Guest Editorial

Paediatric perioperative morbidity and mortality

Children represent a significant proportion of the South African population, with 30% of the population aged ≤ 15 years.[1] Globally, surgical volumes are large. An estimated 312.9 million operations took place in 2012.[2] However, there are few data on perioperative morbidity and mortality in the paediatric surgical population in South Africa. Additionally, information is not known on the number of children undergoing surgery, who provides their anaesthesia (specialist anaesthesiologists versus non-specialist anaesthesiologists), and the quality outcomes of their perioperative care. These data are essential in order to understand current paediatric perioperative morbidity and mortality in order to develop evidence-based recommendations to improve patient outcomes. The World Health Organization (WHO) has initiated the second global patient safety challenge, "Safe surgery saves lives". This is a core set of safety standards to be applied universally.[3] The measurement of surgical (anaesthesia) services is one of four areas that has been identified in which improvement can be made in terms of the safety of surgical care: "Routine surveillance to evaluate and measure surgical services must be established if public health systems are to ensure progress in improving the safety of surgical care".[3] In a guest editorial in *SAJAA* in 2012, Prof Thomas asked the question: "What is the size of the problem of perioperative morbidity and mortality in children in South Africa?" She challenged us to address this problem.[4] The time has come for us to accept this challenge and address these issues.

Cronje's review of anaesthesia-related mortality and morbidity in this edition of *SAJAA* highlights the potentially large discrepancy in anaesthesia-related mortality rates between developed and developing countries.[5] Anaesthesia in children is considered to be safe in developed countries, with anaesthesia-related deaths reported to be from 0.1–1.2/10 000.[6–8] The data are limited in developing countries, but suggest that the number of anaesthesia-related deaths is between two and 100 times higher than that in developed countries.[9,10] The limitations of these studies in both developed and less developed countries is that they often reflect the institution's experience over many years, rather than the overall experience of a country's healthcare system.

Voluntary reporting from multiple institutions is a different approach. In the USA, the Society for Pediatric Anesthesia gave its support to a voluntary reporting system for cardiac arrests, the Pediatric Perioperative Cardiac Arrest Registry.[11] Over time, a change in the demographics of cardiac arrests was reported. The change was from primarily airway and medication (halothane anaesthesia) related events initially to other causes, including hyperkalaemia during transfusion in infants, haemorrhage in infants undergoing craniosynostosis correction, specific congenital heart lesions in children, such as Williams syndrome (supravalvular aortic stenosis with abnormal coronary arteries), and Fontan physiology in children.[12–14] A consistent theme in these reports was that the highest rate of cardiac arrest was in neonates and infants, and in particular, those with congenital heart disease. It is likely that the change away from airway-related events reflects the improved availability of specialised advance airway equipment (laryngeal mask airways, GlideScope® and fibre-optic equipment).

The Pediatric Regional Anesthesia Network database,[15] designed to assess the incidence of adverse events following regional anaesthesia, is another ongoing project. Both of these databases have and continue to provide useful information, but the limiting factor is that these systems rely upon accurate voluntary reporting without means of data verification. Thus, although laudable, it is likely that these types of data collection and analyses do not reflect the true incidence of adverse events, and instead reflect the overall experience of the major academic institutions that elected to participate in the registries.

The Anesthesia Closed Claims Project is another broader effort which has been established in the USA. This project is supported by the American Society of Anesthesiologists, who developed a system to examine adverse events leading to medical or legal lawsuits which have been settled. This has allowed rare events associated with adverse outcomes to be analysed and studied, and for assessment to take place on whether or not the events were preventable or related to surgical, anaesthetic or patient factors.

A change in the demographics of adverse anaesthesia events relating to respiratory morbidity and mortality in adults from 1985–2006 coincided with the increased use of pulse oximetry and capnography.[16] Additionally, when compared with adults, a clear difference was reported in children, where it was felt that ~ 90% of adverse outcomes relating to inadequate ventilation could have been prevented with pulse oximetry and capnography.[17]

Unfortunately, because of the nature of such an analysis, the events may have taken place many years before settlement. Thus, there is loss of a real-time reflection on current practice and outcomes. All of these studies are also limited because the true numerator or denominator is not known.

In Europe, the Anaesthesia Practice in Children Observational Trial (APRICOT), a prospective multi-centre observational study, was recently completed.[18] More than 260 centres in Europe contributed data on perioperative critical incidents in children. These data should be published early in 2016. In addition, the Neonate-Children Study of Anaesthesia Practice in Europe (NECTARINE) will provide information on morbidity and mortality relating to neonatal anaesthesia.[19] These two studies should provide further valuable information on anaesthesia practice and anaesthesia-related morbidity and mortality in

the paediatric population. However, the fundamental problem with these large registries and observational studies is that they continue to provide data on paediatric patients in predominantly developed countries. Therefore, the direct applicability of these data to South Africa is compromised.

We cannot provide fully informed information to paediatric patients and their parents in South Africa on the risk of anaesthesia because such data do not exist, and we are unable to assess where we stand in relation to other developed and undeveloped healthcare systems. Anaesthesia-related mortality is a baseline measure of the safety of an anaesthesia service, but a crude measure of quality of care since these events are hopefully rare.[4,7,20] An extensive and detailed collection and analysis of South African data would help the risk factors associated with morbidity to be identified, together with system issues, e.g. the lack of equipment, inadequate recovery and discharge criteria, and inadequate skills of healthcare providers, as contributors to perioperative morbidity. Ideally, the aim should be to strive to emulate the examples set by developed countries to identify modifiable risk factors, and develop subsequent strategies to improve patient safety and quality of care.

Unfortunately, the majority of published African-based studies are too small to provide meaningful perioperative paediatric morbidity and mortality information.[9,10,21] Therefore, it is difficult to confidently report on the current morbidity and mortality associated with paediatric surgery and anaesthesia, and associated risk factors in South Africa. Therefore, the need remains for a large prospective study to be conducted in South Africa in which standardised definitions and timeframes pertaining to paediatric surgical outcomes are utilised. The success of the South African Surgical Outcomes Study (SASOS)[22] indicates that both the motivation and capacity are available in South Africa for large collaborative observational studies to be performed. These data are essential to clinicians, policy-makers and funders of healthcare in order to appropriately address systemic deficiencies and areas which need additional resources and funding for upgrading facilities and equipment.

Performing a South African paediatric surgical outcomes study would provide some of the answers to questions on the state of paediatric anaesthesia in South Africa. If the factors which result in poor outcomes can be identified, interventions can be established to improve the quality of care and outcomes in the future. Such a study would provide the necessary impetus to describe paediatric surgical and anaesthesia practice in South Africa, and provide insight into risk factors for morbidity. Ideally, it should then progress to the establishment of a national prospective observational database, where key risk factors and outcomes are routinely collected to track the quality of paediatric surgical and anaesthesia care across South Africa. However, such an ambitious project should not be limited to academic practice, and must include all healthcare facilities.

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