

Editorial

Progress in Pediatric Anesthesiology Increased Perioperative Safety for Children

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The history of pediatric anesthesiology is long and remarkable. Prior to the mid-twentieth century children with co-existing disease, especially cyanotic cardiac disease, often suffered significant morbidity or mortality when forced to undergo general anesthesia and surgery. Procedures that we now manage safely every day were often life threatening; infants with pyloric stenosis were not guaranteed survival and children with midline gastrointestinal defects often lost large segments of bowel resulting in malabsorption during the postoperative period. Certainly, improvement in the ability of pediatric surgeons to manage congenital conditions of newborns has been dramatic. What about the growth of pediatric anesthesiology during the last fifty years? Has this kept up with the growth in the skill level of our surgical colleagues?

Since 1960, the scientific foundation of the practice of pediatric medicine has grown continuously; much of this knowledge has been incorporated as the fundamental basis of pediatric anesthesia. The growth in pediatrics has been broad and deep including such elements as increased knowledge of the development of the central nervous system, an understanding of the development of respiratory control, new insights on psychosocial development, and a deeper understanding of cardiovascular physiology. This information, along with technological advances and standardized training have been incorporated into practice and now provide pediatric anesthesia clinicians with a better understanding of patients during the perioperative period as well as methods to more easily manage the smallest of patients. Several areas stand out as representing substantial improvements in health care in general and especially in pediatric anesthesia. These additions to our knowledge over the last fifty years are especially important.

The stress response is present in neonates and requires potent anesthetics for blockade

Recognition of the stress response in infants undergoing surgical procedures and the increase in morbidity and mortality associated

with this response is a concept that is less than thirty years old. Early studies suggested that anesthetic techniques that relied on nitrous oxide as the primary anesthetic were ineffective in blunting the significant outpouring of stress hormones and glucose. Morbidity and mortality were associated with this. This observation did much to change the subsequent anesthetic management of neonates and infants and set the stage for the development of pediatric pain management.

Preoperative preparation of infants and children prior to operative intervention

Preparation of children for surgical procedures is now the standard. Preoperative transfusion of patients with sickle cell disease, volume repletion for infants with pyloric stenosis, pulmonary stabilization of infants with congenital diaphragmatic hernia, and shrinkage of highly vascular tumors prior to resection are but a few of the many clinical procedures that have improved the safety of infants and children. Pediatric anesthesiologists are expected to have diagnostic skills commensurate with their pediatric colleagues and to understand the process of treatment for complex diseases of infants and children.

Postoperative critical management of sick infants

Pediatric critical care and pediatric anesthesia have developed side by side over the last forty years. Most of the earliest practitioners of critical care were anesthesiologists, many with dual training in pediatrics. The presence of experts in the ICU, especially those with knowledge of the pathophysiology of disease in infants as well as the stresses of the operating room has improved survival in complicated postoperative patients.

Elucidation of the pulmonary mechanics at birth

An understanding of the importance of surfactant and its role in the development of lung disease in newborns has reduced the development of chronic lung disease in premature infants and reduced perioperative risk for many newborns.

An understanding of the role of the pulmonary circulation in children with congenital heart disease or lung disease

Children who have developed pulmonary hypertension because of heart or lung disease are at substantial risk for death during the perioperative period. The ability to treat chronic pulmonary hypertension has evolved within the last 20 years providing agents for acute intraoperative management as well as chronic control. Training in the management of pulmonary hypertension is a fundamental element of the curriculum for pediatric anesthesiologists.

The development of regional anesthesia as an adjunct in the management of infants

Though reports of the use of regional anesthesia in children are

present before 1960, the true development of regional as an adjunct to general anesthesia did not occur until the 1970s. Since that time there has been an explosion in the use of regional anesthesia to manage an infant's postoperative pain and to reduce the amount of volatile anesthetics required to provide adequate general anesthesia.

The development of safer anesthetic agents

Halothane, once considered the perfect agent for anesthetizing children, has largely been supplanted by Sevoflurane and Desflurane. Both of these drugs are less soluble than halothane and have a margin of safety that is dramatically improved over halothane. This substitution alone is responsible for a significant improvement in perioperative morbidity and mortality rates in children.

Intraoperative monitoring

Pulse oximetry and end tidal carbon dioxide measurement are standards in the operating room and have dramatically improved safety for all patients. Arguably, infants and children have gained most from the widespread use of these monitors because of the high incidence of airway disasters associated with the perioperative care of children.

The widespread availability of high quality fiberoptic airway equipment

The ability to visualize the airways of tiny infants has improved dramatically in the last ten years. Fixed and flexible fiberoptics are used daily in operating rooms that care for infants with syndromes involving the mandible and the midface. This has allowed practitioners of pediatric anesthesia to safely manage many children who were difficult or impossible to manage in the past.

A more complete understanding of child development and the risk of post traumatic stress syndrome in children

The psychosocial development of infants and children is only

now becoming recognized as fundamental to their perioperative management. Practitioners of pediatric anesthesia consider the developmental level of the patient when planning an anesthetic and understand that the outcome of a "stormy induction" for a child doesn't end when the child leaves the hospital.

These are certainly not the only areas of development within pediatric anesthesiology in the last forty years. New information, much of it culled from the field of pediatric medicine - new techniques, new drugs, improved monitoring, as well as increased and standardized training of practitioners, have demonstrably improved the practice of pediatric anesthesia and have reduced morbidity and mortality of infants and children during the perioperative period. This progress, along with the development of improved pediatric surgical skills and the widespread use of laparoscopic surgery has not only saved lives but has improved the quality of the perioperative experience for children and their families. Progress in pediatric anesthesia is ongoing and is providing our surgical colleagues and our patients with safe care in the perioperative period. Children with chronic disease, significant congenital anomalies, and life threatening acute processes can receive the surgical care that they require safely every day.

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