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Current situation of pediatric anesthesiology training in Colombia

Estado actual de la formación en anestesiología pediátrica en Colombia

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Abstract

Surgery is a key pillar in medical care, and both the surgical as well as the anesthetic components are essential within the health systems in countries of all levels of development. Every year, close to 230 million surgical procedures are performed worldwide, with pediatric surgery being representative, as around 85% of children require a surgical procedure. However, the issue of education and training of the people involved in pediatric surgery who can provide safe surgical and anesthetic care in medium and low income countries has been absent from the global health debate.

The development of anesthesia in pediatrics faces many challenges: it is a relatively new specialty, it has to deal with clinical challenges associated with anatomical, physiological, psychological and procedure-related differences, while it faces the reality of few training opportunities which results in a limited number of duly trained and qualified specialists in pediatric anesthesiology. In Latin America, the possibility of applying to a specialization in pediatric anesthesia is limited. In particular in Colombia it has not been possible to establish a pediatric anesthesia subspecialty, creating the need to promote formal and informal training in this discipline in order to ensure that safe, good quality anesthetic care is provided to children.

This article describes the development of pediatric anesthesia training in the world and in Colombia, highlighting the relationship between the incidence of anesthetic complications and the need for training in this discipline.

Key words

Anesthesiology; Anesthesia; Pediatrics; Medical education; Specialization; Professional training.

Resumen

La cirugía es una parte indispensable en la atención médica, siendo el componente quirúrgico y el anestésico fundamentales dentro del sistema de salud en países de todos los niveles de desarrollo. Anualmente, se realizan alrededor de 230 millones de procedimientos quirúrgicos en todo el mundo, siendo la cirugía pediátrica un porcentaje, ya que alrededor del 85 % de los niños requiere un procedimiento quirúrgico; sin embargo, la prestación de servicios quirúrgicos y anestésicos seguros desde la formación y entrenamiento de los actores involucrados en la atención quirúrgica infantil en países de medianos y bajos ingresos ha estado ausente del discurso de salud global.

El desarrollo del campo de la anestesia en pediatría enfrenta múltiples retos: es una especialidad relativamente nueva, presenta desafíos clínicos relacionados con las diferencias anatómicas, fisiológicas, psicológicas y procedimentales, así como existen pocas oportunidades de entrenamiento con el consecuente número limitado de especialistas en anestesiología pediátrica capacitados y calificados. Para América latina, las posibilidades de aplicar a una especialización en anestesiología pediátrica son limitadas y específicamente para Colombia no ha sido posible crear la subespecialidad de anestesiología pediátrica, por lo que se debe fomentar la formación formal e informal en esta disciplina, con el fin de ofrecer una atención anestésica segura y con calidad para los niños.

Este artículo hace un recuento del desarrollo de la formación en anestesiología pediátrica en el mundo y en Colombia, visibilizando la relación con la incidencia de complicaciones anestésicas y la necesidad de formación en esta disciplina.

Palabras clave

Anestesiología; Anestesia; Pediatría; Educación médica; Especialización; Capacitación profesional.

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INTRODUCTION

Progress in surgery would not have been possible without the advances in anesthesia, which have actually contributed to the development of surgical subspecialties. However, the same has not been true in the field of anesthesiology itself, especially in pediatric anesthesia, which has been slow to evolve as compared to other areas. For this reason, it is considered a fledgeling subspecialty (1) in urgent need of becoming strong, given that, in the developing world, 40 to 50% population is under 18 years of age and 85% of this population will require a surgical intervention before 15 years of age (2).

As far as the development of anesthesia in pediatrics, when considering the significant size of this population and the clinical challenges it poses in terms of physiological and psychological differences (3), it is clear that the number of trained and qualified specialists is quite limited, as is also the number of training opportunities (4). In view of this situation, starting in the 1990s, pediatric anesthesia societies began to come to the forefront in the United States (5) and in Europe (6), calling for the need to promote quality in anesthesia, improve perioperative care and pain management in children through the development of clinical care models and promotion of training and formal education programs in this subspecialty. However, in Latin America, the possibilities of applying to a specialization in pediatric anesthesiology are still limited (7).

In Colombia, the creation of a pediatric anesthesia subspecialty program with university endorsement has not been possible so far, prompting the Colombian Society of Anesthesiology to foster continuing education as the strategy to maintain the anesthesia profession abreast.

The purpose of this article is to provide an account of how pediatric anesthesia training has developed in the world and locally, emphasizing the need for training programs in this discipline in Colombia, with a view at aligning professional practice

with global policies and trends and seeking safe and quality care for the pediatric population.

Anesthetic complications and training in pediatric anesthesiology

As a subspecialty, pediatric anesthesia emerged from the realization that mortality is two to three times higher in children than in adults, particularly in low or medium income countries, and the recognition of anatomical, pharmacological, pathophysiological and procedural differences in the pediatric population (1). Added to this is the fact that training during the graduate anesthesia program is short, with local exposure to the pediatric population in mixed hospitals in which this population is not the sole focus of care accounting for only 12% of the total anesthesia workload, thus limiting the acquisition of the competencies and skills needed to provide safe care to this age group (1). Along the same lines, it is important to remember that a qualified pediatric anesthetist needs a minimum caseload 200 to 300 children up to 10 years of age, including one infant per month (8). One can conclude that financial pressures, the lack of logistic resources and of a well trained team, as well as the lack of training in pediatric anesthesia result in procedures with low anesthetic risk becoming high anesthetic risk scenarios as they are performed by people without experience or sufficient training (9).

It is worth highlighting that occasional anesthetic practice in children, defined as less than 100 cases per anesthetist, results in a five-fold increase in the risk of complications when compared with regular pediatric anesthesia practice, as well as in a higher frequency of severe complications in one out of every five infants (9). Additionally, in routine outpatient surgery such as adenotonsillectomy, better operating room efficiency is reported when the specialist has formal training in pediatric anesthesiology (10); the same is

true in children undergoing anesthesia for endoscopic gastroenterology procedures with anesthesia-controlled time when the provider is a pediatric anesthetist, reducing costs and improving efficiency (11).

Competencies in pediatric anesthesiology

The European Training Requirements in Anesthesiology set forth the minimum requirements for anesthesiology residents and anesthetists with training in pediatric anesthesia. For anesthesia residents, the proposed requirements include exposure to at least preoperative assessment, general anesthesia in children over one year of age, pediatric surgery, otolaryngological and airway surgery, ophthalmology, orthopedic surgery, neurosurgery, neonatal surgery, dentofacial surgery, anesthesia outside the operating room, and acute pain management. For anesthetists with formal training the requirements include clinical tools and competencies for the management of newborns and children under 1 year of age, peripheral regional and neuroaxial anesthesia, invasive and advanced airway management, advanced resuscitation, nutrition and intravenous fluid management, transfusion strategies, ultrasound-guided vascular accesses, advanced acute pain management, chronic pain management, transport and stabilization, intensive neonatal and pediatric intensive care, organ transplantation, and cardiothoracic anesthesia (12).

Similarly, the American Council of Graduate Medical Education (ACGME) sets forth core competencies for specialists, pediatric anesthetists included. These competencies include compassionate, appropriate and effective patient care; comprehensive medical knowledge; professionalism marked by ethics and acceptance of diversity; system-based practice for efficient resource management; practice-based learning and improvement, providing opportunities for research; and,

finally communication and interpersonal engagement skills (13).

Likewise, in March 2023, the Society of Pediatric Anesthesiology set up a workgroup to determine the future of pediatric anesthesia training. It settled around eight domains that need to be taught to all pediatric anesthesiologists, as follows: practice management, patient safety, oversight skills, medical education, communication skills, quality improvement, leadership, and basic research fundamentals (14).

In turn, the Colombian Society of Anesthesiology and Resuscitation (S.C.A.R.E.) considers pediatric anesthesia as a specific competency requiring in-depth training (15).

Recognition of the relevance of pediatric anesthesia training in the world

Growing recognition of pediatric anesthesia and its risks —especially in high-risk patients such as neonates, children under two years of age, high-risk surgeries or children with significant comorbidities— have led surgical teams, hospital administrators and even informed parents to demand the presence of experienced anesthesiologists with training in perioperative care of children (1). Therefore, defining safe anesthetic practice and increasing perioperative care standards in children must be a central topic for the international community; likewise, in the local setting, it must be a priority within the framework of public health policy and call for the promotion of education and awareness of safe and quality practices for the pediatric population (9).

Based on the arguments mentioned above and the aim of improving education and training — particularly of academic leaders— and furthering the advancement of new knowledge that would improve outcomes in the care of pediatric patients (10), the first specialization programs in pediatric anesthesiology were created in the 1950s and 1960s.

Historically, pediatric anesthesiology as a subspecialty in the United States dates back to the post Second World War II years, with its beginnings attributed to physician Robert M. Smith, in Boston Children's Hospital (5). In the 1980s, the number of specialization programs with a duration of 6 to 12 months began to increase. Later, in 1987, the Society for Pediatric Anesthesia came into being with the aim of promoting quality anesthesia and perioperative care and alleviate pain in children through the development of clinical care models, research, and education focused on pediatric anesthesia and critical care (5). Then, in 1997, pediatric anesthesiology was recognized as a subspecialty by the ACGME in the United States, in such a way that by 2013 there were already 51 pediatric anesthesiology specialization programs accredited in the country, with 215 places available. In October of the same year, a certification exam in pediatric anesthesia was first carried out, with 1500 applicants coming forth (5).

It is worth mentioning that, in 2014, 230 candidates applied to the 53 pediatric anesthesia specialization programs in the United States, reflecting the growing demand in the specialty and attracting 10% of the students graduating from anesthesiology programs (16). In 2020, 216 specialists graduated from the 60 formal pediatric anesthesia specialization programs in the United States (17).

Currently, the Society for Pediatric Anesthesia is even discussing options for strengthening clinical and non-clinical competencies during pediatric anesthesia training (18). These include a two-year training program, the standardization of the minimum number of cases required (19), the establishment of the essential components to optimize training time and on-the-job training as a strategy to acquire work-relevant clinical skills considered non-essential during training (18). Likewise, formal pediatric anesthesiology programs are exploring new strategies and teaching settings for this subspecialty, including a simulation-based training campus for

acquiring technical and non-technical skills (20), the creation of a national on-line curriculum covering non-clinical competencies, as well as the design and implementation of an evaluation and feedback strategy framed within a competency-based education model (21).

Concomitantly, in 1996, the World Federation of Societies of Anesthesiologists (WFSA) created the advanced pediatric anesthesiology training program with a duration of 6 to 12 months, which included two months of cardiac anesthesia, at a cost to the WFSA of approximately US \$5,000 per scholar. The program was carried out in countries with higher levels of medical development, so that grantee anesthesiologists could receive training in their own language and return to their countries of origin after completing the program in order to lead promotion and education in the specialty (22). The program was first established in Santiago de Chile in 1999, with a duration of 6 to 12 months during which students rotated through different areas of the specialty, acquiring competencies in pediatric anesthesia, cardiac anesthesia, invasive monitoring, preanesthesia assessment, risk stratification, blood-sparing techniques, regional anesthesia, acute pain control, anesthesia for organ transplantation, and airway management (23). By 2018, 28 anesthesiologists from countries like Bolivia, Paraguay, Ecuador, Guatemala, Nicaragua, Peru, Honduras, Colombia, Dominican Republic, Venezuela and El Salvador had taken the training program; of them, 75% were working as pediatric anesthesiologists in their country of origin, creating a Latin-American network of experts in pediatric anesthesia (24). Given the success of the program, it was later expanded to Africa and Asia. At present, the WFSA advanced pediatric anesthesia program exists in countries like India, Kenya, Morocco, Serbia, Chile and Mexico (22).

In India, for example, the Indian Association of Paediatric Anaesthesiologists (IAPA) reports that the pediatric anesthesiology specialization offered by the government and private

hospitals in approximately 24 programs focuses on anesthesiologists who wish to acquire experience in the pediatric population, improving the quality of care and promoting training in this discipline (1).

As far as Europe is concerned, there is no homogenous frame of reference for pediatric anesthesia training, despite the fact that training programs for the specialty in the continent dates back to the 1990s, with the creation of the Federation of European Associations of Paediatric Anaesthesiologists (FEAPA), now called European Society for Paediatric Anesthesiology (ESPA) (6). Initially, they recommended one year of training to achieve the expert level, plus an additional year, including 6 months of pediatric intensive care, to reach the specialist level. However, this curricular structure was implemented only in the United Kingdom, the Scandinavian countries and France (6). But following the publication of the APRICOT study in 2018, given the prevalence of congenital or complex diseases in children, and the anesthesia-related complication rates in this population, the consensus is that the pediatric anesthesia subspecialization program requires an absolute minimum of two years in order to achieve certification in the European continent (6).

In contrast, in France, children under 3 years of age must be given anesthesia by certified pediatric anesthesiologists (9). This landscape reflects the degree of importance gained by pediatric anesthesiology in some societies, resulting in the need to formalize its practice and promote its teaching as a subspecialty with the support of States, scientific communities, healthcare organizations and education institutions.

In Nairobi, Kenya, a training program in pediatric anesthesia was established in 2014 as a result of the collaboration between the University of Nairobi, the Kenya Society of Anesthesiologists and WFSA, as well as with the support of the Society for Pediatric Anesthesia, the Association of Paediatric Anaesthetists of Great Britain and Ireland (APAGBI), and

Smile Train (24). By 2018, this program had trained eleven anesthesiologists who are now leaders in this specialty in their countries of origin, strengthening educational and clinical practice and bringing perioperative care of children to a new level in this region of the world (24).

In Australia and New Zealand, training in pediatric anesthesiology has not been well defined given the absence of formal curricula. It has developed in the form of time-based training ranging between six months and two years, also with wide variation in terms of exposure to cases and acquired experiences and competencies, depending on location and form of teaching and training (25). Consequently, through collaboration among scientific societies, a pediatric anesthesia specialization program based on reliable professional activities is being developed (25).

There is also the Scandinavian experience. In Denmark, teaching of anesthesia in children under two years of age is not part of the official anesthesia curricular programs (9). For that reason, formal education in pediatric anesthesiology began in 2002 with a twelve-month program consisting of anesthetic management in children and pediatric intensive care. In this program, a committee assigns students to high level pediatric hospitals where they develop their entire training. Additionally, they have established two years of age as the threshold for exclusive management by trained anesthesiologists (26).

In Japan, although pediatric anesthesia started back in 1965 and there is a Japanese Society of Pediatric Anesthesiology, this discipline is still not recognized as a subspecialty. Even if training in pediatric anesthesia is mandatory when it comes to deliver care to children, the lack of university hospitals with sufficient numbers of cases limits the development of formal education (27).

In Latin America, apart from the WFSA-sponsored programs in Chile and México, there are formal training programs at the Pequeno Príncipe Hospital in Brazil,

the Garrahan Hospital in Argentina, the Federico Gómez Children's Hospital in Mexico, and the National Children's Hospital in Costa Rica. In the rest of the region, training is offered after non-standardized residence programs (7).

Pediatric anesthesiology training in Colombia

In Colombia, according to the National Higher Education Information System (SNIES), there are 24 anesthesia programs with qualified registration which graduate approximately 120 anesthesiologists every year. During the three or four years of training, students dedicate between two to five consecutive or non-consecutive months to rotate in pediatric anesthesia (7). Likewise, all anesthesia programs cover pediatric anesthesia: as a one-time course during the entire residency in 91% of the programs; in the form of two different rotations; and even one of them has the training during the entire three-year residency (15). Additionally, the Colombian Society of Anesthesiology and Resuscitation (SCARE) reports that 18% of the anesthesia residency programs include a course on pediatric intensive care, while 40% include neonatal anesthesia courses in their curricula (28). This is similar to the training offered in North America, where students are required to complete a rotation in pediatric anesthesia for a minimum of two to six consecutive or non-consecutive months during their residency. During this time, they need to administer anesthesia to a total of 100 patients up to 12 years of age, 20 of them under 3 years of age, and 5 under three months of age (10). In Colombia, these targets have not been defined and they would be theoretical given that a rotation does not mean that the training plan will be accomplished, meaning that it cannot ensure competency in the area because Colombian hospitals rarely have sufficient subspecialty cases to ensure exposure to the representative cases (29).

On the other hand, Colombia has faced significant challenges for the implementation of formal pediatric anesthesiology training as the creation of a university subspecialty training program has not been possible given that it is not considered relevant by the Ministry of Education and the Ministry of Health and Social Protection. They base their view, first, on the lack of active programs in this discipline in the country and, second, on the assumption that a specialist graduating from an anesthesia residency program might have difficulty practicing the competencies of his/her specialty because of the emergence of new competing subspecialties (30).

However, it begs mentioning that during the period between 2003 and 2009, SCARE and Fundación Hospital Pediátrico La Misericordia (HOMI), in partnership with other hospitals such as Fundación Cardiovascular in Bucaramanga, Fundación Valle de Lili in Cali and Fundación Cardioinfantil, Clínica del Niño and Instituto Roosevelt in Bogotá, implemented a one-year informal pediatric anesthesia education program which included rotations in operating rooms, radiology, neonatal intensive care unit, general and cardiovascular pediatric intensive care unit, pediatric cardiovascular anesthesia, anesthesia for pediatric transplants, and pain management. The scientific society certified six anesthetists. However, admission was not widely publicized and the program was eventually closed due to the failed attempt at joining a higher education institution for formalization, as reported by Felipe Carmona (HOMI) and Piedad Echeverry (Instituto Roosevelt), physicians who trained under the program, in personal communication with the author of this article in 2023.

For this reason, other options for pediatric anesthesia training have been explored in Colombia, including continuing medical education and professional development. One such example is the online course on pediatric anesthesiology offered by the Colombian Society of

Anesthesiology and Resuscitation (S.C.A.R.E.).

Additionally, S.C.A.R.E.'s National Pediatric Anesthesia Committee, as part of a work plan for the development of continuing education projects, began its publication in 2015 of the Pediatric Anesthesia Treatise (31), with the participation of 95 authors from 8 countries and of various medical specialties such as anesthesiology, pediatrics and pediatric pulmonology (32). Opportunities for updates in this discipline have also been offered in the form of symposia and congresses in partnership with higher education institutions, such as the Southern Colombian Congress of Pediatric Anesthesia and Critical Child Care organized in 2015 by Universidad Surcolombiana and the Hernando Moncaleano Perdomo University Hospital, and the First International Congress of Pediatric Anesthesia organized also in 2015 by the Cundinamarca Society of Anesthesiology, the National University of Colombia and HOMI.

Also in order to promote training in pediatric anesthesia, the SAFE Paediatrics (Safer Anesthesia from Education) course was held in 2019 in the city of Medellín. This worldwide initiative, launched in 2011 by the Society for Pediatric Anesthesia and the World Federation of Societies of Anesthesiologists (WFSA), seeks to provide anesthetists the essential knowledge and the tools needed to offer competent and safe care to the population, even in very low resource settings. It also incorporates trainer training in order to create a sustainable education model that can be adopted by national health systems. Specifically in pediatric anesthesia, this three-day course covers anesthesia for common elective procedures and emergency conditions in children, pain management, fluid resuscitation, pediatric and neonatal advanced life support, as well as management of trauma in children.

Despite multiple undertakings to promote formal or continuing education in pediatric anesthesia in Colombia, there is a paucity of research work in this area

due to the absence of training programs, the dearth of resources, heavy workloads and the lack of a research culture. However, there is undoubtedly a felt need to bolster this practice in order to generate applied knowledge in our own setting and to improve the quality of care for this population. It is clear that adult research cannot be extrapolated to children, that safety studies are needed and that research is an integral part of anesthesia education (33).

In Colombia, like in most low and medium income countries, it is impossible to recommend that children receive anesthesia only from a pediatric anesthetist given the political, social and training circumstances. However, what is feasible is to identify high risk patients such as neonates and children under two years of age, children undergoing high risk surgeries or critically ill children in whom the intervention of a trained anesthetist is definitely advisable. This does not mean, however, that the general anesthetist lacks the competency to provide perioperative care for common elective procedures which do not entail a high risk, or in emergency situations, when finding a specialist with training in pediatric anesthesia might be challenging (1). The creation of a specialization training program in this discipline promotes continuing education and regular training for the profession and for general anesthetists practicing in different areas, so that they can hone their skills and basic competencies throughout their entire professional practice (9).

CONCLUSION

The importance of quality surgical care for the pediatric population is recognized worldwide. Therefore, from the perspective of medical education relevance, it is essential to advocate strengthening of pediatric anesthesia training with the aim of providing safe and good quality perioperative care to Colombian children as well as to more than 117 million children

in Latin America, recognizing the complexity of their physiological and anatomical conditions, as well as their pathologies and surgical procedures. This requires the availability of curricular processes on which to base training in pediatric anesthesia competencies and which will result in the promotion of research and continuing education for human resources in health.

Conflicts of interest

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REFERENCES

- Sen I, Dave N, Bhardwaj N, Juwarkar C, Beegum S. Specialised training in paediatric anaesthesia: Need of the hour. *Indian J Anaesthesia*. 2021;65(1):17. doi: http://www.doi.org/10.4103/ija.IJA_1445_20
- Jacob R. Pro: anesthesia for children in the developing world should be delivered by medical anesthetists. *Pediatr Anesth*. 2009;19(1):35-8. doi: <http://www.doi.org/10.1111/j.1460-9592.2008.02842.x>
- Brown TC. Helping trainees to become good pediatric anesthetists. *Paediatr Anaesth*. 2013;23(8):751-3. doi: <http://www.doi.org/10.1111/pan.12188>
- Desjardins G, Cahalan MK. Subspecialty accreditation: is being special good? *Current Opin Anesthesiol*. 2007;20(6):572-5. doi: <http://www.doi.org/10.1097/ACO.0b013e-3282f18bd8>
- Andropoulos DB, Walker SG, Kurth CD, Clark RM, Henry DB. Advanced second year fellowship training in pediatric anesthesiology in the United States. *Anesth Analg*. 2014;118(4):800-8. doi: <http://www.doi.org/10.1213/ANE.000000000000089>
- Habre W. Pediatric anesthesia after APRICOT (Anaesthesia PRactice in children observational trial): who should do it? *Curr Opin Anesthesiol*. 2018;31(3):292-6. doi: <http://www.doi.org/10.1097/ACO.0000000000000580>
- Echeverry P. Reflexion about pediatrics, anesthesia and education in pediatric anesthesia in colombia and south america. *Pediatr Neonatal Nurs Open J*. 2015;2(1):37-42. doi: <http://www.doi.org/10.17140/PNNOJ-2-107>
- Auroy Y, Ecoffey C, Messiah A, Rouvier B. Relationship between complications of pediatric anesthesia and volume of pediatric anesthetics. *Anesth Analg*. 1997;84(1):234-5. doi: <http://www.doi.org/10.1097/00000539-199701000-00060>
- Weiss M, Vutskits L, Hansen TG, Engelhardt T. Safe Anesthesia For Every Tot –“The SAFETOTS initiative. *Curr Opin Anaesthesiol*. 2015;28(3):302-7. doi: <http://www.doi.org/10.1097/ACO.000000000000186>
- Boyer TJ, Ye J, Ford MA, Mitchell SA. Modernizing education of the pediatric anesthesiologist. *Anesthesiol Clin*. 2020;38(3):545-58. doi: <http://www.doi.org/10.1016/j.anclin.2020.06.005>
- Carlson A, McElrath A, Herrera G, Patzkowski M. Pediatric fellowship-trained anesthesiologists improve anesthesia-controlled time in a pediatric endoscopy suite. *J Pediatr Gastroenterol Nutr*. 2023;76(6):813-6. doi: <http://www.doi.org/10.1097/MPG.0000000000003770>
- Hansen TG, Vutskits L, Disma N, Becke-Jakob K, Elfgren J, Frykholm P, et al. Harmonising paediatric anaesthesia training in Europe: Proposal of a roadmap. *Eur J Anaesthesiol EJA*. 2022;39(8):642-5. doi: <http://www.doi.org/10.1097/EJA.0000000000001694>
- Viola L, Clay S, Samuels P. Education in pediatric anesthesiology: competency, innovation, and professionalism in the 21st century. *International Anesthesiol Clin*. 2012;50(4):1-2. doi: <http://www.doi.org/10.1097/AIA.0b013e-31826df848>
- Nathan N. The future of pediatric anesthesiology training. *Anesth Analg*. 2023;136(3):433. doi: <http://www.doi.org/10.1213/ANE.0000000000006393>
- Documento marco del Plan de Estudios y Competencias para un programa de Anestesiología en Colombia. Sociedad Colombiana de Anestesiología y Reanimación (S.C.A.R.E.). 2017. [Internet]. [cited 13 Sep 2023]. Available at: <https://scare.org.co/wp-content/uploads/Documento-Marco-del-Plan-de-Estudios-y-Competencias-para-un-programa-de-Anestesiologia-en-Colombia-1.pdf>
- Samuels PJ, Clay SJ. What is the condition of education in Pediatric Anesthesiology? *Pediatr Anesth*. 2015;5(25):445-6. doi: <http://www.doi.org/10.1111/pan.12654>
- Snell JJ, Lockman JL, Suresh S, Chatterjee D, Ellinas H, Walker KK, et al. Pediatric anesthesiology milestones 2.0: An update, rationale, and plan forward. *Anesth Analg*. 2023;10-213. doi: <http://www.doi.org/10.1213/ANE.0000000000006381>
- Cladis FP, Waisel D. Creating the pediatric anesthesiology consultant: you can't have your cake and eat it too (unless you change the recipe). *Anesth Analg*. 2023;136(3):434-6. doi: <http://www.doi.org/10.1213/ANE.0000000000006218>
- Ambardekar AP, Furukawa L, Eriksen W, McNaull PP, Greeley WJ, Lockman JL. A consensus-driven revision of the Accreditation Council for Graduate Medical Education case log system: pediatric anesthesiology fellowship education. *Anesth Analg*. 2023;136(3):446-54. doi: <http://www.doi.org/10.1213/ANE.0000000000006129>
- Ambardekar AP, Singh D, Lockman JL, Rodgers DL, Hales RL, Gurnaney HG, et al. Pediatric anesthesiology fellow education: is a simulation-based boot camp feasible and valuable? *Pediatr Anesth*. 2016;26(5):481-7. doi: <http://www.doi.org/10.1111/pan.12865>
- Ambardekar AP, Eriksen W, Ferschl MB, McNaull PP, Cohen IT, Greeley WJ, et al. A consensus-driven approach to redesigning graduate medical education: the Pediatric Anesthesiology Delphi Study. *Anesth Analg*. 2023;136(3):437-45. doi: <http://www.doi.org/10.1213/ANE.0000000000006128>
- Coté CJ. The WFSA pediatric anesthesia fellowships: origins and perspectives. *Paediatr Anaesth*. 2009;19(1):31-2. doi: <http://www.doi.org/10.1111/j.1460-9592.2008.02867.x>
- Cavallieri S, Canepa P, Campos M. Evolution of the WFSA education program in Chile. *Paediatr Anaesth*. 2009;19(1):33-4. doi: <http://www.doi.org/10.1111/j.1460-9592.2008.02881.x>

24. Morriss WW, Milenovic MS, Evans FM. Education: the heart of the matter. *Anesth Analg*. 2018;126(4):1298-304. doi: <http://www.doi.org/10.1213/ANE.0000000000002653>
25. Kaur B, Taylor EM. Development of a pediatric anesthesia fellowship curriculum in Australasia by the Society for Pediatric Anesthesia of New Zealand and Australia (SPANZA) education sub committee. *Pediatr Anesth*. 2023;33(2):100-6. doi: <http://www.doi.org/10.1111/pan.14536>
26. Hansen TG. Specialist training in pediatric anesthesia—the Scandinavian approach. *Pediatr Anesth*. 2009;19(5):428-33. doi: <http://www.doi.org/10.1111/j.1460-9592.2009.02932.x>
27. Shimada Y, Nishiwaki K, Sato K, Sato E, Miyasaka K. Pediatric anesthesia practice and training in Japan: a survey. *Pediatr Anesth*. 2006;16(5):543-7. doi: <http://www.doi.org/10.1111/j.1460-9592.2005.01817.x>
28. Trujillo A. Social determinants for health and neonatal anesthesia in Colombia. *Colombian Journal of Anesthesiology*. 2023;51(2). doi: <http://www.doi.org/10.5554/22562087.e1063>
29. Ibarra P. Colombian anesthesiology at a crossroad? *Colombian Journal of Anesthesiology*. 2021;49(4). doi: <http://www.doi.org/10.5554/22562087.e994>
30. Ministerio de Educación Nacional de la República de Colombia. Resolución 16233 del 30 de septiembre de 2015. Por medio de la cual se resuelve la solicitud de registro calificado del programa de Especialización en Anestesiología Pediátrica de la Universidad ICESI para ser ofrecido bajo la metodología presencial en Cali-Valle. 2015.
31. Jaramillo J, Echeverry PC, Gomez JM. Tratado de Anestesiología Pediátrica. Sociedad Colombiana de Anestesiología y Reanimación (S.C.A.R.E.). Bogotá, Mayo 2015. ISBN 978-958-8873-18-3.
32. Echeverry P. The new challenges in pediatric anesthesia in Colombia. *Colombian Journal of Anesthesiology*. 2017;45(1):5-7. doi: <http://www.doi.org/10.1016/j.rca.2016.10.003>
33. Liston DE, Jiménez N. Promoting research in pediatric anesthesiology. *Colombian Journal of Anesthesiology*. 2014;42(2):120-3. doi: <http://www.doi.org/10.1016/J.RCA.2013.12.001>