



ANZCA

AUSTRALIAN AND NEW ZEALAND
COLLEGE OF ANAESTHETISTS

Safety of Anaesthesia

A review of anaesthesia-
related mortality reporting
in Australia and New Zealand
2009-2011

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

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Foreword



Dr Genevieve Goulding

Ensuring our patients enjoy the highest in healthcare standards and outcomes is a critical role for ANZCA and the reason reports such as *Safety of Anaesthesia: A review of anaesthesia-related mortality reporting in Australia and New Zealand 2009-2011* play an important role in what we do.

Reporting this important information also complies with ANZCA's first strategic priority to "advance standards through training, education, accreditation and research".

This year, *Safety of Anaesthesia* contains data from five Australian states (NSW, SA, Tasmania, Victoria and WA). This represents 17.3 million or 70 per cent of the Australian population and can thus be considered a reasonable estimate of anaesthetic mortality for this period. It equates to an anaesthesia mortality rate of three deaths per million population per annum, which is very similar to the figure (2.79) in the previous triennium (2006-08) for the four states covered (NSW, Tasmania, Vic, and WA).

Importantly, this report shows a continued reduction in the percentage of category one deaths (where it was considered "reasonably certain" that death was caused by anaesthesia factors alone). In 2003-05, category one deaths made up 21 per cent of the total anaesthesia-related deaths, and this reduced to 15 per cent in 2006-08 and 14 per cent in 2009-11.

For the first time, a brief clinical summary of the category one causes of death is included. Interestingly, of the 22 category one deaths, seven were due to anaphylaxis, five involved management of the airway, five involved pulmonary aspiration and three deaths involved cardiac arrest.

This report continues a long tradition in reporting anaesthesia-related deaths, which started in 1960 in NSW. More recently, the South Australian Mortality Committee was re-established (in 2010) and has been able to provide mortality data for this ninth triennial report. The next report (2012-14) will contain Queensland data thanks to the re-establishment in 2012 of the Queensland Perioperative and Peri-procedural Anaesthetic Mortality Review Committee (QPPAMRC).

To ensure we have a more complete picture of the Australian situation, the reporting is set to expand, with ANZCA's ACT Regional Committee working with the ACT Audit of Surgical Mortality (Royal Australasian College of Surgeons) to develop anaesthesia mortality reporting. The South Australian committee could receive data from the Northern Territory as has occurred previously. New Zealand has a multi-disciplinary perioperative mortality committee, and although this committee is unable to specifically provide the information needed for our reports, its report is very informative.

The efforts of all involved in compiling this report, in particular its editor, Associate Professor Larry McNicol, the mortality committees and the reporting anaesthetists are gratefully acknowledged along with the co-operating coroners.

Dr Genevieve Goulding
President, ANZCA

Mortality Subcommittee

The Mortality Subcommittee 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

Dr Genevieve Goulding

Chairs or co-ordinators of functioning (2014) Australian state/territory and New Zealand anaesthesia mortality committees

Chair/Co-ordinator	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 Brian Spain	Northern Territory
Dr Phillipa Hore	ANZCA
Dr Peter Roessler	ANZCA

ANZCA Safety and Quality Co-ordinator

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 15.

Executive Summary



Larry McNicol

1. This is the ninth triennial report of anaesthesia-related mortality in Australia (the first being for the triennium 1985-87¹⁻⁸). The format is similar to previous reports, and contains data from five states (New South Wales, South Australia, Tasmania, Victoria and Western Australia). The ANZCA Mortality Sub-Committee has supported these states in their collection of data and encouraged the establishment or re-establishment of anaesthetic mortality reporting in other Australian states and territories and in New Zealand. The South Australian Mortality Committee was re-established in 2010 and has been able to provide mortality data for 2009-11.
2. While this report contains data from only five states, these five states include more than 70 per cent of the population of Australia. The report is therefore likely to provide a reasonable estimate of anaesthetic mortality across Australia for this period.
3. The Australian Capital Territory (ACT), the Northern Territory and Queensland, did not provide anaesthetic mortality data for this report because they did not have functioning anaesthetic mortality committees during the 2009-11 triennium. However, the Queensland Perioperative and Peri-procedural Anaesthetic Mortality Review Committee (QPPAMRC) was re-established in 2012 and will be able to provide mortality data for the next triennial report (2012-14). The ACT Regional Committee of the Australian and New Zealand College of Anaesthetists (ANZCA) is working with the ACT Audit of Surgical Mortality (Royal Australasian College of Surgeons) to develop anaesthesia mortality reporting similar to the model established in Tasmania. It is possible the South Australia committee could receive data from the Northern Territory as has occurred previously. New Zealand has established a multi-disciplinary perioperative mortality committee, and although this committee is unable to provide specific anaesthesia mortality data using the Australian classification system, the report is very informative. (See *State, Territory and National Information*, page 15.)
4. As with all anaesthesia mortality reporting, 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. Nevertheless, due to the comprehensive processes in place in all five states reporting, it is unlikely that many cases were missed or classified incorrectly.
5. During the triennium, the number of anaesthesia-related deaths (categories one, two and three) reported from the five states was 156. However, in only 22 cases were the deaths classified as category one (where it was considered 'reasonably certain' that death was caused by anaesthesia factors *alone*). In 15 cases there was 'some doubt' (category two), and in the remaining 119 cases, 'medical, surgical and anaesthetic' factors were implicated (category three). This demonstrates a continued reduction in the percentage of category one deaths in recent triennial reports. In 2003-05, category one deaths were 21 per cent of the total anaesthesia-related deaths, and this reduced to 15 per cent in 2006-08 and 14 per cent in 2009-11.
6. During the triennium, the combined population for the five states was about 17.3 million (Australian population statistics)⁹. Using this figure, the anaesthesia-related mortality rate for these five states was 3.01 deaths per million population per annum. This is slightly higher than the figure (2.79) for the four states (NSW, Tasmania, Vic and WA) in the previous triennium (2006-08)⁷. It is, however, very similar to the anaesthesia mortality rate per million population per annum in all triennial reports since 1997-99.
7. During the triennium there were about 9.05 million individual episodes of anaesthesia care in the five states. This figure was obtained from the Australian Institute of Health and Welfare (AIHW)¹⁰. 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 1:58,039 for the five states included in this report. This is similar to figure for the four states (NSW, Tasmania, Vic, WA) for the previous triennium (2006-08; 1:55,490⁷).
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 identified for each state and the population of each of the five states. The ratio was consistent across all five states (NSW 0.16, WA 0.17, SA 0.18, Tas. 0.18, Vic. 0.18).

9. The majority of anaesthesia-related deaths (84 per cent) occurred in older patients (age over 60 years). Fifty-one per cent of cases were female. It is of some interest that 70 per cent of anaesthesia-related deaths occurred when surgery was either urgent or emergent. This is a significant change from the previous report (2006-08) when approximately one third were urgent or emergent. Only a very small proportion (7 per cent) occurred in patients considered low risk (ASA-P 1-2)¹². Hence 93 per cent of anaesthesia-related deaths occurred in patients assessed as higher risk (ASA-P 3-5). The types of surgery most frequently associated with anaesthesia-related death were orthopaedics (48 per cent), cardiothoracic (14 per cent), vascular (10 per cent) and abdominal surgery (10 per cent). An emerging trend is the increased frequency of anaesthesia-related deaths in gastro-intestinal endoscopy and interventional procedures in cardiology/radiology (10 per cent). Of note, some of these did not involve an anaesthetist at all.
10. For the first time, information has been included regarding the location of the event leading to death as well as the location of death. The vast majority of fatal events, 96 per cent, occurred in the operating or procedure room (139 cases out of 145, excluding WA from which data was unavailable). The most common location of death was the intensive care unit (39 per cent), followed by the operating or procedure room (27 per cent), the general ward 19 per cent and the post-anaesthesia care unit (10 per cent).
11. As in previous reports, the majority of deaths occurred in metropolitan teaching hospitals and larger regional teaching hospitals (55 per cent), as would be expected with the acuity of the cases in these hospitals. By far the majority of deaths (83 per cent) involved specialist anaesthetists (121/145 as data for WA was not available). Twelve cases involved non-specialist/GPs, seven were anaesthesia trainees, and in at least four cases there was no anaesthetist in attendance.
12. 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 and 1.01 in 2009-11. 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 and 81 per cent in 2009-11. 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 also progressively increased, from 20 per cent in 2000-02, 33 per cent in 2003-05, 49 per cent in 2006-08 to 58 per cent in 2009-11. 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.
13. For the first time, this triennial report includes a brief clinical summary of the causes of death in those classified as category one (where it is 'reasonably certain' death was caused the anaesthesia or other factors under the control of the anaesthetist). Of the 22 category one deaths, seven were due to anaphylaxis, five involved management of the airway, five involved pulmonary aspiration, three deaths involved cardiac arrest attributed to inappropriate choice or application of anaesthesia technique and there were two fatal outcomes resulting from invasive cardiovascular procedures. Of note; (i) *anaphylaxis remains one of the less preventable causes of anaesthesia-related deaths, but early diagnosis and appropriate crisis management with escalating doses of adrenaline and aggressive fluid replacement are paramount*; (ii) *in more than one of the airway-related deaths there was an inappropriate choice or application of anaesthesia technique and inadequate monitoring*; and one case involved a non-anaesthesia trained practitioner; (iii) *in four of the five aspiration-related deaths, aspiration risk was high and no airway protection was provided*; in two of these cases, *no anaesthetist was involved*; (iv) *the three deaths due to cardiac arrest all involved inadequate preoperative assessment or management and inappropriate choice or application of anaesthesia technique and were deemed to have been preventable*; and (v) *both the deaths due to invasive procedures involved uncertainty about the anatomical position of the vascular access device*.
14. 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 (3.01) or by the number of anaesthesia-related deaths per number of anaesthesia procedures per annum (one in 58,021). The emerging pattern is that anaesthesia risk is now extremely low in patients who are basically fit and well (ASA-P 1 – 2). However, 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. Of course 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, 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.

Larry McNicol, FRCA FANZCA

Editor

Chair, ANZCA Mortality Sub-Committee

Recommendations

The ANZCA Mortality Sub-Committee makes the following recommendations:

1. 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.
2. Patients, health 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.
3. 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.
4. Healthcare authorities should recognise that anaesthesia mortality is higher in older, sicker patients having major or urgent surgery and appropriate perioperative resources are required, including the provision of appropriate levels of specialist anaesthetist care, supervision and high dependency facilities (ANZCA professional document PS59: *Statement on Roles in Anaesthesia and Perioperative Care*).
5. 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*).
6. Many anaesthesia-related deaths are potentially preventable and these could be further reduced by continuous improvement in training, medical education and increased allocation of specialist anaesthesia resources. However, there remains a component of anaesthesia-related mortality deemed not preventable in the current state of knowledge. The pursuit of “no deaths attributable to anaesthesia” therefore requires further research into safer drugs and techniques.

Clinical aspects of category one anaesthesia-related deaths

For the first time, in this the ninth triennial anaesthesia mortality report, we have 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. There were seven deaths due to **anaphylaxis**, five involving management of the **airway**, five involving pulmonary **aspiration**, three deaths involving **cardiac arrest** attributed to inappropriate choice or application of anaesthesia technique and two fatal outcomes resulting from **invasive cardiovascular procedures**.

Anaphylaxis (seven)

There were seven deaths from anaphylaxis due to drugs administered by the anaesthetist. Five of them involved profound hypotension and cardiac arrest and in the other two the major initial presentation was severe bronchoconstriction and hypoxaemia, with subsequent cardiac arrest. In four of the cases, the trigger agent was a neuromuscular blocker (atracurium, rocuronium x two, suxamethonium). In another case, although atracurium had been given earlier, the likely trigger was cephazolin. Of the remaining two cases, one involved administration of vecuronium as well as both cephazolin and gentamicin, and the other was due to ampicillin. In at least one of the cases, initial crisis management did not take account of possible anaphylaxis and in five other cases, there were significant co-morbidities, which were likely to have contributed to the failure of resuscitation.

Note: Anaphylaxis remains one of the less preventable causes of anaesthesia-related deaths, but early diagnosis and appropriate crisis management with escalating doses of adrenaline and aggressive fluid replacement are paramount.

Airway related deaths (five)

There was one death in which the airway was lost during maxillofacial surgery performed with the use of a submentally placed endotracheal tube. Airway obstruction from tube malpositioning resulted in hypoxic cardiac arrest prior to the difficult replacement with an oral endotracheal tube. Another death was attributed to airway obstruction, which occurred immediately after extubation in a patient who had undergone prolonged emergency surgery. The initial laryngoscopy had been rated as grade 3 and endotracheal intubation involved the use of a bougie. Emergent repeat direct laryngoscopy noted oedema and bleeding and there were two unsuccessful attempts at re-intubation, prior to hypoxic cardiac arrest. During CPR, endotracheal re-intubation was established via a blind technique through a Fastrach LMA, but hypoxic encephalopathy ensued. Another patient had a cardiac arrest (presumed to be due to hypoxia from airway obstruction) during spontaneous respiration under intravenous anaesthesia for a minor procedure administered by a medical practitioner without anaesthesia expertise. A patient with obstructing malignant pathology of the upper airway died from the sequelae of barotrauma complicating jet ventilation used during anaesthesia for the endoscopic

procedure. Another death was attributed to loss of the airway during anaesthesia with spontaneous respiration with a supraglottic airway, resulting in hypoxic cardiac arrest prior to successful endotracheal intubation.

Note: In more than one of these cases there was an inappropriate choice or application of anaesthesia technique and inadequate monitoring; and one case involved a non-anaesthesia trained practitioner.

Aspiration (five)

There were five deaths due to pulmonary aspiration, four of which occurred in the setting of endoscopy with an unprotected airway. One case involved a patient who 12 hours previously had been administered anaesthesia for gastroscopy, which was abandoned due to limited mouth opening and failure to intubate. In the setting of ongoing bleeding, and in the absence of any anaesthetist, the endoscopist administered sedation for the repeat attempt gastroscopy. The patient had a cardiac arrest, which was attributed to aspiration of blood, hypoxia, hypovolaemia and underlying cardiac disease. There were three other cases of aspiration in which high-risk upper gastrointestinal endoscopy was performed under anaesthesia without protection of the airway. In an elderly frail patient with an incarcerated umbilical hernia, an emergency physician trainee attempted to reduce the hernia under intravenous sedation, but abandoned the procedure due to apnoea and aspiration.

Note: In four of the five cases, aspiration risk was high and no airway protection was provided. In two of these cases, no anaesthetist was involved.

Cardiac arrest (three)

There were three deaths involving cardiac arrest resulting from inappropriate choice or application of anaesthesia technique. There were two patients with multiple co-morbidities who suffered cardiac arrest after induction of anaesthesia, both of whom received excessive doses of induction agents. One of them was also scheduled for emergency surgery and was hypovolaemic. Another patient with severe cardiac disease died during intravenous sedation/anaesthesia for a very minor procedure that was either not required at all or could have been performed under local anaesthesia alone.

Note: These three deaths all involved inadequate preoperative assessment or management and inappropriate choice or application of anaesthesia technique and were deemed to have been preventable.

Invasive procedure related deaths (two)

There was a death associated with the use of a pulmonary artery catheter (PAC) used for monitoring during cardiac surgery. Pulmonary artery rupture was attributed to uncertainty regarding the position of the PAC and inappropriate advancement. Another death resulted from inadvertent misplacement of a central venous device inserted to provide access for parenteral nutrition. There were issues associated with the type of catheter used and the monitoring of its position after insertion.

Note: Both these cases involved uncertainty about the anatomical position of the vascular access device.

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 15.

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 and SA

Number of deaths classified

The total number of deaths reviewed by the five states for the triennium was **1052**, of which **156** were considered to be wholly or partly related to anaesthetic factors (categories one, two and three Table 2). Of the **1052** cases reviewed, **30** 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	647	11	8	106	125
Vic	61	7	0	11	18
WA*	271	4	6	1	11
Tas	55	0	0	0	0
SA	18	0	1	1	2
Total	1052	22	15	119	156

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*, page 15). 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.

Number of anaesthesia-related deaths in relation to population

Table 3: Number of anaesthesia-related deaths during the 2009-11 triennium, in relation to the population* of NSW, Vic, WA, Tas and SA

No. of deaths considered anaesthesia-related	156
Population of NSW, Vic, WA, Tas and SA.	(17.3 million)
No. of anaesthesia-related deaths per million population, 2009-11	9.02
No. of anaesthesia-related deaths per million population per annum	3.01

* Estimated resident population for 2010 (**Australian Bureau of Statistics**)⁹ [NSW 7.25, Vic 5.56, WA 2.30, Tas 0.51, SA 1.65 (x million)].

The 'estimated resident population' is considered more accurate than the Census figure.

The number of anaesthesia-related deaths per million population at 3.01 was slightly greater than in the previous reports (2003-05)⁷, in which there were approximately 2.73 anaesthesia-related deaths per million population per annum and (2006-08)⁸ in which there were approximately 2.79 anaesthesia-related deaths per million population per annum.

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

	1997-99 ⁵	2000-02 ⁶	2003-05 ⁷	2006-08 ⁸	2009-11
NSW	56	67	53	92	125
Vic	32	39	40	21	18
SA and NT	11	3	-	-	-
SA	-	-	-	-	2
WA	11	16	19	7	11
Qld	20	12	-	-	-
Tas	-	-	-	4	0
Total	130	137	112	124	156

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***
Population (x million)	13.40	13.75	13.68	14.80	17.30
Number of anaesthesia-related deaths	130	137	112	124	156
Anaesthesia-related death rate per million population per triennium	9.70	9.96	8.19	8.37	9.02
Anaesthesia-related death rate per million population per annum	3.23	3.32	2.73	2.79	3.01

Population source – **Australian Bureau of Statistics** *NSW, Vic, WA **NSW, Vic, WA, Tas ***NSW, Vic, WA, Tas, SA

It is noteworthy that the anaesthesia-related death rate per million population per annum is very similar in all triennial reports since 1997-99.

Findings for NSW, VIC, WA, Tas and SA continued

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 6.

Table 6: Causal or contributory factors in anaesthesia-related deaths

	NSW	Vic	WA	Tas	SA	Total
A Preoperative	21	5	2	0	1	30
i assessment	15	3	0	0	0	
ii management	6	2	2	0	1	
B Anaesthesia Technique	15	10	6	0	0	32
i choice or application	10	3	1	0	0	
ii airway maintenance	4	4	4	0	0	
iii ventilation	0	3	1	0	0	
iv circulatory support	1	0	0	0	0	
C Anaesthesia Drugs	19	6	3	0	2	30
i selection	3	0	0	0	2	
ii dosage	11	3	3	0	0	
iii adverse event	5	2	0	0	0	
iv incomplete reversal	0	1	0	0	0	
v inadequate recovery	0	0	0	0	0	
D Anaesthesia Management	21	8	2	0	1	32
i crisis management	8	3	1	0	1	
ii inadequate monitoring	7	2	0	0	0	
iii equipment failure	0	1	0	0	0	
iv inadequate resuscitation	6	2	1	0	0	
v hypothermia	0	0	0	0	0	
E Post-Operative	11	2	2	0	1	16
i management	6	1	1	0	0	
ii supervision	5	1	1	0	0	
iii inadequate resuscitation	0	0	0	0	1	
F Organisational	8	9	1	0	0	18
i inadequate supervision or assistance	3	2	1	0	0	
ii poor organisation	1	4	0	0	0	
iii poor planning	4	3	0	0	0	
Total contributory factors	95	42	16	0	5	158
G No correctable factor	86	1	4	0	0	91
H Medical condition of the patient a significant factor	102	13	10	0	1	126

In comparison to the previous triennium, the average number of causal or contributory factors per anaesthesia-related death was lower at 1.01 (compared to 1.30). 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 and 1.01 in 2009-11. 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 and 81 per cent in 2009-11. 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 and 58 per cent in 2009-11. 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.

Findings for NSW, VIC, WA, Tas and SA continued

Gender

Fifty-one per cent of the deaths were females.

Age

Table 7: Age distribution in anaesthesia-related deaths

Age (Years)	NSW	Vic	WA	Tas	SA	Total
<11	2	0	0	0	0	2
11-20	0	0	1	0	0	1
21-30	0	1	0	0	0	1
31-40	3	1	1	0	0	5
41-50	3	1	0	0	0	4
51-60	9	3	0	0	0	12
61-70	13	3	2	0	0	18
71-80	33	4	4	0	1	42
81-90	44	5	3	0	1	53
>90	18	0	0	0	0	18
Total	125	18	11	0	2	156

The majority of anaesthesia-related deaths occurred in older patients. 84 per cent of deaths were in patients over the age of 60 years, 72 per cent of deaths were in patients over the age of 70 years and 46 per cent were in patients over the age of 80 years.

Level of risk

The level of risk was stratified using the American Society of Anesthesiologists (ASA) physical status classification¹².

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

ASA physical status	NSW	Vic	WA	Tas	SA	Total
1	0	2	0	0	0	2
2	5	3	1	0	0	9
3	54	6	2	0	1	63
4	62	7	7	0	1	77
5	4	0	1	0	0	5
Total	125	18	11	0	2	156

Only a very small proportion, 11/156 cases (7 per cent) occurred in patients considered low risk (ASA-P 1-2)¹². Hence 93 per cent of anaesthesia-related deaths occurred in patients assessed as higher risk (ASA-P 3-5). Gender

Degree of urgency

Table 9: Degree of urgency of the procedure with anaesthesia-related deaths

Urgency	NSW	Vic	WA	Tas	SA	Total
Elective	33	9	5	0	0	47
Urgent/emergent	92	9	6	0	2	109
Total	125	18	11	0	2	156

70 per cent of the anaesthesia-related deaths (109/156) occurred in patients having procedures classified as urgent or emergent. This is a significant change from the previous report (2006-08) when only approximately one third were urgent or emergent. 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 preoperative assessment, or a requirement for continued resuscitation at the same time as the administration of anaesthesia.

Findings for NSW, VIC, WA, Tas and SA continued

Type of hospital

Table 10: Type of hospital

	Metropolitan public teaching	Metropolitan non-teaching	Rural base	Rural public other	Private	Day care (free standing)	Regional	Total
NSW	62	26	2	21	14	0	0	125
Vic	8	0	0	3	1	1	5	18
WA	9	1	1	0	0	0	0	11
Tas	0	0	0	0	0	0	0	0
SA	1	1	0	0	0	0	0	2
Total	80	28	3	24	15	1	6	156

As in previous reports, the majority of deaths occurred in metropolitan teaching hospitals and larger regional teaching hospitals (55 per cent). This was not unexpected because these hospitals most likely 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 11: Location of event leading to death

	Induction room	Operating theatre	PACU	Procedural room	ICU/HDU	General ward	Other	Total
NSW	1	119	0	4	1	0	0	125
Vic	0	12	3	2	0	1	0	18
WA	NR	NR	NR	NR	NR	NR	NR	NR
Tas	0	0	0	0	0	0	0	0
SA	-	2	0	0	0	0	0	2
Total	1	133	3	6	1	1	0	145

NR = not recorded

The vast majority of fatal events, 96 per cent, occurred in the operating or procedure room (139 cases out of 145, excluding WA from which data was unavailable).

Location of death

Table 12: Location of death

	Induction room	Operating theatre	PACU	Procedural room	ICU/HDU	General ward	Other	Total
NSW	1	31	15	1	50	26	1	125
Vic	0	4	0	1	11	2	0	18
WA	0	3	0	0	0	1	7	11
Tas	0	0	0	0	0	0	0	0
SA	0	2	0	0	0	0	0	2
Total	1	40	15	2	61	29	8	156

The most common location of death was intensive care unit (39 per cent), followed by the operating or procedure room (27 per cent), the general ward (19 per cent) and the post-anaesthesia care unit (10 per cent).

Findings for NSW, VIC, WA, Tas and SA continued

Grade of anaesthetist

Table 13 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 13: Grade of anaesthetist

	Specialist	GP non-specialist	Trainee/registrar	Other	Total
NSW	107	11	3	4	125
Vic	13	0	4	1	18
WA	NR	NR	NR	NR	NR
Tas	0	0	0	0	0
SA	1	1	0	0	2
Total	121	12	7	5	145

NR = not recorded

By far the majority of deaths (83 per cent) involved specialist anaesthetists (121/145 as data for WA was not available). This finding is expected as most anaesthetics in Australia are provided by specialist anaesthetists, especially for patients undergoing major procedures in teaching hospitals. Twelve cases involved non-specialist/GPs, seven were anaesthesia trainees, and in at least four cases there was no anaesthetist in attendance. It is of some concern that some deaths occurred when the proceduralist was the only attending medical practitioner.

Type of surgery or procedure

Table 14: Type of surgery or procedure

	NSW	Vic	WA	Tas	SA	Total
Type of surgery						
Abdominal	11	2	3	0	0	16
Cardiothoracic	20	2	0	0	1	23
ENT and head/neck	1	1	0	0	0	2
General (non-abdominal)	3	1	0	0	0	4
Gynaecological	0	1	0	0	0	1
Maxillofacial	0	1	0	0	0	1
Neurosurgery	0	0	0	0	0	0
Obstetrics	0	0	0	0	0	0
Ophthalmological	0	0	0	0	0	0
Orthopaedic	67	5	2	0	1	75
Renal	0	0	0	0	0	0
Urological	2	0	0	0	0	2
Vascular	12	2	2	0	0	16
Type of procedure						
Endoscopy	6	3	3	0	0	12
Interventional cardiology	2	0	0	0	0	2
Radiology	0	0	1	0	0	1
Other (for example, electroconvulsive therapy, invasive monitoring, pain management and resuscitation)	1	0	0	0	0	1
Total	125	18	11	0	2	156

The types of surgery most frequently associated with anaesthesia-related death were orthopaedics (48 per cent), cardiothoracic (14 per cent), vascular (10 per cent) and abdominal surgery (10 per cent). An emerging trend is the increased frequency of anaesthesia-related deaths in gastro-intestinal endoscopy and interventional procedures in cardiology/radiology (10 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.

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 (AIHW¹⁰). 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, 2010 and December 31, 2010 inclusive was then obtained. In order to estimate the denominator for the triennium, this one-year figure was multiplied by three. This information is presented in Table 15.

Hierarchy used by 'coders'

This hierarchy follows the Australian coding standards of the National Centre for Classification in Health¹¹.

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):

[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 15: Estimated number of anaesthetics administered in the five states and the estimated anaesthesia mortality rate per number of procedures

	NSW	Vic	WA	Tas	SA	Total
No. Anaesthetics January 1, 2010 – December 31, 2010* **	1,190,858	1,027,040	410,063	90,409	299,702	3,018,072
Estimate for the triennium	3,572,574	3,081,120	1,230,189	271,227	899,106	9,054,216
No. Anaesthetic-related deaths (triennium)	125	18	11	0	2	156
No. Anaesthetics per death	28,581	171,173	111,835	n/a	449,553	58,039

*AIHW10 www.aihw.gov.au

**Australian Hospital Statistics, January 1, 2010 – December 31, 2010. 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, Tasmania and SA.

Findings for NSW, VIC, WA, Tas and SA continued

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. In NSW, 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. In South Australia, the mortality committee has retrospectively collected cases during the triennium and this may also indicate a higher likelihood of missed cases, with the potential for underestimation of anaesthesia-related mortality. Tasmania did not record any anaesthesia-related deaths for the triennium and therefore no mortality rate can be recorded.

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 five reporting states was 1:58,039 procedures. This is very similar to the rate for the last three triennial reports. (Table 16).

Table 16: Estimated anaesthesia-related mortality in relation to number of procedures compared to previous reports

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

*All Australian states **NSW, Vic, WA *** NSW, Vic, WA, Tas **** NSW, Vic, WA, Tas, SA

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

Table 17: 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	26%
1994-96	13	135	10%
1997-99	19	130	15%
2000-02	26	137	19%
2003-05	18	112	16%
2006-08	17	124	14%
2009-11	11	156	7%

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. Hence 93 per cent of deaths occurred in patients deemed of higher risk (ASA-P 3-5). This is consistent with the trend towards higher anaesthesia-related mortality in older, sicker patients.

State, Territory and National Information

New South Wales

Overview

The Special Committee Investigating Deaths under Anaesthesia (SCIDUA) has operated continuously in NSW since 1960, apart from a short break in the early 1980s due to confidentiality problems. SCIDUA was re-established in July 1983 with statutory privilege. While legislation has provided mandatory reporting of anaesthesia-related deaths, the committee has had some success in encouraging reporting of sedation-related deaths.

Composition (2009-11)

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).

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.

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.

The penalty for breaching this provision is a fine of \$1100 or a term of imprisonment for six months. Information can only be released with the consent of the person who provided the information, or the approval of the minister. Documents can be produced and oral evidence given only with the approval of the governor.

Reporting of anaesthesia-related deaths

In NSW, the notification of deaths arising after anaesthesia or sedation for operations or procedures is a legal requirement stipulated in section 84 of the *Public Health Act 2010* (NSW) 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 (SMR010.511): 'Report of death associated with anaesthesia/sedation'. Reporting must occur regardless of whether the death is notifiable to the coroner or not.

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. To ensure major cases are not missed we now have available other reporting sources, within the Clinical Excellence Commission, such as cases reported to the patient safety team for root cause analysis and those referred from CHASM. Our data also indicates good responses from anaesthetists in providing further details of their notified cases, with 70 per cent of questionnaires completed and returned to the committee. This figure represents a high rate of voluntary reporting of anaesthesia-related mortality.

Review of notified deaths

When a death is notified to SCIDUA by an anaesthetist or medical practitioner or referred from other mortality review committees, the SCIDUA's triage sub-committee initially reviews the case. The triage process determines whether a more detailed questionnaire needs to be sent to the anaesthetist 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 usually held once a month, depending on the number of cases prepared. SCIDUA uses the classification system developed by the Australian National Anaesthetic Mortality Committee to classify the cases and determine if they are related to anaesthetics. It relies on expert opinion and consensus. While it is therefore subjective to some extent, the committee has several members who have served for 10-20 years or more. 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 may have altered the outcome.

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

Current developments (2012-14)

SCIDUA is overseeing the development of a web-based application to enable online notification of patient deaths after anaesthesia and sedation administration. The online notification system will complement the current paper-based notification using the state form. 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 that SCIDUA is working on is a casebook. The committee is reviewing closed cases to select those with significant clinical events for learning.

The most common correctable anaesthetic factors identified in 2011-12 were inadequate pre-operative assessment, inappropriate choice, or incorrect application of an anaesthetic technique and inappropriate drug dosage. The selected cases will be de-identified and summarised to present the main clinical information and key learning points. The casebook is planned for release in late 2014.

The committee is concerned about the ongoing relatively high number of deaths associated with cemented hemiarthroplasties. Orthopaedic and cardiothoracic surgery performed on elderly patients still makes up the majority of cases reviewed by the committee.

The committee also is interested in patients with pre-existing not-for-resuscitation orders and is reviewing the peri and post-operative management of these patients.

The lack of or reduced availability of post-mortem results has made the review of notified deaths very difficult and, in some cases, impossible. The committee will continue to explore ways to re-establish a linkage with the Coroner's Office.

Dr David Pickford, FANZCA

Chair
Special Committee Investigating Deaths Under Anaesthesia in
New South Wales

Victoria

Overview

The Victorian Consultative Council on Anaesthetic Mortality and Morbidity (VCCAMM) was established in 1976 under section 13 of the *Public Health Act 1958* and the legislative provisions have recently been updated in sections 33-43 of the *Public Health and Wellbeing Act 2008*.

Composition (2009-11)

- 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.

Terms of reference

- To monitor, analyse and report on key areas of potentially preventable anaesthetic mortality and morbidity within the Victorian hospital system.
- To keep a register of anaesthetic mortality and morbidity within the Victorian hospital system.
- To liaise with other consultative councils on issues of common concern, including the development of appropriate systems for reporting of relevant cases by practitioners.
- To improve the practice of anaesthesia by publication and dissemination of relevant information and practical strategies identified during deliberations of the council.
- To report as required to the minister for health and to the Victorian Quality Council.
- To respond to specific matters referred to the council by the minister for investigation and reporting, as required.

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

Legislative protection and opportunity for enhanced reporting

The VCCAMM operates pursuant to the *Public Health and Wellbeing Act 2008* and there has also been a recent change in coronial legislation under the *Coroners Act 2008*.

The revised provisions of the *Health Act 2008* have taken into account the essential requirement for: (i) preservation of confidentiality, as well as recognising the need to: (ii) improve systematic reporting of potentially anaesthesia-related morbidity and mortality. Historically, in the Victorian coronial legislation, there has been considerable confusion regarding the definition of reportable deaths, particularly for deaths that may have been deemed to be associated with anaesthesia, and this has been addressed through: (iii) improved coronial legislation.

Preservation of confidentiality

The council is aware that reporting of mortality and morbidity has always been voluntary and that the speciality of anaesthesia has a long history of participation in audit and quality assurance activities. The level of reporting has remained constant over many years, due mainly to the high level of trust between practising anaesthetists and the council. Sections 42 and 43 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.

Enhanced systematic reporting

Although there is a strong track record of spontaneous direct reporting by anaesthetists, it is important to maximise the level of case acquisition as required by the council's terms of reference. There are new sections in the legislative provisions, which are designed to improve the systematic reporting of anaesthesia-related mortality and morbidity Victorian hospitals. Under section 39 of the *Public Health and Wellbeing Act 2008*¹ 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. In August 2010, letters were sent from the chair of council to all health services in Victoria, outlining these requirements. It is anticipated that compliance with this legislation will be achieved through hospital department of anaesthesia quality assurance co-ordinators and it is hoped this will increase the overall level of reporting.

Improved coronial legislation

The new *Coroners Act 2008*¹⁴ 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.

This improved definition of reportable death is welcomed by the council and is more specifically aligned with our own definitions of anaesthesia-related mortality. Under the new 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.

Current developments (2014)

The major issue in Victoria continues to be the low number of overall deaths reviewed (61) and the progressive reduction of anaesthesia-related deaths from 40 in 2003-05 to 21 in 2006-08 and 18 in 2009-11. Although this might be due to a genuine reduction, the more likely explanation is under reporting. This has continued despite improvements in the both coronial and public health legislation. The challenge for the 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. The council has recently established a mechanism for improved access to coronial reports from deaths that have occurred in the setting of administration of any anaesthetic, including general, local, conscious sedation, regional anaesthetic, intensive care sedation, spinal or epidural anaesthetic or other. It is hoped this will overcome the recent deficiency in access to Victorian coronial cases. The VCCAMM will also continue to liaise with health service providers to seek compliance with the new legislation in the provision of reports of potentially anaesthesia-related mortality and morbidity. An additional option is to seek referral of cases that have been reviewed as potential anaesthesia-related deaths, from the Victorian Audit of Surgical Mortality (VASM).

As noted in the previous report, the council is still awaiting the much overdue launch of a web-based electronic reporting tool with a direct link to a new database.

Associate Professor Larry McNicol FRCA, FANZCA

Chair

Victorian Consultative Council on Anaesthetic Mortality and Morbidity

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.

Composition

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 of deaths related to anaesthesia

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.

Scope of the investigator

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.

Calling a meeting

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/confidentiality

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.

Coroners Act 1996

The death occurs during or as a result of an anaesthetic (and is not due to natural causes).

Current developments (2014)

1. There have been no significant changes to the function of the West Australian Anaesthetic Mortality Committee since the last triennial report. 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.
2. Dr Neville Gibbs has stepped down as chair of the Western Australian Mortality Committee.
3. Dr Simon Maclaurin has taken over from Dr Paul Rodoreda as chief investigator.
4. 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.
5. 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

Overview

During the triennium of 2009-2011, Tasmania, mortality data was collected and reviewed by the Tasmanian Audit of Anaesthesia Mortality. 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.
1. 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.
 2. 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.
 3. 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.
 4. 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*.
 5. Terms of reference – see below.
 6. 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 ('objects')

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

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 to 2010 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>.

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.

Composition of the South Australian Anaesthetic Mortality Committee

Members of the 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.

Meeting process

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

Reporting

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.

Dr Simon Jenkins

Chair
South Australian Anaesthetic Mortality Committee

Queensland

The minister for health approved the establishment of the Queensland Perioperative and Periprocedural Anaesthetic Mortality Review Committee (QPPAMRC) as a quality assurance committee on May 21, 2012 following a request from the Statewide Anaesthesia and Perioperative Care Clinical Network (SWAPNET).

The minister for health also approved the appointment of Dr James Troup, Deputy Director, Department of Anaesthesia, Royal Brisbane and Women's Hospital as the inaugural chair of the QPPAMRC effective June 1, 2012. Dr Troup was the chair of the former Queensland Committee to Enquire into Perioperative Deaths, which was established in 2003 and disbanded in 2006 when responsibility for its functionality was transferred to the Health Quality Complaints Commission.

The purpose of the QPPAMRC is to:

- Collect and analyse clinical information regarding perioperative and periprocedural anaesthetic mortality in Queensland to identify statewide specific trends.
- Make recommendations to the minister for health on standards and quality indicators of perioperative and periprocedural anaesthetic clinical care to enable health providers in Queensland to improve safety and quality.
- Assist with the adoption of such standards in both public and private sectors.

The committee is gazetted as an approved quality assurance committee pursuant to part 6, division 1 of the *Hospital and Health Boards Act 2011* and is therefore prohibited from providing a report or information that discloses the identity of an individual who is a patient or a health-service provider, unless that individual has consented in writing to the disclosure.

All information held by the committee is managed in accordance with the *Hospital and Health Boards Act 2011*, part 6, section 84 Disclosure of information and part 7, Confidentiality. The *Hospital and Health Boards Act 2011*, part 6 and part 7 replace the disclosure of information and confidentiality provisions in the repealed *Health Services Act 1991*.

Members

Membership of the committee consists of the following (as appointed July 1, 2012):

- Specialist anaesthetist expertise: cardiac surgery – nominated by – Australian and New Zealand College of Anaesthetists (state branch).
- Specialist anaesthetist expertise: anaesthetic incident reporting and informatics – nominated by – Australian Society of Anaesthetists.
- Specialist anaesthetist expertise: general experience in private practice – nominated by – Australian Medical Association.
- Anaesthetist expertise: extensive experience in representing anaesthetists at a professional level (local, state and national) – nominated by – Private Hospitals Association.

- Anaesthetic support officer expertise: extensive knowledge of anaesthetic assistance issues – nominated by – Statewide Anaesthesia and Perioperative Care Clinical Network (SWAPNET).
- Specialist surgeon expertise: member of the former committee and insight into neurosurgical matters – nominated by – Royal Australian College of Surgeons (state branch).
- Trauma surgeon expertise: extensive experience in trauma surgery – nominated by – Faculty of Medicine, University of Queensland.
- Pathologist expertise: interpretation of post mortem findings – nominated by – Royal College of Pathologists of Australasia.

Meetings

The inaugural meeting of the QPPAMRC was convened on August 1, 2012 to provide orientation for QPPAMRC members. Further meetings have been convened approximately quarterly.

Current status (2014)

Designated anaesthetists/quality officers have been identified in Queensland Health anaesthetic departments to support the reporting of deaths to the QPPAMRC.

Processes have been established in each Queensland Health facility to support directors of anaesthesia and/or anaesthetic quality officers being notified when a death has occurred and anaesthesia and/or sedation has been administered as part of the patient's treatment.

Cases are classified by the departmental quality officer prior to being registered in the QPPAMRC database. To classify the cases, anaesthetists need to hold fellowship of the Australian and New Zealand College of Anaesthetists or equivalent. Reporting deaths to QPPAMRC is voluntary.

Eleven Queensland Health hospital and health services out of a possible 18 are currently reporting deaths to the QPPAMRC. To date, 443 deaths have been registered in the QPPAMRC Anaesthetic Death Register and 16 of those cases have been classified as category 1, 2 or 3.

From May until November 2014, Dr James Troup (chair) and Ms Karen Hamilton (secretariat) will be visiting sites not reporting to QPPAMRC, to increase uptake of reporting, establish processes and provide training.

Private facilities have expressed interest in being involved in reporting deaths to the QPPAMRC. Princess Alexandra Hospital Information Services are working on a solution to enable private facilities to report deaths electronically.

Dr James Troup

Chair
Queensland Perioperative and Periprocedural Anaesthetic Mortality Review Committee

Australian Capital Territory

ANZCA Regional Committee Report (2014)

The ANZCA Australian Capital Territory (ACT) Regional Committee has been working for more than nine years to establish an Anaesthetic Mortality and Morbidity Committee. After a somewhat protracted process, qualified privilege has been granted to the collection of anaesthetic mortality data. This data will now be collected as part of the ACT Audit of Surgical Mortality and reported separately. The process is modelled on the system currently operating in Tasmania. Morbidity associated with anaesthesia will not be addressed directly, but it is anticipated that more ACT hospitals will engage with the ANZTADC.

There was no data collected for the 2009-11 triennium.

Dr Carmel McInerney

Chair
ANZCA Australian Capital Territory Regional Committee

New Zealand

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.

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:

4. Monitor the number, categories and demographics of deaths relevant to its functions and to identify patterns and trends over time.
5. 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.
6. Analyse and use data collected to develop effective recommendations that are useful for policy development at a national level.

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.

Members

The committee will have a maximum of seven members, 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 Maori health.

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 (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.

(13) Deaths that must be reported under section 14(2)

- (1) This section applies to the following deaths if, and only if, they are deaths to which subsection (2) applies:
 - During medical, surgical, or dental operation, treatment, etc
 - (c) Every death—
 - (i) That occurred while the person concerned was undergoing a medical, surgical, dental, or similar operation or procedure.
 - (ii) That appears to have been the result of an operation or procedure of that kind.
 - (iii) That appears to have been the result of medical, surgical, dental, or similar treatment received by that person.
 - (iv) That occurred while that person was affected by an anaesthetic.
 - (v) That appears to have been the result of the administration to that person of an anaesthetic or a medicine (as defined in section 3 of the *Medicines Act 1981*).
- (d) Any death that occurred while the woman concerned was giving birth, or that appears to have been a result of that woman being pregnant or giving birth.

Current status (2014)

POMRC has now released three reports, in:

- 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>

The latter two 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) and post-operative complications (pulmonary embolus). 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. It is planned to track specific classes of deaths so that trends can become apparent in time.

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 three 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 psycho-social factors are taken into account in care.

The following key findings are from the POMRC third report, *General Anaesthesia chapter* (reproduced with permission from the Health Quality & Safety Commission New Zealand).

General Anaesthesia

The following section uses information from the National Minimum Data Set (NMDS) and the National Mortality Collection (NMC) to review hospital admissions where one or more general anaesthetics were performed, as well as same and next-day mortality following a general anaesthetic.

Key findings

- In New Zealand during 2007-11, following general anaesthesia on the same/next day, there were 1465 deaths. Most of these deaths occurred among acute admissions and at public hospitals.
- Cardiovascular causes were the most commonly listed underlying reason for mortality within the first day of receiving a general anaesthetic, regardless of admission type.
- All admission types showed an increase in mortality with age.
- Mortality was higher among acute admissions for every age group compared with elective/waiting list admissions. By contrast, among public hospital semi-acute admissions, mortality was higher for people aged 40-59 years in comparison with acute admissions.
- Mortality increased with ASA score for each admission type. Within each ASA category, there was a higher rate of mortality for those admitted acutely than for those admitted electively/from the waiting list or semi-acutely.
- For those admitted acutely, the risk of mortality after receiving one or more general anaesthetics was significantly higher for those aged over 65 years, those who received more than one anaesthetic during their admission, and those with a first ASA score of three or more. The risk of mortality was significantly lower for those aged less than 45 years. These differences continued to be significant even after each variable (age, gender, ethnicity, NZDep decile and ASA score) was adjusted for the other variables in the multivariate model.
- For those admitted electively or from the waiting list, the risk of mortality after a general anaesthetic was significantly higher for those aged over 65 years, those who received more than one anaesthetic during their admission, those whose domicile was in NZDep decile 7-8, and those with a first ASA score of three or more. The risk of mortality was significantly lower for those aged 25-44 years. These differences were present at the multivariate level (that is, when each sociodemographic and clinical factor had been adjusted for the other factors).
- When all hospital admission types were combined, and emergency status and ASA score of the last listed general anaesthetic were considered, the risk of mortality with one or more general anaesthetics was significantly higher for those with an ASA score of three or more, those with more than one anaesthetic during their admission, and for procedures

that were given an emergency status. These differences were observed at the multivariate level (that is, when each sociodemographic and clinical factor had been adjusted for the other factors).

All of the above results were consistent with the 2005-09 period, with the following main exceptions or additions:

- The mortality rate increased slightly to 125.5 deaths per 100,000 admissions compared with 119.1 per 100,000.
- There was a rise in the number of deaths for all types of admissions and public hospital semi-acute admissions in particular.

The increase in public hospital semi-acute admission deaths was related to an increase in deaths due to other injuries and other cardiovascular causes. Among acute admissions there were more deaths due to gastrointestinal conditions and falls. Deaths for those admitted electively or from the waiting list rose due to cancer and other cardiovascular causes. By contrast, myocardial infarctions decreased in 2007-11 for all admission types.

Dr Leona Wilson

Chair

New Zealand Perioperative Mortality Review Committee

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<http://sydney.edu.au/health-sciences/ncch/>
12. ASA Physical Status Classification System
www.asahq.org/clinical/physicalstatus.htm

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 that death was caused by both surgical and anaesthesia factors.

Explanatory notes

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

Deaths in which anaesthesia played no part

Category 4	Surgical death where the administration of the anaesthesia is not contributory and surgical or other factors are implicated.
Category 5	Inevitable death, which would have occurred irrespective of anaesthesia or surgical procedures.
Category 6	Incidental death, which could not reasonably be expected to have been foreseen by those looking after the patient, was not related to the indication for surgery and was not due to factors under the control of anaesthetist or surgeon.

Unassessable deaths

Category 7	Those that cannot be assessed despite considerable data but where the information is conflicting or key data is missing.
Category 8	Cases that cannot be assessed because of inadequate data.

Casual or contributory factors in Category A death

Note that it is common for more than one factor to be identified in the case of anaesthesia attributable death.

Subcategories

A. Preoperative

(i) Assessment	This may involve failure to take an adequate history or perform an adequate examination or to undertake appropriate investigation or consultation or make adequate assessment of the volume status of the patient in an emergency. Where this is also a surgical responsibility the case may be classified in category 3 above.
(ii) Management	This may involve failure to administer appropriate therapy or resuscitation. Urgency and the responsibility of the surgeon may also modify this classification.

B. Anaesthesia technique

(i) Choice or application	There is inappropriate choice of technique in circumstances where it is contraindicated or by the incorrect application of a technique, which was correctly chosen.
(ii) Airway maintenance Including pulmonary Aspiration	There is inappropriate choice of artificial airway or failure to maintain or provide adequate protection of the airway or to recognise misplacement or occlusion of an artificial airway.
(iii) Ventilation	Death is caused by failure of ventilation of the lungs for any reason. This would include inadequate ventilator settings and failure to reinstitute proper respiratory support after deliberate hypoventilation (for example, bypass).
(iv) Circulatory support	Failure to provide adequate support where there is haemodynamic instability, in particular in relation to techniques involving sympathetic blockade.

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

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