8	1	1	2	3	55
81 - 90	54	5	0	1	1	2	63
> 90	38	0	0	0	0	2	40
Total	156	28	2	3	4	7	200

The majority of anaesthesia-related deaths occurred in older patients. 87 per cent of deaths were in patients over the age of 60 years, 79 per cent of deaths were in patients over the age of 70 years, 52 per cent were in patients over the age of 80 years and 20 per cent were in patients over the age of 90 years.

Degree of urgency (urgency is based on admission status)

Table 12: Degree of urgency of the procedure with anaesthesia-related deaths

Urgency	NSW	Vic	WA	Tas	SA	Qld	Total
Elective	35	13	1	1	3	1	54
Urgent / emergent	121	15	1	2	1	6	146
Total	156	28	2	3	4	7	200

73 per cent of the anaesthesia-related deaths (146/200) occurred in patients having procedures classified as urgent or emergent. This is similar to the previous report (2009-2011) in which 70 per cent of anaesthesia-related deaths occurred in relation to urgent or emergent procedures. Therefore, urgent or emergent surgery remains a likely risk factor for anaesthesia-related deaths. This may relate to the unstable condition of these patients, the inadequate opportunity for complete pre-operative assessment, or a requirement for continued resuscitation at the same time as the administration of anaesthesia. It is important to recognise that the combination of elderly and often frail patients presenting for urgent or emergent surgery leads to the potential for increased mortality (and morbidity). Anaesthetists must be actively engaged in full discussion with the patient, their carers and other clinicians to take account of the issues of informed consent, and end of life care planning. Specifically, many patients will have existing advanced care directives which require consideration and detailed discussion in this setting. It is also very important that there is collaboration between the patient, their carers and a broad range of clinicians including anaesthetists, surgeons, physicians including intensive care and aged care specialists to identify occasional cases in which surgical intervention may be deemed to be futile.

Type of hospital

Table 13: Type of hospital

Hospital	NSW	Vic	WA	Tas	SA	Qld	Total
Metropolitan public teaching	86	13	1	1	3	6	110
Metropolitan non-teaching	19	0	0	0	0	0	19
Rural base	3	1	0	0	0	1	5
Rural/Regional public other	34	9	1	2	0	0	46
Private	14	5	0	0	1	0	20
Day care (free standing)	6	0	0	0	0	0	0
Total	156	28	2	3	4	7	200

It is noteworthy that the nomenclature for classification of hospitals varies in different states.

However, the majority of deaths occurred in metropolitan teaching and larger regional hospitals (78 per cent). This was not unexpected because these hospitals treat the majority of urgent and emergency patients. They also undertake the bulk of the more complex procedures, which are usually performed on older, sicker patients, often with a higher risk.

Location of event leading to death

Table 14: Location of event leading to death

Location of event leading to death	NSW	Vic	WA*	Tas	SA	Qld	Total
Induction room	0	6	0	0	0	0	6
Operating theatre	141	13	1	3	1	5	164
PACU	3	3	0	0	0	0	6
Procedural room	7	2	0	0	2	0	11
ICU/HDU	1	1	0	0	0	1	3
General ward	3	2	0	0	0	0	5
Other**	1	1	0	0	1	1	4
Total	156	28	1	3	4	7	199

* WA : information only collected data on one case

** Other : radiology suite, emergency department, departing from hospital and not specified

The vast majority of fatal events, 88 per cent, occurred in the operating or procedure room (175 cases out of 199, excluding one case from WA for which data was unavailable).

Location of death

Table 15: Location of death

Location of death	NSW	Vic	WA*	Tas	SA	Qld	Total
Induction room	0	4	0	0	0	0	4
Operating theatre	43	7	0	1	0	2	53
PACU	17	2	0	0	1	1	21
Procedural room	4	1	0	0	0	0	5
ICU/HDU	53	11	1	2	2	2	71
General ward	37	1	0	0	0	1	39
Other**	2	2	0	0	1	1	6
Total	156	28	1	3	4	7	199

* WA: information only collected data on one case

** Other: radiology suite, emergency department, departing from hospital and not specified

The most common location of death was intensive care or high dependency unit (36 per cent), followed by the operating or procedure room (29 per cent), the general ward (20 per cent) and the post-anaesthesia care unit (11 per cent)

Grade of anaesthetist

Table 16 shows the grade of the anaesthetist. In cases during which two or more anaesthetists were involved, the grade of anaesthetist was taken as the principal anaesthetist involved, as indicated in individual anaesthetists' reports.

Table 16: Grade of anaesthetist

Grade of anaesthetist	NSW	Vic	WA*	Tas	SA	Qld	Total
Specialist	142	25	0	2	4	5	178
GP/Non-specialist	2	0	0	1	0	1	4
Trainee/Registrar	10	2	0	0	0	1	13
Other*	2	1	0	0	0	0	3
Not reported	0	0	2	0	0	0	2
Total	156	28	2	3	4	7	200

*No anaesthetist in attendance

By far the majority of deaths (89 per cent) involved specialist anaesthetists (178/200 as data for WA was not reported). This finding is expected as most anaesthetics in Australia are provided by specialist anaesthetists, especially for patients undergoing major procedures in teaching hospitals. Four cases involved non-specialist/GPs, 13 were anaesthesia trainees, and in three cases there was no anaesthetist in attendance. It is of some concern that at least one death occurred when the proceduralist was the only attending medical practitioner.

Type of surgery or procedure

Table 17: Type of surgery or procedure

	NSW	Vic	WA*	Tas	SA	Qld	Total
Type of surgery/procedure							
Abdominal	9	7	0	3	0	0	19
Cardiothoracic	17	1	0	0	0	0	18
ENT and head/neck	0	1	1	0	0	0	2
General (non-abdominal)	5	1	0	0	0	0	6
Gynaecological	1	1	0	0	0	0	2
Maxillofacial	0	0	0	0	0	0	0
Neurosurgery	1	0	0	0	0	0	1
Obstetrics	1	2	0	0	0	0	3
Ophthalmology	1	0	0	0	1	0	2
Orthopaedic	95	10	0	0	1	5	111
Plastic surgery	0	0	1	0	0	0	1
Renal	0	0	0	0	0	v	0
Urological	2	2	0	0	0	0	4
Vascular	9	0	0	0	0	2	11
Procedural categories							
Cardiology	2	1	0	0	0	0	3
Endoscopy	9	2	0	0	2	0	13
Radiology	3	0	0	0	0	0	3
Miscellaneous							
Electroconvulsive therapy	0	0	0	0	0	0	0
Invasive monitoring	0	0	0	0	0	0	0
Pain management	0	0	0	0	0	0	0
Resuscitation	1	0	0	0	0	0	1
Total	156	28	2	3	4	7	200

The types of surgery most frequently associated with anaesthesia-related death were orthopaedics (56 per cent), cardiothoracic (9 per cent), abdominal surgery (10 per cent) and vascular (6 per cent). As in the 2009-11 report, an emerging trend is the increased frequency of anaesthesia-related deaths in endoscopy and interventional procedures in cardiology/radiology (8 per cent). Of note, some of these did not involve an anaesthetist at all. It should be noted that the definition of anaesthesia-related deaths is such that the surgical procedure should not be a direct factor. Care should be taken in attempting to interpret these data, because denominators for each procedure are not known, and the relative levels of risk of patients presenting for various procedures are also not known.

State, territory and national information

New South Wales

NSW Special Committee Investigating Deaths Under Anaesthesia

OVERVIEW

The Special Committee Investigating Deaths under Anaesthesia (SCIDUA) has operated continuously in NSW since 1960, apart from a short period in the early 1980s due to confidentiality problems. SCIDUA was re-established in July 1983 with statutory privilege. Current legislation provides mandatory reporting of all anaesthesia and sedation related deaths in NSW.

COMMITTEE COMPOSITION (2012-14)

During this reporting period, SCIDUA had eight members who were nominated by:

- NSW Regional Committee of the Australian and New Zealand College of Anaesthetists.
- The Australian Society of Anaesthetists.
- The Department of Anaesthetics, University of Sydney.
- The Division of Anaesthesia and Intensive Care, University of Newcastle.
- The Royal College of Pathologists of Australia.

All members were appointed by the NSW Minister for Health pursuant to section 20 of the *Health Administration Act 1982* (NSW). SCIDUA is supported by a secretariat team appointed by the Clinical Excellence Commission. The secretariat team also supports the Collaborating Hospitals' Audit of Surgical Mortality (CHASM).

REPORTING AND REVIEW OF ANAESTHESIA-RELATED DEATHS

The notification of deaths arising after anaesthesia or sedation for operations or procedures is a mandatory requirement in NSW, regardless of whether it is a coroner's case or not. This has caused some confusion because until 2009 reporting was stipulated within the Coroner's Act 1980.

Reporting to SCIDUA is required under s 84 of the *Public Health Act 2010* and applies:

"if a patient or former patient dies while under, or as a result of, or within 24 hours after, the administration of an anaesthetic or a sedative drug administered in the course of a medical, surgical or dental operation or procedure or other health operation or procedure (other than a local anaesthetic or sedative drug administered solely for the purpose of facilitating a procedure for resuscitation from apparent or impending death)".

Health practitioners are required to notify the death by completing the state form: "Report of death associated with anaesthesia/sedation". The notification may lead to a questionnaire being sent.

We currently do not have available a method to verify whether all anaesthesia and/or sedation deaths are reported under that provision. The committee is confident the data contains a representative sample of deaths in NSW, and there are other reporting sources available within the Clinical Excellence Commission to ensure major cases are not missed.

When a death is notified to SCIDUA by an anaesthetist or medical practitioner the SCIDUA's triage sub-committee reviews the information contained on the notification form. This determines whether a more detailed questionnaire needs to be sent to the medical practitioner or whether the case can be classified based on the available information. A questionnaire is always sent if there is any suspicion that the anaesthetic was involved, or if the patient died during the procedure or in the recovery room.

Committee meetings are typically held once a month, depending on the number of cases prepared. SCIDUA uses the classification system developed by the ANZCA Anaesthesia Mortality Sub-Committee in 2006. It relies on expert opinion and consensus. It is important to note the process is a retrospective review of cases where there has been a known outcome of death. The committee reviews whether alternative management strategies could have led to a more favourable result.

Each anaesthetist who completes a questionnaire for the committee receives a confidential letter from the chair explaining the committee's views of the case.

LEGISLATIVE PROTECTION

SCIDUA has special privilege under section 23 of the *Health Administration Act 1982* (NSW). This legislation makes it an offence for a person who obtains information in connection with the work of SCIDUA to:

- Disclose the information.
- Answer any questions or produce any documents relating to the information in any proceedings.

Information can only be released with the consent of the person who provided the information, or the approval of the NSW Minister for Health.

TERMS OF REFERENCE

- To register, investigate and classify deaths occurring during or within 24 hours of a procedure performed under anaesthesia or sedation.
- To determine whether further information is required to complete the above investigation, and if so, to request such information under guarantee of confidentiality from the attending practitioner(s).
- To examine information acquired and identify any issues of management which were instrumental in the patient's death.
- To report the committee's findings confidentially to the practitioners involved in the patient's care.

- To report annually to the minister for health, drawing attention to any matters that require action to improve the safety of anaesthesia and sedation in New South Wales.
- To acquaint the medical profession in general and anaesthetists in particular to any matters to which special attention needs to be paid to ensure the safety of anaesthesia and sedation.
- To submit for publication in appropriate peer-reviewed journals the results of the committee's investigations in such a way as to preserve undertakings of confidentiality given to respondents.
- To make available the expertise of its members to the Clinical Excellence Commission in pursuit of systemic improvements to patient care in the fields of anaesthesia and sedation.

CURRENT DEVELOPMENTS (2017)

SCIDUA is overseeing the development of a web-based application to enable online notification of patient deaths after anaesthesia and sedation administration. It is envisaged the online system will simplify the notification process for most busy practitioners, and shorten the timeline between notification, review and reporting back to the medical practitioner.

Another initiative is a case-book based on commonly identified anaesthetic factors that provides learning opportunities to the anaesthetic community. This booklet was released in 2015.

The committee is concerned about the increasing number of deaths from procedures where the death was not an unexpected outcome of the procedure. These are frequently classified as inevitable deaths and sometimes futile, or may be classified as deaths with both anaesthetic and surgical factors. The committee acknowledges that the current classification system does not clearly identify these cases.

Dr David Pickford, FANZCA

Chair

Special Committee Investigating Deaths Under Anaesthesia in New South Wales

Victoria

Victorian Consultative Council on Anaesthetic Mortality and Morbidity

OVERVIEW

The Victorian Consultative Council on Anaesthetic Mortality and Morbidity (VCCAMM) was established in 1976 under section 13 of the Health Act 1958. The council now operates pursuant to sections 33-43 of the Public Health and Wellbeing Act 2008

COMPOSITION (2012-2014)

- The chair: a specialist anaesthetist nominated by the Australian and New Zealand College of Anaesthetists, recommended by the minister and appointed by cabinet.
- Sixteen specialist anaesthetists, appointed by the minister, comprising three nominated by the Australian and New Zealand College of Anaesthetists, three by the Australian Society of Anaesthetists, and 10 (including a rural practitioner) by the Victorian Teaching and Regional Hospitals.
- Six additional members, appointed by the minister, comprising a nominated representative from each of the Royal Australasian College of Surgeons, the Australian and New Zealand Intensive Care Society and/or the College of Intensive Care Medicine, the Royal College of Pathologists of Australasia and/or the Victorian Institute of Forensic Medicine, the Australasian College of Emergency Medicine, the Royal Australian College of General Practitioners and/or the Rural Visiting Medical Officer, and the Department of Health.

A confidential project officer appointed by the Department of Health supports the council.

REPORTING AND REVIEW OF ANAESTHESIA-RELATED DEATHS (2012-14)

The VCCAMM operates pursuant to the *Public Health and Wellbeing Act (PHWBA) 2008* and coronial legislation under *the Coroners Act 2008*.

Under section 39 of the *PHWBA 2008* the council chair may request, by written notice, a health service provider to provide general or specific information (anaesthesia-related morbidity or mortality). Under section 40, the health service provider must provide such requested information. However, activation of these provisions is dependent on initial notification of potential anaesthesia related mortality and morbidity to the VCCAMM and there is no certainty that this is occurring.

Sections 42 and 43 of the *PHWBA 2008* describe the confidentiality obligations, which preclude the identification of a person from whom, or in relation to whom, the information was obtained. In addition to these legislative confidentiality provisions, the council has imposed an additional layer of security in that only the council chair and the council's confidential project officer are privy to the identity of the reporting practitioner, the patient and the hospital. All identifiable information is deleted from the case reports prior to presentation to council for deliberation. However, it remains important for the council chair to have direct contact with the reporting anaesthetist in order to obtain the most accurate information regarding the case.

The *Coroners Act 2008* includes improved definitions of reportable deaths, and in part 1, section 4, 2 (b), a reportable death includes, a death that occurs – during a medical procedure; or following a medical procedure where the death is or may be causally related to the medical procedure – and a registered medical practitioner would not, immediately before the procedure was undertaken, have reasonably expected the death. Included within the term medical procedure is any diagnostic or therapeutic procedure as well as the administration of any anaesthetic, including general, local, conscious sedation, regional anaesthetic, intensive care sedation, spinal or epidural anaesthetic or other. Under the arrangements with the Coroner’s Court of Victoria, the chair of the council has access to the medical depositions submitted to the coroner in all cases in which any of the above anaesthetic administrations has occurred. The chair can then screen all such depositions and, when deemed appropriate, further information can be obtained for cases that require deliberation by the council.

Cases which are presented to council for review, deliberation and classification are therefore obtained from either direct voluntary reports from individual practitioners, referral of cases from Department of Anaesthesia Quality Assurance Co-ordinators or from the Coroner’s Court. However, it should be noted that despite the improved legislation, there is still some doubt about the ability of VCCAMM to be notified of all potential anaesthesia related deaths.

It is of some concern that there has been a progressive reduction in the number of cases available for review by VCCAMM and hence the lower numbers of anaesthesia related deaths may reflect poor access to cases rather than reduced anaesthesia mortality. There were 40 anaesthesia related deaths in 2003-05, 21 in 2006-08, 18 in 2009-11 and 22 in 2012-14. This has continued despite improvements in the both coronial and public health legislation. The challenge for VCCAMM is to improve interaction and liaison with both the coroner and all Victorian hospitals to enhance awareness of the new legislation and increase the number of reports. A new collaboration with the Victorian Audit of Surgical Mortality is anticipated to substantially improve access to potential anaesthesia related deaths.

FUNCTIONS OF VCCAMM

The functions of the Council as outlined in the *Public Health and Wellbeing Act 2008* are to:

- a. monitor, analyse and report on matters specified for that prescribed Consultative Council; which for this council relates to potentially preventable anaesthetic mortality and morbidity within the Victorian hospital system;
- b. collect information for the purpose of performing the functions specified in this subsection;
- c. keep a register of anaesthetic mortality and morbidity within the Victorian hospital system;
- d. publish an annual report on the activities of the prescribed Consultative Council;

- e. improve public health and wellbeing by publishing and disseminating relevant information and practical strategies identified by the prescribed Consultative Council of performing its functions;
- f. consider, investigate and report on any matter specified by the Minister or Secretary in the direction of the council or the prescribed secretary in a direction to the prescribed Consultative Council;
- g. liaise with any other Consultative Council on any matter relevant to the functions of the prescribed Consultative Council;
- h. perform any function specified in the order which established that prescribed Consultative Council;
- i. perform any other prescribed function.

VCCAMM is the only state mortality committee that also has a brief to report on significant morbidity associated with anaesthesia.

TERMS OF REFERENCE

The role of the council is to provide advice to the Minister for Health and the Department of Health and Human Services on avoidable causes of mortality and morbidity relating to anaesthesia.

The council works closely with the Department of Health and Human Services in its role to advise on strategies to reduce avoidable anaesthesia related mortality and morbidity.

The Clinical Councils Unit within the Health Service Programs Branch, Health Service Performance and Programs Division, Department of Health and Human Services manages and supports the work programs of the council and two other Consultative Councils.

CURRENT DEVELOPMENTS (2017)

In October 2014, VCCAMM members three year term of appointment was due to expire, and, as the Victorian government had entered “caretaker mode” pending the November 2014 election, a decision was made to suspend the council, despite the fact that in August 2014, the chair had been re-appointed for a further three year term. The consequence was a hiatus in the activity of the council until December 2015 when a new, broader council was appointed, with revised terms of reference and functions. The new VCCAMM comprises the existing chair, and 14 other members including six specialist anaesthetists, a medical leader in clinical practice improvement with an anaesthesia background, a pathologist, a private sector hospital executive, a public hospital director of safety and quality, a perioperative nursing representative, a department of health and human services (DHHS) representative and two consumer representatives. The council meets quarterly and does not review cases. Case review is undertaken by a subcommittee (which meets six to eight times per year) including seven VCCAMM members, and three external appointees (two anaesthetists and one surgeon).

VCCAMM is one of three consultative councils which make up the Clinical Councils' Unit (CCU). The others are the Consultative Council on Obstetric and Paediatric Mortality and Morbidity (CCOPMM) and the Victorian Surgical Consultative Council (VSCC). CCU is now part of the newly created Safer Care Victoria (SCV).

Two recent initiatives for the VCCAMM have been the introduction of a web-based electronic reporting tool and collaboration with the Victorian Audit of Surgical Mortality (VASM) which is now able to refer cases which have been identified as possibly or probably anaesthesia related deaths.

Associate Professor Larry McNicol MBBS, FRCA, FANZCA

Chair

Victorian Consultative Council on Anaesthetic Mortality and Morbidity

Western Australia

Anaesthetic Mortality Committee of Western Australia

OVERVIEW

The Anaesthetic Mortality Committee (AMC) of Western Australia was established in 1978 by proclamation of the *Health Act Amendment Act 1978*. The committee consists of five permanent and seven provisional members. For any particular meeting, the chair, having regard to the cases to be discussed, invites two provisional members to make up, with permanent members, a committee of seven. In addition to the committee, the minister appoints a specialist anaesthetist as investigator.

COMMITTEE COMPOSITION (2012-14)

The five permanent members of the committee are:

- A person nominated by the state branch of the Australian and New Zealand College of Anaesthetists who is also chair of the committee.
- A medical practitioner nominated by the executive of Public Health.
- A specialist anaesthetist nominated by the senate of the University of Western Australia.
- A specialist anaesthetist nominated by the Australian Society of Anaesthetists.
- A specialist anaesthetist nominated by the Australian Medical Association.

The seven provisional members are:

- A specialist obstetrician and gynaecologist nominated by the state branch of the Australian Council of the Royal Australian and New Zealand College of Obstetricians and Gynaecologists.
- Two general practitioners with a special interest in anaesthesia, nominated by the state branch of the Royal Australian College of General Practitioners.
- A specialist surgeon nominated by the state branch of the Royal Australasian College of Surgeons.
- A registered midwife nominated by the state branch of the Royal Australian Nursing Federation.
- A dental practitioner nominated by the state branch of the Australian Dental Association.
- The professor of clinical pharmacology of the University of Western Australia.

REPORTING AND REVIEW OF ANAESTHESIA-RELATED DEATHS

All deaths occurring within 48 hours of commencement of an anaesthetic or deaths where the anaesthetic is thought to have been a contributing factor must be reported to the Executive Director of Public Health.

The Executive Director of Public Health, on receipt of a report of such a death, directs the investigator to inquire into the circumstances of the death. If the investigator finds that the death is not likely to have been due to the anaesthetic, he or she reports this to the Executive Director of Public Health, and that, so far as the AMC is concerned, is the end of the matter. If the investigator is of the opinion that the death is likely to have been due in some measure to the anaesthetic, he or she prepares a case report for the chair of the committee.

The investigator receives a report from the anaesthetist concerned. It is usually possible to make a decision based on this report. If not, the investigator may request further information. This is usually in the form of the hospital file and the autopsy report, which are always made available by the relevant authorities. The investigator may also interview the anaesthetist or any other persons likely to assist in the investigation. No one else on the committee is entitled to communicate with any person mentioned in the investigator's report unless that person makes a request in writing.

The chair, having received the report, invites all permanent members and selects at least two provisional members to make up a committee of at least seven. The report is then considered by the committee, which reaches a consensus opinion on the cause of death and whether the conduct of the anaesthetic played any part.

LEGISLATIVE PROTECTION

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. There are strict guidelines for dealing with the material collected by the committee in a confidential manner. 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. The information used by the committee and its opinions about that information are not admissible in any court, and no person furnishing information to the committee is liable in any action for damages. The only exception to the confidentiality clauses are the provisions of the *Coroners Act*, whereby the adducing of evidence for a serious offence would take precedence over the confidentiality clauses of the *Health Act*. With this in mind, the committee has always deferred any discussion of deaths related to anaesthesia until the coroner has brought down his or her report. *The Freedom of Information Act, 1992*, opened a way for the public to breach the confidentiality of the committee. However, under *the Health Services (Quality Improvement) Act, 1994*, the AMC was exempted from the provisions of the *Freedom of Information Act*. The members of the committee believe the acts provide watertight protection for its deliberations and those involved in them.

CURRENT DEVELOPMENTS (2017)

1. There have been no significant changes to the function of the West Australian Anaesthetic Mortality Committee in the period since the last triennial report. However the WA State Government is in the final stages of reviewing and updating the Health Act under which the committee operates. This will come into effect in 2017; there will be some changes to the composition of the committee but not to the reporting and investigation requirements or processes.
2. The committee is exploring options to enable online reporting, however there are issues with maintaining confidentiality, which have yet not been resolved.
3. A standardised template to aid in the completion of the report by the anaesthetist has been trialled and is expected to be available formally in 2017.
4. The committee continues to seek alternative mechanisms to identify deaths within 48 hours of anaesthesia, although if and when such a mechanism is in place, it will continue to seek information provided by the anaesthetists involved in these cases.
5. There continues to be a significant delay in assessment of cases awaiting completion of a coroner's investigation affecting the timing of review by the committee.
6. There is ongoing education at regional meetings and consultation with hospitals and individuals regarding the reporting requirements for anaesthetic mortality.

Dr Jennifer (Jay) Bruce FANZCA

Chair

Anaesthetic Mortality Committee of Western Australia

Tasmania

Tasmanian Audit of Anaesthesia Mortality

OVERVIEW

During the triennium of 2012-14, Tasmania, mortality data was collected and reviewed by the Tasmanian Audit of Anaesthesia Mortality (TAAM). The audit is being run in tandem with the Tasmanian Audit of Surgical Mortality (TASM), for a number of reasons including:

- I. Sharing of resources including staff, office space, consumables and software.
- II. Funding approval from the state government was easier to secure for a joint audit, as funding was already in place for the surgical audit, and additional funding for the anaesthesia audit was small in comparison (the initial establishment costs for the surgical audit having been met by Royal Australasian College of Surgeons).
- III. Ease of identifying cases – surgical audit office is notified of all deaths occurring in Tasmania within 30 days of a surgical procedure, so capture rate for post-surgical deaths is high.

COMMITTEE COMPOSITION (2012-14)

The audit is co-ordinated by a committee consisting of representatives from the three main regions (health department regions) of the state and a representative of the Department of Health and Human Services.

REPORTING AND REVIEW OF ANAESTHESIA-RELATED DEATHS

As 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. This system allows us to engage more Fellows in the audit process, encourage wider participation and awareness of the audit, ensures anonymity is maintained, allows Fellows to gain continuing professional development points for the case reviews, and facilitates more timely feedback than having a small committee reviewing all cases at intervals during the year. This system works particularly well in a small population.

LEGISLATIVE PROTECTION

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

The current coronial act is Tasmanian Coroner's Act 1995, in which a reportable death is defined as a death occurring under anaesthesia or sedation, or occurring as a result of anaesthesia or sedation and is not due to natural causes.

TERMS OF REFERENCE

The Tasmanian Audit of Surgical Mortality Safety and Quality Committee functions with the following terms of reference (enacted 2006):

1. The objects of the committee shall be:
 - 1.1. To provide leadership and strategic direction for the development and implementation of the Tasmanian Audit of Surgical Mortality (TASM).
 - 1.2. 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.
 - 1.3. To promote the use of the independent audit of surgical and anaesthesia mortality among all Tasmanian surgeons and anaesthetists.
 - 1.4. To compare surgical and anaesthesia mortality outcomes in Tasmania with other Australian states and territories, and with international standards.
 - 1.5. 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.
 - 1.6. 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.
 - 1.7. To provide direction and support for first level evaluations of perioperative mortality reported on a voluntary basis by participating surgeons and anaesthetists.
 - 1.8. 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.
 - 1.9. 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.
 - 1.10. To promote systemic improvements in the safety and quality of healthcare in the Tasmanian health system both in hospitals and other healthcare settings.
 - 1.11. 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.
 - 1.12. 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.
 - 1.13. To report in accordance with these terms of reference.

Dr Margaret Walker, FANZCA

Co-ordinator

Tasmanian Anaesthesia Mortality Audit

South Australia

South Australian Anaesthetic Mortality Committee

OVERVIEW

During the triennium 2009-11 South Australia was in the process of re-establishing its anaesthetic mortality committee, so reporting had dropped off considerably. However, the South Australian Anaesthetic Mortality Committee (SAAMC) was granted confidentiality under the *Health Care Act 2008*, gazetted in September 2010 and recommenced meetings in 2011, chaired by Professor W John Russell. The committee worked through the backlog of reports from 2008-10 and is currently continuing to assess reports with Dr Simon Jenkins as the current chair.

Its role is to analyse adverse event information, specifically patient mortality, from health services related to anaesthesia with the objective of recommending quality improvement initiatives. To facilitate the reporting, the anaesthetists' and surgeons' reporting forms are available to download on the SA ANZCA website at <http://sant.anzca.edu.au/committee/south-australia-anaesthetic-mortality-committee.html>.

Only 18 reports were considered for the 2009-11 triennium, however, reporting of deaths has been increasing annually since the re-establishment of the committee.

COMMITTEE COMPOSITION (2012-14)

Members of the South Australian Anaesthetic Mortality Committee consist of the following:

Three nominations each from:

- Australian and New Zealand College of Anaesthetists.
- Australian Society of Anaesthetists.

One nomination each from:

- South Australian Department of Health and Aging.
- College of Intensive Care Medicine.
- Royal Australasian College of Surgeons.
- Australian College of Operating Room Nurses.
- Royal Australian and New Zealand College of Obstetricians and Gynaecologists.
- Australian College of Rural and Remote Medicine.

REPORTING AND REVIEW OF ANAESTHESIA-RELATED DEATHS

The SAAMC reports to the South Australian and Northern Territory Regional Committee of ANZCA, the Quality and Safety Committee and South Australian Health Safety and Quality Council. All reports, communication and/or advice given to these or any other persons/groups/bodies will not contain identifying information.

The committee meets quarterly. Individual reports are considered at each meeting.

LEGISLATIVE PROTECTION

The SA Anaesthetic Mortality Committee has qualified privilege under Part 7 of the *Health Care Act 2008*.

CURRENT DEVELOPMENTS (2012-14)

During the 2012-14 triennium, SAAMC and the South Australian Audit of Perioperative Mortality (SAAPM) were able to strengthen their ties through membership spanning the two protected committees and collaboration towards an annual SAAPM Seminar. This relationship has continued to grow since.

Dr Simon Jenkins, FANZCA

Chair

South Australian Anaesthetic Mortality Committee

Queensland

Queensland Perioperative and Periprocedural Anaesthetic Mortality Review Committee

OVERVIEW

The Queensland Perioperative and Periprocedural Anaesthetic Mortality Review Committee (QPPAMRC) was established as a Quality Assurance Committee on May 21, 2012 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.

COMMITTEE COMPOSITION (2012-14)

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

The QPPAMRC was established to:

- a. Collect and analyse clinical information regarding perioperative and periprocedural anaesthetic mortality in Queensland to identify state-wide 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.

The committee comprises:

Senior Specialist Anaesthetist (Chair), four other specialist anaesthetists, an anaesthetic support officer, two specialist surgeons and a forensic pathologist.

REPORTING AND REVIEW OF ANAESTHESIA-RELATED DEATHS

Reporting deaths to the QPPAMRC is voluntary.

LEGISLATIVE PROTECTION

The QPPAMRC operates in accordance with sections 81-92 of the Act. All information held by the QPPAMRC is managed in accordance with the Act and where relevant, the Information Privacy Act 2009.

TERMS OF REFERENCE

The QPPAMRC Terms of Reference outlines the committee's purpose, functions, membership, reporting requirements and business rules and a Privacy Policy has been developed to guide activity and reflect confidentiality obligations.

CURRENT DEVELOPMENTS (2017)

The first meeting of the QPPAMRC was convened on August 1, 2012.

Since the first report was logged on the QPPAMRC Anaesthetic Death Register (online database) on August 20, 2012, over 1000 deaths have been reported. The Register continues to be enhanced and refined. A solution to enable private hospitals to report deaths to the QPPAMRC is currently under development.

Ongoing changes to the Queensland Health organisational structure throughout the period have impacted on the ability of some anaesthetic departments to report deaths to the QPPAMRC. An audit was conducted in 2015 to identify consistency of reporting. The QPPAMRC Chair and secretariat are interacting with sites across the state to establish or re-establish processes and promote reporting.

The QPPAMRC has developed a mortality review report (volume 1) based on the first 800 reported cases which includes six case studies as learning opportunities for anaesthetists.

Dr James Troup

Chair

Queensland Perioperative and Periprocedural Anaesthetic Mortality Review Committee

Australian Capital Territory

Australian Capital Territory Audit of Anaesthesia Mortality

OVERVIEW

Australian Capital Territory Audit of Anaesthesia Mortality data review only began in February 2014. Thus, this first contribution from the ACT to the Triennial report is incomplete.

COMMITTEE COMPOSITION (2012-14)

The audit is conducted alongside the ACT Audit of Surgical Mortality (ACTASM) which began in October 2010 and now involves most surgical craft groups. The Royal Australian College of Surgeons and ACT Health jointly fund the ACTASM Project Manager position.

REPORTING AND REVIEW OF ANAESTHESIA-RELATED DEATHS

Participation in ACTASM is mandatory for surgeons. Involvement by anaesthetists is voluntary – 48% have agreed to participate with many volunteering to be assessors.

All deaths within 30 days of a surgical procedure are reported to the ACTASM 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 and it is anticipated that in this way surgical craft groups not included in ACTASM (such as maxillo-facial surgery) or other areas where anaesthesia services are provided will be included.

First-line assessment of the de-identified Anaesthetic Case Form occurs by the anaesthetic representative on the ACTASM Committee or other local Fellow who has volunteered to be an assessor. Second-line assessment of the patient notes will occur by assessors from other states with reciprocal assessment by ACT Fellows as requested. If there is concern about local first-line assessment, then it is proposed that the anaesthetic representative on ACTASM and the Chairs (or their nominee) of the Regional Committees of ANZCA and ASA will decide on whether external review is appropriate.

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

Northern Territory

Northern Territory Audit of Anaesthesia Mortality

OVERVIEW

Anaesthetic mortality data review only began in July 2016. Thus, the Northern Territory (NT) is not in a position to provide data for the 2012-14 Safety of Anaesthesia report. It is anticipated that data will be provided for the 2015-17 report.

COMMITTEE COMPOSITION

The audit is conducted alongside the NT Audit of Surgical Mortality (NTASM). The Royal Australian College of Surgeons and 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. Involvement by anaesthetists is voluntary – although the majority of anaesthetists at the five hospitals in the NT have signed the participation form. These hospitals include Royal Darwin Hospital, Darwin Private Hospital, Alice Springs Hospital, Gove District Hospital and Katherine District Hospital. Thirty-one anaesthetists have signed the participation form.

All deaths related to a surgical procedure, or if a death occurred 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 and it is anticipated that in this way other areas where anaesthesia services are provided will be included.

As the NT is a small jurisdiction it was thought that to maintain impartiality all first-line assessment of the de-identified Anaesthetic Case Form was passed via the NTASM project officer to the Tasmanian Audit of Surgical Mortality (TASM). TASM would then task 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 the patient notes will occur by assessors from Tasmania with reciprocal assessment by NT Fellows as requested.

TASM has stated that they are happy to collate our NT de-identified data for the ANZCA Triennial 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

NT Audit of Anaesthesia Mortality

New Zealand

Perioperative Mortality Review Committee

OVERVIEW

The New Zealand Perioperative Mortality Review Committee (POMRC) was established in 2010 under the *NZ Public Health and Disability Act 2000* and reports to the Health Quality and Safety Commission alongside the already established mortality review committees; that is the Perinatal and Maternal, the Family Violence, the Child Mortality Review Committees and recently the time-limited Suicide Mortality Review Committee. The committee of the mortality review committee chairs is working to co-ordinate and, where appropriate, integrate the activities of the respective committees and align the work of the committees with the aims of the Health Quality and Safety Commission.

COMMITTEE COMPOSITION (2012-14)

The committee will have a maximum of eight members, including a public member, which will include the following expertise:

- a. Substantial clinical experience and national credibility in one or more of the following: anaesthesia; surgery; obstetrics and gynaecology; intensive care; surgical nursing; and procedural internal medicine (for example, cardiology).
- b. Knowledge of and experience in clinical epidemiology.
- c. Knowledge of quality and risk management, in particular quality improvement in the health sector.
- d. Knowledge of data and information gathering systems and analysis.
- e. Senior level health service provision and management, both public and private sectors.
- f. Knowledge of Māori health.

DEATHS TO BE REPORTED

1. Deaths that occurred during or after an operative procedure:
 - a. Within 30 days.
 - b. After 30 days but before discharge from hospital.
2. A death that occurred while under the care of a surgeon in hospital even though an operation was not undertaken.

Noting that:

3. An operative procedure is defined as any procedure that requires anaesthesia (local, regional or general) or sedation.
4. Gastroscopies, colonoscopies, and cardiac or vascular angiographic procedures (diagnostic or therapeutic) carried out in designated endoscopy or radiological rooms would be included in this definition.

CONFIDENTIALITY

The provisions relating to confidentiality are contained in schedule 5 of the *NZ Public Health and Disability Act 2000*, and place strict limits on disclosure of information. Anyone who discloses information illegally faces a fine of up to \$10,000 and if a registered health practitioner, disciplinary action.

Coroners Act 2006 (relevant sections)

- (1) The purpose of this act is to help to prevent deaths and to promote justice through:
 - (a) Investigations, and the identification of the causes and circumstances, of sudden or unexplained deaths, or deaths in special circumstances.
 - (b) The making of specified recommendations or comments (as defined in **section 9**) that, if drawn to public attention, may reduce the chances of the occurrence of other deaths in circumstances similar to those in which those deaths occurred.
- (14) Deaths that must be reported under section 13(2)
 - (b) a death—
 - (i) that occurred during, or appears to have been the result of, a medical procedure; and
 - (ii) that was medically unexpected:
 - (c) a death—
 - (i) that occurred while the person concerned was affected by an anaesthetic; and
 - (ii) that was medically unexpected:
 - (d) the death of a woman that occurred while the woman was giving birth, or that appears to have been a result of the woman being pregnant or giving birth:

TERMS OF REFERENCE

The committee is required to:

1. Review and report to the Health Quality and Safety Commission on deaths that are within the committee's scope, with a view to reducing these deaths and to continuous quality improvement through the promotion of ongoing quality assurance programs.
2. Advise on any other matters related to mortality.
3. Develop strategic plans and methodologies that are designed to reduce morbidity and mortality and are relevant to the committee's functions.

The committee must:

1. Monitor the number, categories and demographics of deaths relevant to its functions and to identify patterns and trends over time.
2. Undertake or co-ordinate reviews locally as local quality improvement initiatives, for system and practice

improvements to reduce avoidable perioperative mortality and as data collection systems for national review.

3. Analyse and use data collected to develop effective recommendations that are useful for policy development at a national level.

CURRENT DEVELOPMENTS (2017)

POMRC has now released five reports:

2012: <http://www.hqsc.govt.nz/assets/POMRC/Publications/POMRC-2011-Report-Lkd.pdf>

2013: <http://www.hqsc.govt.nz/assets/POMRC/Publications/POMRC-second-report-March-2013.pdf>

2014: <http://www.hqsc.govt.nz/assets/POMRC/Publications/third-POMRC-report-June-2014.pdf>

2015: <http://www.hqsc.govt.nz/assets/POMRC/Publications/POMRC-fourth-report-Jun-2015.pdf>

2016: <http://www.hqsc.govt.nz/assets/POMRC/Publications/POMRC-fifth-report-Jun-2016.pdf>

The latter four were released at a national workshop. POMRC has two streams to its activities, the epidemiological analysis of perioperative deaths, and in-depth peer review of selected classes of deaths.

For the epidemiological analysis, POMRC uses data from the National Minimum Dataset (NMDS), which receives coded information about all discharges from public and some discharges from private facilities, and the National Mortality Collection (NMC), which receives information from multiple sources including death certificates, police and coroner. Using these data sources allows deaths in institutions the patient was transferred to and after discharge to be identified. These reports have focused on the epidemiology of all-cause perioperative deaths related to specific procedures (general anaesthesia, total hip and knee replacements, colorectal resection, cataract extraction, cholecystectomy), a higher expected mortality group (age 80+), a lower expected mortality group (ASA-P 1-2 elective admissions), post-operative complications (pulmonary embolus) and recent concerns in other countries (day of week of procedure). Each specific group of deaths is analysed with respect to admission status (elective, acute-arranged, acute), gender, ASA status, ethnicity and socio-economic status (NZDEP scale). As with the reports from the Australian state mortality committees, the main risk factors are the specific procedure, age, admission status and ASA status.

While cause of death is noted in the national mortality collection, it is the underlying cause of death, not the proximate cause of death. Specific classes of deaths are tracked over time so that trends can become apparent.

These data can describe who died, but not why they died or

if some of those deaths could have been prevented. This is the focus of the second stream of work, peer review of selected cases of interest. To do this, the committee needs to receive reports describing the care delivered in more detail. POMRC envisages that local review will occur within the institution that delivered the care, be multi-disciplinary, and the results of that analysis will be reported to POMRC. POMRC will choose specific classes of deaths for in-depth review (for example, patients having fixation of fractured neck of femur), which will change annually or biennially. These processes are under development.

So far, many of the recommendations from the first five reports necessarily are about better information collection and analysis, including a recommendation that the ASA score is collected for each anaesthesia episode and that it is used as a method of communicating patient condition between the professionals involved in the patient's care. For better patient care, POMRC has recommended that patients receive accurate information about the risk of perioperative death when that is significant, that non-operative treatment is considered, and that the psychosocial factors are taken into account in care.

The following key findings and recommendations are from the POMRC fifth report, Executive Summary (reproduced with permission from the Health Quality & Safety Commission New Zealand).

KEY FINDINGS FROM NEW CLINICAL AREAS

For the two new clinical areas examined, as with other clinical areas previously examined, higher 30-day mortality rates were consistently associated with:

- increasing age.
- comorbidities and poorer overall health status (higher CCIs and ASA scores).
- emergency (unarranged) admissions into hospital.

DAY-OF-THE-WEEK MORTALITY

- Mortality among all admissions whose first procedure with a general anaesthetic was on a Saturday or Sunday was significantly higher compared to mortality among those whose first procedure was on Tuesday (ie, a "weekend effect" was shown), after adjusting for socio-demographic and clinical factors (CCI and ASA score).
- Among those admitted acutely, the risk of mortality following the first procedure with a general anaesthetic was significantly higher if the day of procedure was either Saturday or Sunday, compared to Tuesday, after adjusting for socio-demographic and clinical factors.
- Among those admitted electively, the risk of mortality following the first procedure with a general anaesthetic was significantly higher for weekend procedures (Saturday and Sunday combined), compared to Tuesday procedures, after adjusting for socio-demographic and clinical factors.

FIFTH REPORT RECOMMENDATIONS

The following four categories of recommendations were informed by data presented in this report. The first three of these categories were developed by the POMRC. The final category of recommendations was developed by the Māori Caucus, convened by the Health Quality & Safety Commission.

1. Improvements to care:

- a. Non-operative treatment for patients who are assessed as having an ASA status of 5 must be considered.
- b. The risk of dying perioperatively should be discussed with all patients contemplating an operation with a significant risk.
- c. Death following elective surgery performed on the weekend should be investigated in depth by that health care institution, assessing all potential contributory factors.

2. Better documentation:

- a. All patients should have their ASA status recorded in their clinical anaesthetic record.

3. Further research and research funding:

- a. The difference in mortality between patients having procedures in the weekend compared to weekdays, in particular those admitted electively, should be investigated.
- b. The reasons for increased perioperative mortality of Māori should be further investigated.

4. Recommendations from the Māori Caucus to the POMRC for better data analysis:

- a. The impact that the Māori population age structure has on analyses of perioperative mortality should be investigated.
- b. The Charlson Comorbidity Index should be considered to strengthen future analyses and better understand how severity of illness impacts Māori perioperative mortality.

Dr Leona Wilson

Chair

New Zealand Perioperative Mortality Review Committee

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Appendices

Appendix 1: 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 death was caused by both medical/surgical and anaesthesia factors.
<p>Explanatory notes:</p> <ul style="list-style-type: none"> • <i>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.</i> • <i>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.</i> • <i>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.</i> 	
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 are missing.
Category 8	Cases that cannot be assessed because of inadequate data.
CASUAL OR CONTRIBUTORY FACTORS IN CATEGORY A DEATH	
<i>Note that it is common for more than one factor to be identified in the case of anaesthesia attributable death.</i>	
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	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 it is considered that the medical condition was a significant factor in the anaesthesia-related death.

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