



## Short title: Anaesthesia in children BP

### 1. Purpose

PG29(A) was last reviewed in 2008. This revision broadens the scope and delineates the principles for the delivery of care to all children, in all locations, by all anaesthetists. This updated document recognises there are a wide range of facilities where children are cared for, and these facilities may not easily be stratified into different "levels of care". In addition, recent revisions of *PG07(A) Guideline on pre-anaesthesia consultation and patient preparation* and *PG15(POM) Guideline for the perioperative care of patients selected for day stay procedures*, have occurred that overlap and require consistency with PG29(A). Furthermore, there is clarification around terminology, credentialling and scope of clinical practice, and staffing and provision of resources for perioperative services.

### 2. Background and scope

The delivery of care to children is the central element of the accompanying guideline, which have been developed for use by all healthcare facilities and individual practitioners who provide anaesthesia care to children. The majority of children in Australia and New Zealand receive anaesthesia care outside tertiary children's hospitals. Simple stratification of facilities was not considered to be the best approach because of the wide variety of facilities and resources where children are cared for, issues of remote access and heterogenous referral pathways.

While the guideline seeks to be useful for healthcare facilities and professionals caring for children in the perioperative period, they do not provide precise models of care for regional services or comment on national healthcare issues such as the distribution or delivery of services over geographical regions.

Clinical issues relating to anaesthesia care for children have been excluded as there are many high quality, contemporary resources available to guide clinical decision making.

### 3. Discussion

The title of PG29(A) has been changed from "Recommendations" to "Guideline" to align with the current categories of professional documents as described in *CP24(G) Policy for the development and review of professional documents*.

### 4. Explanation of terms and definitions

- 4.1 **Post menstrual age (PMA)**, defined as the gestational age plus the chronological age, replaces the term post conceptional age as the preferred term. In 2004, the American Academy of Paediatrics released a policy statement which recommended that the term post conceptional age, and variants of this term, not be used in clinical paediatrics. For infants born after assisted reproductive technology, the gestational age is calculated by adding two weeks to the conceptional age.<sup>1</sup> Many older studies looking at apnoea in the premature infant used the two terms interchangeably.

- 4.2 **Planned vs emergency surgery** has been defined here for the purposes of the accompanying guideline, however, it is recognised there are regional differences in terminology for these categories. Planned surgery may also be known as elective, while emergency surgery might be known as non-elective, acute, emergent and urgent.
- 4.3 Readers may note the absence of the term “**paediatric anaesthetist**” in the accompanying guideline. This term has been omitted due to the lack of an agreed definition, qualification or standard to which the term could be applied. Anaesthetists with a subspecialty interest in anaesthesia for children have been referred to as such throughout the document.

## 5. Scope of practice issues

- 5.1 Limitations of practice of individuals will depend on many variables and change over time. Limits on practice are not solely determined by defining a lower age threshold. Patient age is only one of the metrics that should be considered in determining scope of practice.
- 5.2 This document does not seek to prescribe age limits to practitioners or institutions but rather to provide guidance as to the key patient, staff, and facility related factors to consider in determining these age thresholds. Scope of practice issues can often be resolved when practitioners ask themselves the question; “Do I have the necessary knowledge, skills and assistance to care for this child and manage any complications that might arise in the context of this health care facility?” If the answer is no and the care is not urgently required, then the patient should be referred (refer section 9). If the care is urgently required, and delay would result in harm, then the practitioner should utilise the skills they have to provide care to the best of their ability. Consideration should be given to seeking the assistance of another colleague if available as well as the use of remote resources for advice.
- 5.3 There are excellent guides available for defining scope of clinical practice and credentialling for both practitioners and healthcare facilities.<sup>2,3</sup>

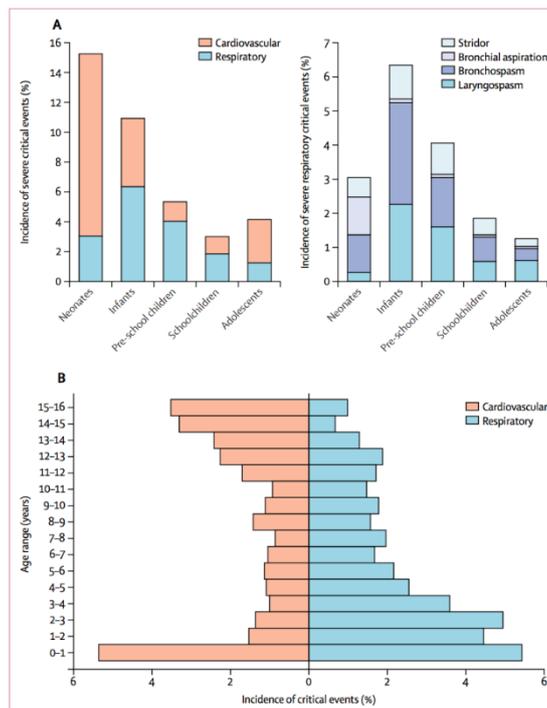
## 6. Training

- 6.1 The ANZCA Paediatric Specialised Study Unit (SSU)<sup>4</sup> is competence and knowledge based. Rather than a time-based attachment, completion is contingent upon attaining a volume of practice of specified complexity.
- 6.2 Anaesthesia training for GP anaesthetists is administered by the tripartite Joint Consultative Committee on Anaesthesia (JCCA) and comprises a twelve-month training period in a JCCA accredited post. A satisfactory report from their JCCA supervisors and success in the JCCA examination are required for completion.<sup>5</sup> The JCCA curriculum stipulates the requirements for endorsement of paediatric practice for children (ASA 1 or 2) greater than 5 years of age and for children (ASA 1 or 2) 3-5 years of age based upon volume of practice.
- 6.3 It is generally agreed that care of children with complex disease and/or having complex surgery should be undertaken by anaesthetists with subspecialty interest in anaesthesia for children.<sup>6</sup> A formal standard for subspecialisation in paediatric anaesthesia does not currently exist in Australia and New Zealand. Subspecialty training usually involves a fellowship in a tertiary paediatric centre, often with ICU experience. However, it is acknowledged that there are many competent, experienced anaesthetists caring for children who have not had the benefit of a tertiary fellowship.
- 6.4 Additional training is advised for practitioners caring for children less than 2 years of age, or for the specialised categories referred to in the accompanying document.

6.5 Paediatric trauma or emergency situations can present a dilemma. Practitioners may find themselves faced with children younger or with a more complex history than is part of their usual practice. As always, in an emergency situation, all practitioners should use the skills, knowledge and assistance they have on hand to care for unwell children.

## 7. Patient age

- 7.1 While institutions, individuals and training programs often articulate and emphasise a minimum age threshold, it is crucial to understand that age is only one of the factors that needs to be considered when determining who should provide care along with timing and location of care.
- 7.2 The ANZCA Paediatric SSU aims to train FANZCA graduates to be able to provide anaesthesia and sedation for surgery of moderate complexity for children more than 2 years of age without significant co-morbidities.<sup>4</sup>
- 7.3 The threshold patient age of 2 is an arbitrary guide for the newly-graduated fellow. It is younger than the age suggested by our UK counterparts (3 years).<sup>7</sup> Risk increases with diminishing age and especially so for children less than 1 year of age. This trend is supported by the APRICOT<sup>6</sup> study, which aimed to identify the incidence, nature and outcomes of severe critical events in children undergoing anaesthesia, and the associated potential risk factors across 261 European hospitals.<sup>6</sup> This study highlights a relatively high rate of severe critical events during the anaesthesia management of children for surgery or diagnostic procedures (figure 1).<sup>6</sup>
- 7.4 Co-morbidity and other factors increase risk associated with anaesthesia<sup>6,8</sup> and should be carefully considered when determining the timing and location of care. Section 9 summarises the issues that are known to contribute to risk. Medical, technical and nursing staff numbers and experience, perioperative facilities such as availability of high dependency areas and support services such as blood bank should also be considered when making the decision to anaesthetise any child.



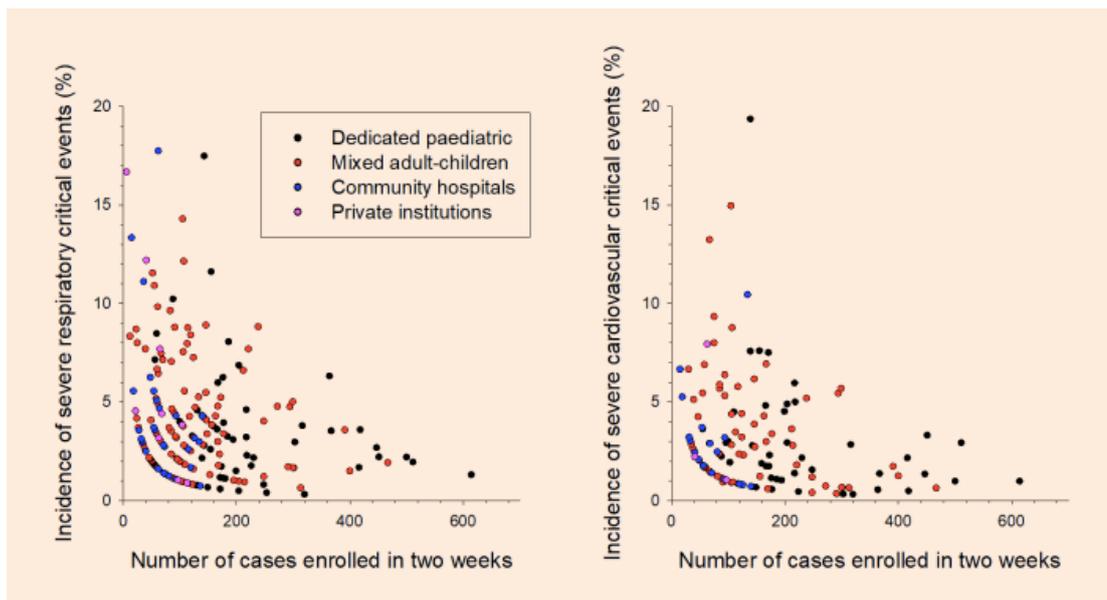
**Figure 1:** Distribution of severe critical events throughout the age groups. (A) Relative incidence of respiratory and cardiovascular events (%) and the relative distribution of the four respiratory critical events (%). (B) Age distribution of cardiovascular (orange) and respiratory (blue) critical events. (Used with permission).<sup>6</sup>

## 8. Volume of practice/caseload

- 8.1 There is limited evidence for a specific minimum case load to maintain competence in caring for children. This lack of data contributes to difficulties in setting standards for expertise, defining scope of practice and monitoring competence.<sup>9</sup>
- 8.2 There is evidence to support an association between frequency of practice/caseload, years of experience and patient outcomes. Data from the APRICOT study show an association between institutional case-load and incidence of cardiovascular and respiratory critical events in children, across a range of institutions (figure 2).<sup>6</sup>
- 8.3 There have been attempts in the past to suggest a minimum volume of practice. It is important to note these have been largely based on opinion. In recommendations based on the National Confidential Enquiry into Perioperative Deaths in 1992,<sup>10</sup> the author suggested that the frequency of "current experience" for a "children's anaesthetist" should be annually: 300 children under 10, 50 children under 3 years, and 12 children under 6 months of age. The authors of a 1994 survey of French anaesthetists suggested that a minimum case-load of 200 paediatric anaesthetics per year is necessary to reduce the incidence of complications and improve the level of safety in paediatric practice.<sup>11</sup> This survey had a low response rate. The Royal College of Anaesthetists (UK) suggests that the lead paediatric anaesthetist in all centres admitting children should undertake at least one paediatric list per week.<sup>7</sup>

Healthcare facilities in regional remote areas should consider their circumstances and resources when credentialling anaesthetists and defining their scope of clinical practice.

- 8.4 It is recognised that not all paediatric lists are equivalent and that an appraisal of the volume and recency of practice should guide the planning of maintenance of competence activities.
- 8.5 Anaesthetists with subspecialty interest in caring for children should maintain a significant commitment to the areas of specialty. Highly specialised areas such as neurosurgery or cardiac surgery call for a continuing volume of recent practice and a commitment to ongoing education in the specific areas.



**Figure 2:** The APRICOT study<sup>6</sup> showed an association between institutional caseload and cardiorespiratory adverse outcomes in children. (Used with permission).<sup>6</sup>

## 9. Stratifying risk

This section has been formulated to assist anaesthetists to determine which cases should be performed at any given time in any given health care facility. It is an attempt to avoid prescriptive guidelines regarding patient age or clinician caseload and to use the available evidence to weigh the risk of an episode of care, given the resources available at a healthcare facility at a given time.

More broadly, the purpose of this section is to assist anaesthetists in answering the question “Should I undertake this anaesthetic in this child in this facility with this theatre team?” Fundamentally this is a question of risk assessment and risk mitigation set in the background of best care principles as outlined in PG29(A).

Audits of mortality and morbidity form the basis of risk assessment in paediatric anaesthesia. Different approaches and different classifications mean that studies are not directly comparable; nevertheless, there is a consistency in the findings that enables some guidance to be developed. Major morbidity includes cardiovascular (cardiac arrest or haemorrhage) and respiratory (severe laryngospasm or bronchospasm). The most severe consequences, death or hypoxic brain damage, are in fact very rare in healthy children.

The most recent report on anaesthesia safety, Safety of Anaesthesia: A review of anaesthesia-related mortality reporting in Australia and New Zealand 2012-2014<sup>12</sup> reported an overall anaesthesia related death rate of 1 in 57,000 per annum. There were no anaesthesia related deaths in patients under 11 years. The emerging pattern is that anaesthesia risk is extremely low in patients who are fit and well (ASA-P 1-2).

The common factors that are noted to significantly increase mortality or morbidity are:

1. Age.
  1. High risk: neonates, ex-premature infants, age <12 months.
  2. Medium risk: age 12-36 months.
  3. Low risk: age > 36 months.
2. ASA status.

1. High risk: ASA 3-5.
  2. Medium risk: ASA 2 including respiratory risk factors such as recent URTI.
  3. Low risk: ASA 1.
3. Surgery.
1. High risk: Cardiothoracic, neurosurgery, scoliosis surgery.
  2. Medium risk: Airway and dental surgery.
  3. Low risk: Peripheral, minor surgery.
  4. Emergency surgery is associated with increased risk.
4. Experience of the anaesthetist.  
The experience and volume of practice of the anaesthetist in paediatric anaesthesia is relevant, however evidence for absolute numbers is weak.

For the purpose of this document low risk means a relative risk of 1 or less, medium risk 2-3 times that and high risk 4 times or greater than low risk.

## **10. Maintenance of competence and continuing professional development**

It is recognised that anaesthesia services will be delivered by qualified, registered medical specialists as well as by practitioners with generalist registration who have completed their college's recognised training. Irrespective of the training and qualification it is expected that standards of practice meet the demands of the environment in which practitioners practise. Continuing professional development (CPD) is an essential part of maintenance and improvements in skills regardless of volumes of practice, and even more so where these may be low.

The ANZCA CPD Standard identifies the elements that need to be included in any CPD program to ensure safety and quality in the provision of anaesthesia.

- 10.1 A formal standard for maintenance of competence for practitioners caring for children does not currently exist. The expectation is that practitioners will tailor their own CPD to their practice and caseload. A framework for CPD is provided through the college in the form of the ANZCA/FPM CPD program<sup>13</sup> which is based on the ANZCA CPD Standard.
- 10.2 CPD calls for reflection on the part of anaesthetists. This might include an assessment of the likelihood of treating paediatric patients in planned or in unplanned situations, the volume of practice, and the recency of practice. These factors can guide a plan to develop and maintain skills and knowledge required to function at the accepted standard. Anaesthetists who care for children should be able to provide advanced life support, resuscitation, stabilisation and transfer of critically unwell children.
- 10.3 Australia and New Zealand face the dual challenges of sparse populations and geographically remote locations. Maintaining competence and, equally important, the confidence to treat children when exposed to low volumes of practice can be difficult. Maintaining skills can take a variety of forms: direct care, CPD activities, refresher and scenario-based courses, and visits to other centres. There should be established networks and arrangements in place to facilitate supernumerary attachments or secondments to higher volume or specialist centres. Regional networks should facilitate and support joint CPD activities specific to paediatric practice and health networks should support the time required to undertake these activities.

## **11. Legislative requirements**

- 11.1 Local requirements for background checks or police clearance specific to paediatric practice will vary but must be adhered to and monitored by the healthcare facility credentialing authority.

- 11.2 Practitioners should be aware of issues relating to assent, consent and the rights of children and adolescents undergoing medical care as well as avenues for child protection, mandatory reporting and safeguarding vulnerable children.<sup>14, 15</sup>

## **12. Location for care and patient selection**

- 12.1 The approach to the perioperative care of children is underpinned by the commitment to children described in the United Nations Convention on the Rights of the Child<sup>16</sup> which states that the best interests of the child should be a primary consideration.
- 12.2 Distance between centres in Australia and New Zealand means that care needs to be delivered in different contexts. Australia has the lowest population density of any country in the OECD. Geographical challenges impact on many aspects of care including the transport of acutely unwell children and the configuration of regional elective services for children requiring anaesthesia.<sup>17</sup>
- 12.3 It is common within geographical regions to stratify healthcare facilities in order to determine the appropriateness of services delivered and patients to be treated at any particular facility.<sup>18</sup>
- 12.4 Networks between hospitals can provide support for institutions that care for children. Networks are a way of utilising available specialist expertise, standardising care and improving access. Networks allow collaboration between institutions, facilitate communication and training, and provide support in the event of a critical incident. Where an institution that cares for paediatric patients is not part of a larger network, they should seek to create such links with hospitals within the region.<sup>19-21</sup>

## **13. Care of the critically ill paediatric patient**

- 13.1 The importance of pre-planning and a team based approach is highlighted in the Royal College of Anaesthetists *Guidelines for the provision of paediatric anaesthesia services*<sup>7</sup>, the NSW government *Surgery for children in metropolitan Sydney strategic framework*<sup>22</sup> and ANZCA professional document *PG52(G) Guideline for transport of critically ill patients*. Forward planning of resuscitation and stabilisation teams, and clear referral and transfer pathways will reduce the chances of anaesthetists being left unsupported in the care of a critically ill child.
- 13.2 Anaesthetists have competencies that are invaluable in the care of the critically ill child.<sup>23</sup> These include securing the airway and vascular access in a collapsed or severely injured child requiring resuscitation, and stabilising a child with rapidly advancing respiratory disease. In the event of critically ill children presenting to hospital, these competencies should be utilised regardless of professional titles.
- 13.3 In Australia and New Zealand, dedicated services take on the role of providing specialist intensive care advice and co-ordinating retrieval and transfer of paediatric, neonatal and perinatal patients. Hospitals should ensure that they have in place clear guidelines for contacting the relevant service in their area.

## **14. Neonates and infants**

- 14.1 Apnoea following anaesthesia and sedation is a potentially life-threatening complication that occurs mostly in premature infants. Apnoea is considered significant if it lasts more than 15 seconds, is associated with bradycardia (HR < 100/min or a drop of at least 30/min from baseline) or with oxygen desaturation (< 90%).

- 14.2 Risk factors for postoperative apnoea include postmenstrual age, gestational age at birth, preoperative apnoea of prematurity, anaemia (Hb <10 g/dl or Haematocrit < 30%) and chronic lung disease.<sup>24, 26-28</sup>
- 14.3 Most postoperative apnoea occurs within the first 2 hours. In healthy infants, after 12 apnoea-free hours, apnoea risk approaches preoperative levels in healthy infants. Infants should be monitored for 12 apnoea free hours. High-risk infants or those with persistent apnoeas may need to be admitted for a longer period of monitoring.
- 14.4 Healthy ex-premature infants who have reached a PMA of 60 weeks can be sent home with standard discharge criteria. Ex-premature infants below 46 weeks should be admitted for apnoea monitoring after general anaesthesia or sedation. Between 46 weeks and 60 weeks PMA, there is currently no consensus as to whether or not infants need overnight monitoring.<sup>25-27</sup> The analysis done by Côté et al showed that in the ex-premature infant born at 35 weeks, the risk of postoperative apnoea did not fall to 1% or less until the infants reach a PMA of 54 weeks. In the ex-premature infant born at 32 weeks, the risk of apnoea did not fall to 1% or less until the infants reach 56 weeks<sup>24</sup> PMA. Apnoea in otherwise well ex-premature infants has been reported as late as 54 weeks postmenstrual age.<sup>24, 28</sup>
- 14.5 Full term infants (greater than 37 weeks gestational age) may develop apnoea after general anaesthesia or sedation, although there is less evidence to guide decision making for these patients. There have been case reports of term infants up to 45 weeks PMA having apnoea in the postoperative period<sup>26, 28</sup>.

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#### **Related ANZCA documents**

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| PS02(A)   | Position statement on credentialling and defining the scope of clinical practice in anaesthesia  |
| PG03(A)   | Guideline for the management of major regional analgesia   |
| PG06(A)   | Guideline on the anaesthesia record  |
| PG07(A)   | Guideline on pre-anaesthesia consultation and patient preparation  |
| PS08(A)   | Position statement on the assistant for the anaesthetist   |
| PG09(G)   | Guideline on procedural sedation   |
| PG15(POM) | Guideline for the perioperative care of patients selected for day stay procedures  |
| PS26(A)   | Position statement on informed consent for anaesthesia or sedation   |
| PG41(G)   | Guideline on acute pain management   |
| PS45(G)   | Position statement on patients' rights to pain management and associated responsibilities  |
| PS55(A)   | Position statement on minimum facilities for safe administration of anaesthesia in operating suites and other anaesthetising locations |

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