Global Safe Pediatric Anesthesia Care

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It is now recognized that five billion of more than seven billion people globally do not have timely access to safe surgery and anesthesia. This is a surgical and anesthesia access, workforce, and funding crisis. If you consider that in many low- and middle-income countries, children under the age of 15 yr make up 40% to 50% of the population, then two thirds of the world's children (1.7 billion) lack access to appropriate surgical and anesthesia care. Only 8% of children in these countries have timely access to surgical care, and injuries alone kill more children globally than human immunodeficiency virus, tuberculosis, and malaria combined.[1] This deficit represents the majority of the global pediatric surgical burden. Children are often the most marginalized group in already marginalized societies. A child's needs may be neglected and the child with an untreated surgical condition may be ostracized, never attend school, or even be abandoned.

"[In low- and middle-income countries] pediatric upskilling of existing anesthesia workforces, including nonphysician anesthesia providers, is necessary."

In this issue of Anesthesiology, Newton *et al.*[2] report on pediatric perioperative mortality rates in Kenya, analyzing 6,000 cases over two years in primary, secondary, and tertiary hospitals. These data are lacking in many resource-poor countries, and Newton *et al.* have addressed multiple challenges by using a laptop-based electronic data collection system for pediatric surgery at government and nongovernment hospitals. They found that the cumulative pediatric perioperative mortality was 0.8% at 24 h, 1.1% at 48 h, and 1.7% at seven days. The majority of these cases (95.8%) were American Society of Anesthesiologists (ASA) Physical Status I or II. Mortality was less in secondary and tertiary hospitals, where more complex pediatric surgery was often performed, and 70% of these cases were performed at the one center in Nairobi, which has a focus on pediatric surgery. Risk factors identified were an ASA Physical Status score of III or more, after-hours surgery, and potentially the lack of completion of the Safe Surgery Checklist.

This year, Torborg *et al.* also looked prospectively at pediatric surgical outcomes in South Africa in 2,024 patients over more than 14 days in 43 government hospitals.[3] The overall incidence of complications was 9.7% (mainly infective), with an in-hospital mortality of 1.1%. Forty-one percent of these deaths were in ASA I or II children, and one-third were within 24 h. These authors, and also Newton *et al.*, have shown that when children are operated on in centers with some focus on pediatric care, perioperative mortality rates are lower but may still be up to ten times that of high-income countries.

Overall global pediatric mortality rates have decreased by 52% since 1999, mostly because of the prevention and treatment of infectious diseases. However, this has only served to emphasize the relative burden of pediatric surgical disease. Congenital anomalies are increasingly becoming the most frequent cause of infant mortality in some countries.

Pediatric surgical conditions cross categories like trauma, congenital anomalies, infection, and cancer. Pathology is often advanced because of delayed presentation in many low- and middle-income countries, and lack of antenatal care means that many major congenital anomalies are only diagnosed at birth. Poor outcomes may be due to an inability to refer to appropriate centers, lack of surgical and anesthetic expertise, and lack of specialized equipment and appropriate postoperative care. Anesthesia is often administered by nonphysician anesthesia providers in these remote environments,[4] and Newton *et al.* found that the majority of pediatric anesthesia in their study was provided by nonphysician anesthesia providers.[2]

Image: B. Sileshi, Vanderbilt University Medical Center.

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The greatest challenges and worst outcomes for pediatric anesthesia and surgery occur for neonatal surgery, and pediatric mortality rates, especially for major neonatal emergency surgery in low- and middle-income countries, continue to be horrific—50% to nearly 100% for ruptured abdominal wall defects, tracheo-esophageal fistula, and bowel perforation or resection.[5] Even urgent neonatal colostomy, which is an essential operation for many anorectal anomalies and Hirshsprung's disease, carries a significant mortality in resource-poor settings.

Often pediatric surgery is carried out in the most remote hospitals with the least level of expertise, equipment, and support. A review of pediatric emergency and essential surgical care in Zambia showed that 68% of 32 emergency and essential pediatric procedures were available, and minimum pediatric surgical safety criteria were met by only 14% of hospitals.[6]

What can we do to help overcome these very challenging issues? Far too often resources are devoted to surgical subspecialty development, and there needs to be parallel development of pediatric surgery and anesthesia and other stakeholders within a country to achieve these goals. The development of pediatric anesthesia and surgery needs to be integrally involved in any country developing their National Surgery Obstetric and Anesthesia Plan. Pediatric upskilling of existing anesthesia workforces, including nonphysician anesthesia providers, is necessary. National anesthesia societies and pediatric anesthesia societies around the world have supported pediatric anesthesia fellowships and initiatives in pediatric anesthesia, and these are to be maintained, encouraged, and supported.

The Global Initiative for Children's Surgery (USA) has developed the Optimal Resources for Children's Surgery, which details pediatric surgical and anesthesia guidelines for primary health centers, first-, second-, and third level, and national children's hospitals.[7]

The World Federation of Societies of Anesthesiologists (United Kingdom) has many initiatives to support pediatric anesthesia in resource-poor countries, including the following:

- Support for National Surgery Obstetric and Anesthesia Plan development;
- Pediatric anesthesia fellowships for low- and middle-income country anesthesiologists (Fund-A-Fellow Program) to develop leaders in pediatric anesthesiology;
- Recent development of the new international standards for the safe practice of anesthesia endorsed by the World Health Organization.[8] These standards are very relevant to pediatric anesthesia care;
- Collaboration, partnership, and advocacy with other national societies and other organizations promoting safety in pediatric anesthesia and surgery.

The Safe Anesthesia From Education (SAFE) program has developed several courses, including the SAFE pediatric anesthesia course which has become the definitive short (three-day) course for both physician and nonphysician anesthesia providers.[9] A specific SAFE course is currently being developed for anesthesia for cleft surgery. Philanthropic organizations such as KidsOR provide specialized pediatric operating rooms in different countries with improved local capability and expertise.

Well-defined metrics are essential if we wish to benchmark perioperative outcomes and monitor progress, especially in low- and middle-income countries, and even more so for pediatric surgery and anesthesia.[10] Newton *et al.* are to be congratulated on their work in this area, and one would hope that this pediatric data collection technique can be replicated in other resource-poor settings. In the last 15 yr there have been increasingly better data on pediatric perioperative morality especially from sub-Saharan Africa. There is a great need to see equivalent data from other regions, such as South East Asia and the Western Pacific. We also need specific bellwether indicators for pediatric surgery to gauge specific pediatric surgery and anesthesia safety.[10] Pediatric anesthesiologists undoubtedly have an important role and responsibility as global health physicians in gathering perioperative data on the outcome of their patients in resource-poor countries and promulgating education and training around the globe.

Competing Interests

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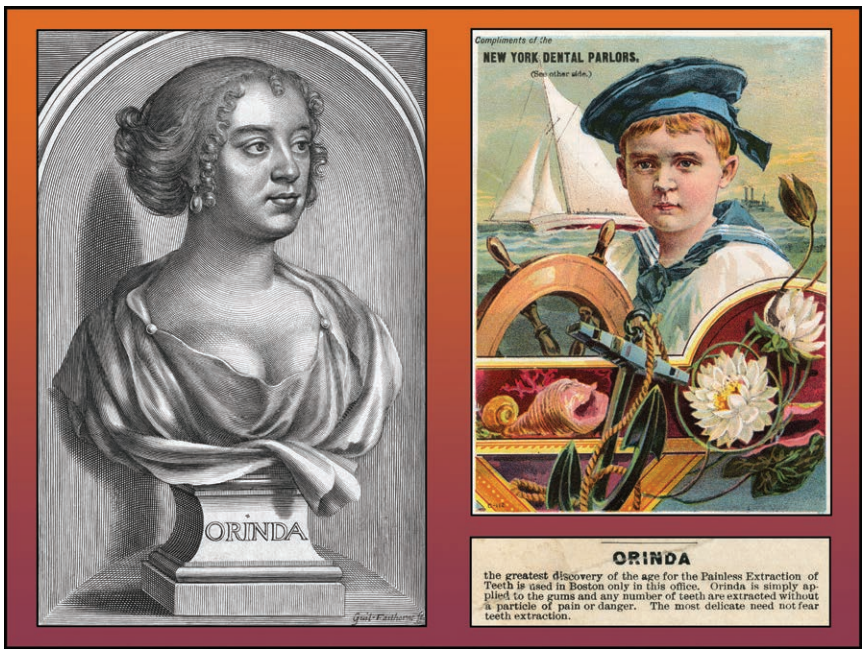
Tracing "Orinda" from Corneille to Cocaine: A "Matchless" *Nom-de-plume*, but Outmatched Numbing



After reading the entire Bible at the age of four, Katherine Fowler (1632 to 1664) surprised the English public first as a child prodigy, then as a teenaged polyglot, and finally as a 16-year-old royalist bride to a much older antiroyalist groom. An unabashed Francophile, she was memorialized by the 1667 posthumous publication of *Poems by the Most Deservedly Admired Mrs. Katherine Philips, the Matchless Orinda* (its frontispiece, *left*), which included her brilliant translations of Pierre Corneille's tragedies *Horace* and *Pompée*. Over 230 years later, Philips' *nom-de-plume* "Orinda" was borrowed for use by two dental offices as the "greatest discovery of the age," a cocaine-laced compound for the "Painless Extraction of Teeth" (extracts from Boston's "New York Dental Parlors" trade card, *right*). Centuries before, in England, the "matchless" Katherine Philips had died from smallpox at the tender age of 33; however, in New England, her namesake anesthetic, Orinda—outmatched by proprietary competitors—did not survive even 33 months. And so, a poet and a painkiller shared more than a name; each was long in promise but short in lifespan. (Copyright © the American Society of Anesthesiologists' Wood Library-Museum of Anesthesiology.)

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