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Perception of pediatric anesthesiology training in Colombia: a qualitative study

Percepción de la formación en anestesiología pediátrica en Colombia: estudio cualitativo

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What do we know about this problem?

The lack of recognition of the clinical challenges and particularities of the pediatric population, along with the lack of training opportunities, leads to unsafe care and a limited number of trained and qualified pediatric anesthesiology specialists. Even though efforts have been made in Colombia for continued education in pediatric anesthesiology, it has not been possible to create the subspecialty as a formal university program, as it is considered non-pertinent and limiting to the practice of anesthesiology.

How does this study contribute?

Strengthening training in pediatric anesthesiology in Colombia is a necessity. This implies restructuring and implementing curricular processes as well as promoting research and continuing education, with the aim of providing safe and quality surgical care.
It is difficult to expect that only pediatric anesthesiologist should be allowed to provide care for children in Colombia, given the political, social and educational limitations. However, there is awareness of the importance of having trained anesthesiologists for high-risk cases, such as neonates, children under 2 years of age, high-risk surgeries, and critically ill children.

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Abstract

Introduction

The development of pediatric anesthesiology worldwide recognizes the clinical challenges of the pediatric population, as well as their differences from adults, increasing access to training opportunities. In Colombia, recognizing training in this discipline has not been possible, as it is considered non-pertinent and restrictive of the practice of anesthesiology.

Objective

To describe the perception of a group of healthcare professionals doing anesthesia-related work for pediatric surgical care in Bogotá regarding training in pediatric anesthesiology in Colombia.

Methods

Descriptive qualitative approach, in which semi-structured interviews were conducted with a group of healthcare professionals doing anesthesia-related work during pediatric surgical care. They were selected using the maximum variation search technique with snowball sampling recruitment. Recruitment was stopped when interview saturation was found. A thematic network analysis was developed using the MAXQDA 24.1.0 software.

Results

Three overarching themes were identified: the limitations of pediatric anesthesia practice in Colombia, the strengthening of competencies in pediatric anesthesiology, and strategies to optimize and promote training in pediatric anesthesia.

Conclusions

Strengthening training in pediatric anesthesiology in Colombia is essential from the perspective of the relevance of medical education, recognizing the peculiarities of children, as well as the challenges for the practice of this discipline in the country.

Keywords

Anesthesiology; Medical education; Qualitative research; Pediatrics; Professional training.

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Resumen

Introducción: El desarrollo de la anestesiología pediátrica en el mundo reconoce los retos clínicos de la población infantil, así como sus diferencias con el adulto, aumentando el acceso a oportunidades de entrenamiento. En Colombia no ha sido posible el reconocimiento del entrenamiento en esta disciplina, al ser considerada no pertinente y limitante del ejercicio de la anestesiología.

Objetivo: Describir la percepción de un grupo de profesionales de la salud relacionados con la anestesia durante la atención quirúrgica infantil en Bogotá, respecto a la formación en anestesiología pediátrica en Colombia.

Métodos: Enfoque cualitativo descriptivo, en el que se realizaron entrevistas semiestructuradas a un grupo de profesionales de la salud relacionados con la anestesia pediátrica, seleccionados bajo la técnica de búsqueda de máxima variación, cuyo reclutamiento —en forma de bola de nieve— se detuvo cuando se encontró saturación en las entrevistas. Se desarrolló un análisis temático de redes con el apoyo del software MAXQDA 24.1.0.

Resultados: Se identificaron tres temas globales: las limitaciones del ejercicio de la anestesia pediátrica en Colombia, el fortalecimiento de las competencias en anestesiología pediátrica y las estrategias para optimizar y fomentar la formación en anestesia pediátrica.

Conclusiones: El fortalecimiento de la formación en anestesiología pediátrica en Colombia es esencial desde la perspectiva de la pertinencia de la educación médica, reconociendo las particularidades de los niños; así como, los desafíos para el ejercicio de esta disciplina en el país.

Palabras clave: Anestesiología; Educación médica; Investigación cualitativa; Pediatría; Capacitación profesional.

INTRODUCTION

Surgical services are necessary to meet global and local health objectives. Pediatric surgery is especially relevant, as children constitute 50% of the population in developing countries, and close to 85% will require a surgical procedure during childhood. (1)

Children are often a marginalized group in societies with socioeconomic difficulties, so their needs are at risk of being neglected. (2) Additionally, perioperative mortality, cardiac arrest, and anesthesia-related adverse events are higher in children compared to adults, particularly in middle- and low-income countries. (3)

The clinical challenges posed by children due to their physiological and psychological differences (4), as well as the lack of training opportunities, result in a limited number of trained and qualified pediatric anesthesiology specialists. (5) In Latin America, the possibilities of applying to a specialization program in pediatric anesthesiology are limited. (6) In Colombia, although efforts have been made to provide continuing education in pediatric anesthesiology, it has not been possible to create the subspecialty as a program with university endorsement, as it is considered non-pertinent and restrictive of the practice of anesthesiology. (7) However, this view is contrary to current global quality and education recommendations and reflects only the perception of a single state actor.

The objective of this study was to describe and explore the perceptions regarding training in pediatric anesthesiology in Colombia, among a group of healthcare professionals doing anesthesia-related work during pediatric surgical care in Bogotá.

METHODS

This research was developed with a descriptive qualitative approach under the principles of naturalistic research. (8) The protocol was approved through act 70 on June 6, 2023, by the social projection subcommittee of Universidad de La Sabana in Bogotá, Colombia. Sampling was intentional and reasoned, using maximum variation search technique in snowball sampling, and data collection was stopped when data saturation was found.

Twenty-one healthcare professionals were included: five anesthesiologists, five anesthesiology residents, five surgeons who care for the pediatric population (pediatric surgeon, pediatric orthopedist, pediatric neurosurgeon, pediatric otolaryngologist, and pediatric urologist), and six operating room nurses. These professionals have various degrees of academic training and carry out their work in 100% pediatric or mixed hospitals in Bogotá, with high inter-institutional variability in the number of surgical procedures performed on children (Supplementary content 1. Participant characterization).

Initially, healthcare professionals doing anesthesia-related work in pediatric surgery at one of the two 100% pediatric high-complexity hospitals in Bogotá were approached. Subsequently, more participants were recruited in other Level III and IV healthcare institutions.

To collect the data, synchronous virtual semi-structured interviews were conducted via Google Meet video call or in person, in a private environment, only between the researcher and the participant, with audio and video recording. First, a pilot interview was conducted with a nurse and reviewed

by an expert to confirm the relevance of the content, the ability to cover the topic, and the need to reformulate the questions. Final interviews were conducted in a subsequent stage. All interviews were transcribed and stored in text format for review.

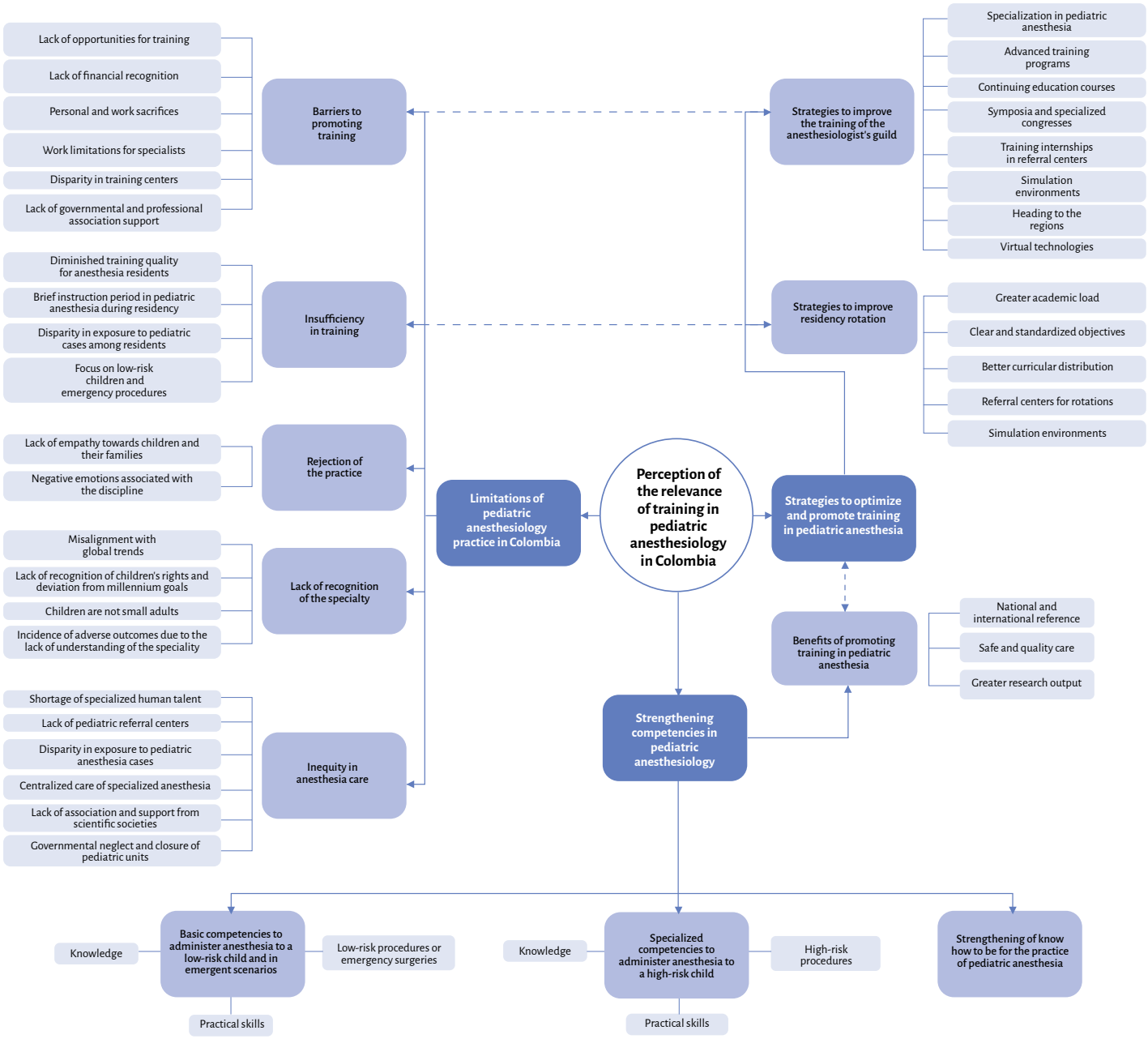
The interview guide was framed in the categories identified from the theoretical framework, including: safe and quality anesthetic care for the pediatric population, training in pediatric anesthesiology, and differences in the competencies required for safe and quality anesthetic in pediatrics (Supplementary content 2. Interview guide).

A thematic network analysis of the collected data was conducted with the support of MAXQDA version 24.1.0 software, identifying overarching, organizing, and basic themes, which were then articulated in accordance with the relationship (Figure 1).

As a result of the analysis, a direct, precise, and complete descriptive summary of the themes extracted from the collected information was made, adjusted as best as possible to the context and actors.

In this research, the criteria of rigor for descriptive qualitative studies were met.

Figure 1. Overarching, organizing, and basic themes identified. Thematic network map.



Source: Authors.

(9) Objectivity was achieved through the explicit and detailed description of the methodology, which favored the audit of the process, reporting possible biases and assumptions of the researcher, and making the study data available to third parties for evaluation.

The participation of the principal investigator in this study was not accidental and came about as a result of personal knowledge and live experience during anesthesia training and interactions with other professionals involved in pediatric anesthesia in various healthcare institutions. Exposure to the act of providing anesthesia to children had led to the identification of the affective factors and training needs involved in this practice. This knowledge was also derived from full-time clinical and teaching work as a specialist in anesthesiology at a 100% pediatric high-complexity hospital in Bogotá for more than five continuous years.

Moreover, a pilot interview was conducted, audited by the project tutor to prevent, identify, and mitigate the influence or orientation that the researcher could exert on the participants and the collected information, making pertinent adjustments to the forms and ways of applying the collection tool, as well as in the different types of questions developed during the interview. The way data were collected and interviews conducted was also reviewed. Additionally, an audit was conducted through a research log, in which methodological decisions as well as analytical and methodological memos were recorded as they emerged.

Reliability was achieved through the definition of the researcher's role and the implementation of a semi-structured interview, previously reviewed and endorsed in the methodology; additionally, the interview was conducted by a single person and formulated in the same order for each participant.

Credibility was addressed by making complete contextual descriptions in order to arrive at a data-based interpretation; also, through the verification of the coherence and truthfulness of the findings with other professionals or researchers, as well as linking the results to a clear theoretical framework.

Transferability was favored by providing a complete description of the participants' characteristics, to enable comparisons with other groups; also, through the precise description of the environment, resources used, and study timing, as well as presenting results consistent with the theoretical framework, which could be audited by other researchers.

Finally, the work was reflected in the publication, dissemination, and validation of the results by checking them with the participants. It also had contextual effects, stimulating research, promoting debates on educational policies, or suggesting real changes in the setting of pediatric anesthesiology training in Colombia.

To check with the participants a 6-minute and 45-second video was sent to their email, making the results public and disseminating them within the framework of the overarching themes, their respective organizing themes, and basic themes. After watching the video, participants were instructed to complete a Google Forms questionnaire with seven questions aimed at validating the identified themes and the context-adjusted thematic network analysis. Of the 21 participants, 17 responded to this request, allowing to determine that this study adequately addressed participant engagement, identifying their perception regarding the purpose of the study and validating the thematic network analysis conducted in accordance with the criteria of rigor for qualitative research.

This research was developed under the principles of research ethics, seeking to protect participants, researchers, and society at large. (10) The participants in this study were not considered vulnerable. Personal data and anonymity were protected —no personal identification data were requested — in order to respect privacy and confidentiality. Likewise, all relevant aspects regarding the research were described in advance by means of an information letter which included participant rights were informed and a request for informed consent, in order to ensure informed, conscious, voluntary, and free participation for both the in-person and virtual semi-structured interviews. Additionally, a unique access link for online interviews was generated for each participant, with access restricted only to the researcher; also, the information obtained from the in-person and online interviews was stored in audio and video files accessible only to the researcher. The principle of well-being, specifically in the social sphere, could have been at risk for the participants as they provided information about their professional practice in different healthcare institutions. However, the risk was mitigated by directing the questions towards their relationship with the study topic in their institution, without asking for the institution's name. Moreover, data were collected by a single person, the principal investigator, and were anonymized.

There was no risk of subordination in this study, considering that the participants, specifically anesthesiology specialists and residents, were not professionally related to the researcher, nor were there power relationships between them; they only maintained a peer or colleague relationship. In the case of nurses, the questions were directed towards their perception of the study topic, not towards their performance or that of any member of the surgical team or the functioning dynamics of their workplaces.

RESULTS

Depending on the group to which each participant belongs, perceptions regarding pediatric anesthesiology training in Colombia varies. In particular, nurses direct their narratives towards what they expect of the care and professionalism of anesthesiologists working with the pediatric population; surgeons focus on what they expect from an anesthesiologist as a teammate and determinant of surgical

procedure outcomes; anesthesiologists emphasize the difficulties of training in pediatric anesthesiology and how beneficial or not it is to have a subspecialization with the current working conditions in the country; and anesthesiology residents focus on the sufficiency of training in pediatric anesthesia during residency, as well as strategies to optimize the rotation. However, it is relevant to mention that all four participant groups are emphatic in recognizing that there are limitations to the practice of this subspecialty in Colombia, that it is necessary to understand that children are not small adults and require specific competencies for their management, and also that strategies are needed to optimize training in pediatric anesthesia for specialists as well as anesthesiology residents.

The thematic network analysis identified thee overarching themes: the limitations of pediatric anesthesia practice in Colombia; strengthening of competencies in pediatric anesthesiology; and strategies to optimize and promote training in pediatric anesthesia (Figure 1).

Additionally, the relationship between the limitations of pediatric anesthesia practice in the country, specifically training insufficiency in this discipline, and the strategies to optimize and promote it in this subspecialty, both for anesthesiology residents and for practicing specialists, was made explicit. The relationship between strengthening the minimum and specialized competencies of anesthesiologists in Colombia to provide anesthesia to children and the consequent benefits of that optimization is clear: safe and quality care, greater research production, and positioning in the region as a leading country in this branch of anesthesiology.

Limitations of Pediatric Anesthesiology Practice in Colombia

The following limitations of pediatric anesthesiology practice in Colombia were identified: inequity in anesthetic care, lack of recognition of the specialty, rejection of the practice of this discipline, insufficient training in this branch of anesthesiology, and barriers to promoting training in pediatric anesthesia.

Inequity in pediatric anesthetic care in Colombia is related to the scarcity of specialized human talent, due to limited training opportunities in this discipline. In most pediatric cases, anesthesia is given by general anesthesiologists with varying levels of experience and interest in pediatrics. Additionally, the lack of pediatric referral centers exacerbates the situation, exposing children to risks and delayed care, and restricting job opportunities for trained or experienced anesthesiologists in this area.

However, this last point suggests the decentralization of subspecialties, without disregarding the importance of referral centers for the pediatric population, highlighting the need for specialized human talent in mixed hospitals exercising leadership in pediatric anesthesia within their work team.

Another point that adds to the inequity in care is the disparity in exposure to pediatric anesthesia cases among anesthesiologists, either due to the greater number of mixed hospitals where the anesthesia workforce is located or because anesthesiologist are not habituated to this population. It is worth mentioning that the centralized care of specialized anesthesia and the neglect of dispersed areas contribute to inequity in care, as it creates issues of access and timely care, as well as lack of training for anesthesiologists in remote areas of Colombia.

On the other hand, the lack of collegial support from scientific societies perpetuates inequity in care by not supporting and facilitating the promotion of formal education in pediatric anesthesiology in Colombia.

Under the overarching theme pertaining to the limitations of pediatric anesthesia practice in Colombia, additional points to consider are the lack of recognition of this discipline, where the country is misaligned with the global trend towards the endorsement of subspecializations; the lack of recognition of children's rights and deviation from meeting the millennium goals; the lack of understanding of the particularities of the pediatric population; and, finally, the incidence of adverse outcomes as a consequence of the disregard for this specialty.

Despite the global recognition of the importance of subspecializations —including pediatric anesthesiology— which acknowledges that children are not small adults and require specific skills, the idea that the general anesthesiologist can handle all types of patients and any type of surgical procedure still prevails in Colombia. Consequently, state entities have limited the formalization of training processes in these disciplines.

To better understand what motivates enquiry into perceptions regarding pediatric anesthesiology training, it is imperative to affirm that children are not small adults. Their anatomy, physiology, thought structure, pathologies, and surgical procedures make them a special population that requires specific competencies for their management and that of their families. For this reason, the four groups of participants focused extensively on the differences in perioperative management between children and adults.

Participants perceived that the lack of recognition of pediatric anesthesia as a specialty leads to an increase in the incidence of adverse clinical and administrative outcomes, influencing the increase in morbidity and mortality and difficulties in access to surgical care.

Another perceived limitation that directly affects the quality of anesthetic care for the pediatric population is the rejection of the practice of this branch of anesthesia, driven by two fundamental reasons: negative emotions associated with this discipline and the lack of empathy of anesthesiologists towards children and their families.

The nature of anesthetic practice in children entails a considerable emotional

burden for anesthesiologists: anxiety, fear of error, pressure from responsibility, and concern for the patient's well-being intertwine in a complex emotional web that can affect both professional performance as well as personal well-being.

A crucial facet of the rejection of pediatric anesthesia practice lies in the lack of empathy of some anesthesia professionals towards children and their families. Often, this lack of empathy arises from an emotional disconnection attributable to work routines and demands in clinical settings.

Another significant limitation in the practice of pediatric anesthesia in Colombia is the insufficiency of specialized training in this field. This educational deficiency poses a series of challenges that affect both healthcare professionals as well as the quality of care provided to pediatric patients. Several basic themes stand out in relation to this problem and deserve detailed attention: lower quality of training for anesthesia residents, the brief period of instruction dedicated to pediatric anesthesia during residency, the disparity in exposure to pediatric cases among anesthesiology residents, and the tendency to focus on managing low-risk children and emergency procedures during graduate training.

It is important to mention that training in pediatric anesthesia during residency in Colombia focuses on managing low-risk children and emergency procedures, as a way for anesthesiologists to acquire the essential minimum competencies they need to provide safe and effective care to the pediatric population. However, this orientation towards less complex cases has a significant consequence: high-risk children and more complex surgeries are beyond the reach of this standard training. This reality poses a significant challenge when it comes to training anesthesiologists to face clinical situations that require an advanced level of competency and experience.

The next point within the analysis of the limitations of pediatric anesthesia practice in Colombia addresses the barriers that hinder the promotion of specialized training in this field. These barriers, which encompass a series of personal and institutional challenges, represent a significant obstacle for anesthesiologists interested in acquiring competencies in pediatric anesthesia. Among the basic themes outlining these barriers are the lack of opportunities for training in pediatric anesthesia, the absence of economic recognition for professionals seeking to specialize in this field, the personal and work sacrifices associated with training in pediatric anesthesia, the work limitations faced by specialists after they complete their training, the disparity in availability and quality of training centers, as well as the lack of governmental or collegiate support, and the complexity of bureaucratic procedures.

Work limitations for the practice of pediatric anesthesia in Colombia represent a challenge for specialized anesthesiologists in this field. These limitations include the scarcity of specific job opportunities for pediatric anesthesiologists, the lack of institutional recognition of this specialty, and the restrictions in clinical practice in terms of equipment and adequate resources for the anesthetic care of pediatric patients.

Finally, the lack of governmental and collegiate support, along with the complexity of bureaucratic procedures, hinders the development and expansion of pediatric anesthesia training in Colombia. This lack of support and bureaucracy makes it difficult to implement effective policies and improve the working and educational conditions for professionals interested in specializing in this branch of anesthesiology.

Strengthening competencies in pediatric anesthesiology

This overarching theme encompasses a series of key aspects ranging from the basic competencies necessary to provide anesthesia to low-risk children and in emergency situations, to the specialized competencies required for the management of high-risk pediatric patients or complex surgeries. It also involves strengthening the essential "know-how" and understanding the benefits of promoting training in pediatric anesthesiology, both for healthcare professionals as well as for patients and their families.

The basic competencies for providing anesthesia to a low-risk child and in emergency situations translate into knowledge, know-how, and specific procedures that allow anesthesiologists to provide adequate anesthetic care in various clinical scenarios. From understanding pediatric physiology and pharmacology to the ability to perform preoperative assessments and manage the risk of procedures and possible complications during the surgical act, these competencies are essential to address the needs of low-risk or emergency pediatric patients.

Knowledge in the context of basic competencies for providing anesthesia to a low-risk child and in emergency situations includes a set of fundamental theoretical skills in the field of pediatric anesthesiology. This knowledge includes an understanding of the psychological development of children and their physiology according to age, the pharmacology of anesthetic and analgesic agents used in children, as well as knowledge of the different anesthesia techniques and their procedures. Additionally, it involves an understanding of common medical and surgical conditions in the pediatric population and the ability to recognize and manage clinical emergencies during the anesthetic procedure. Acquiring this essential knowledge is the first step in developing competencies in pediatric anesthesiology, as it provides the theoretical and procedural foundation necessary for safe and effective clinical practice.

Similarly, the "know-how" in the context of basic competencies for providing anesthesia to a low-risk child and in emergency situations refers to the practical

skills needed to carry out anesthetic procedures effectively and safely in pediatric patients. This includes the ability to perform complete preoperative assessments, administer anesthesia appropriately, accurately monitor vital signs during the procedure, and manage emergency situations that may arise.

Additionally, it involves dexterity in placing airway devices, knowing the technique for administering anesthetic and analgesic drugs, the ability to establish a peripheral vascular access, and the proper management of the patient's ventilation and oxygenation.

On the other hand, low-risk procedures and emergency surgeries are surgical interventions characterized by their relative simplicity, low risk of bleeding, or urgency. These procedures may include outpatient surgeries such as tympanostomy with ventilation tubes, adenoidectomy or tonsillectomy, minor orthopedic procedures, and dental procedures under general anesthesia. Emergency surgeries may include trauma requiring rapid intervention for patient stabilization, appendectomy, hernia repair, fracture or dislocation reduction, and abscess drainage in various parts of the body, to name a few.

The specialized competencies for providing anesthesia to a high-risk child focus on the ability to manage patients with complex medical conditions, high-risk surgical procedures, and critical clinical situations. The associated expertise includes basic knowledge plus a deep understanding of all underlying pediatric diseases and their impact on anesthetic management, as well as an understanding of the most appropriate anesthetic options for each clinical situation. Regarding "know-how," competencies refer to the ability to adapt advanced anesthetic techniques within the framework of general or regional anesthesia, as well as invasive monitoring and mechanical ventilation, to the specific needs of each high-risk pediatric patient. Additionally, they involve the ability to manage intraoperative and postoperative complications efficiently and proactively.

Undoubtedly, it should be emphasized that the specific competencies of pediatric anesthesia are directed towards the management of critically ill children or special age groups such as neonates. Additionally, they are essential for addressing procedures considered high-risk, either due to high exposure, prolonged duration, high risk of bleeding, or involvement of vital organs.

Now, when addressing the topic of strengthening the necessary "know-how" for the practice of pediatric anesthesia, it is essential to recognize the importance of aspects such as empathy, assertive communication, and leadership in the care of this vulnerable population. Beyond theoretical knowledge and procedural skills, anesthesiologists facing anesthetic management in children must possess human and professional qualities that allow them to establish solid relationships with patients, their families, and the medical team.

Benefits of promoting training in pediatric anesthesia

This organizing theme highlights three key aspects: consolidating as a leader in pediatric anesthesia on a national and international scale, ensuring safe and quality care for the youngest patients, and stimulating greater scientific research production in this discipline.

Strategies to optimize and promote training in pediatric anesthesia

It is imperative to implement effective strategies to strengthen competencies in pediatric anesthesiology both among residents as well as among practicing anesthesiologists. These initiatives will not only ensure safe and quality anesthetic care for the pediatric population in Colombia but also promote the development of training in this discipline and excellence in the field of pediatric anesthesiology in the country.

Additionally, it is important for scientific societies and anesthesia associations to conduct a diagnosis of the state of pediatric anesthesiology training, with a view at furthering the implementation of these strategies in the country.

In terms of improving rotations in pediatric anesthesiology, it is crucial to implement a series of strategies that maximize the learning experience of residents. First, a greater academic load should be considered, including longer rotations consisting of greater exposure to cases, theoretical sessions for case discussions, and literature reviews. This will provide residents with a solid foundation of knowledge and skills to complement their clinical experience. Additionally, it is essential to define clear and standardized objectives among the different rotation sites, ensuring that all anesthesiology residents acquire the same skills and competencies during their training. Certainly, a better curricular distribution of the rotation throughout the residency will also ensure adequate exposure to a variety of pediatric cases and procedures according to the level of training. Preferably, rotations should be conducted in referral centers, where residents can have access to cases of varying complexity and to experts in the specialty. Finally, the use of simulation environments can complement the clinical experience, allowing residents to practice skills and face crisis scenarios in a controlled environment. These combined strategies have the potential of significantly enhancing pediatric anesthesiology training and preparing residents to provide optimal care to pediatric patients in the future.

To improve the training of anesthesiologists in Colombia, it is essential to implement a series of strategies that promote continuous professional development and excellence in the practice of anesthesiology. Among these strategies are specialization in pediatric anesthesia, an advanced training program for practicing anesthesiologists, continuing education through courses,

workshops, and conferences, as well as the organization of symposia and specialized congresses. Additionally, internships in national referral centers can be offered, where anesthesiologists can gain experience in complex cases and advanced techniques. Similarly, the use of simulation environments and the integration of virtual technologies in training are also key strategies to improve the skills and competencies of the specialty. For this, greater participation and accountability are needed on the part of referral centers, higher education institutions, and scientific societies in training anesthesiologists, as well as orchestrating and encouraging relocation of specialized human talent to the territories, as a way to disseminate knowledge and promote safe anesthesia practice in the pediatric population throughout the country.

DISCUSSION

The results of this research are consistent with the categories identified from the literature review: safe and quality anesthetic care for the pediatric population, training in pediatric anesthesiology, and the different competencias required for safe and quality anesthetic care for this population. In turn, the overarching themes identified in this research were: limitations of pediatric anesthesia practice in Colombia, strengthening of competencies in pediatric anesthesiology, and strategies to optimize and promote training in pediatric anesthesia.

Seen from the perspective of human talen training, inequity in anesthetic care for the pediatric population in a middle-income country like ours, has been almost absent from global trends. (11) As identified in this research, all participants perceive that the scarcity of specialized human talent limits adequate care of children requiring surgical procedures. In Colombia, there is a ratio of 1 anesthesiologist per 15,000 inhabitants, when a good ratio is considered to be 1 per 5,000 to 10,000 inhabitants. By 2015, of this ratio, approximately 100 anesthesiologists directed their practice towards pediatric anesthesia, in a country where children account for 22% of the population. (6) Likewise, of a group of 702 anesthesiologists in the country, only 5.59% have pediatric anesthesia as a second specialty. (12)

It is fitting to underscore the importance of updating, in future research, the capacity for pediatric anesthesia care in Colombia with the aim of strengthening this community. As recommended in 2021 by the Surgical Care for Pediatric Patients Guide of the American College of Surgeons, to achieve optimal quality care, a pediatric-trained anesthesiologist should lead the process in specialized centers, even more so considering that the Safetots initiative recognizes since 2015 that the anesthesiologist with formal training in managing the pediatric population plays the key role in providing safe care. (13)

Also, the low number of pediatric referral centers is a limitation, as by 2015 there were only eleven pediatric hospitals in the national territory. (6) The registry of health service providers shows that of the 33 departments in Colombia, ten lack authorized pediatric surgery services. Added to this is the perceived neglect of the care of children by the government and the closure of pediatric units in the country. This leads to a large percentage of the Colombian pediatric population being cared for in general hospitals, where the exposure of the anesthesiologist to this age group is limited, putting patients at risk when they seek healthcare due to the lack of experience and training.

Anesthesiologists interested in pediatric anesthesia in Colombia have failed to come together, unlike what has happened in the United States and Europe where pediatric anesthesiology societies have been consolidated since the 1990s, spearheading the advancement of the subspecialty in these continents. (14,15) In Colombia, initiatives aimed at consolidating a community of pediatric anesthesiologists should begin to be generated and supported, in order to promote the quality of anesthesia, improve perioperative care and pain management for children, through the development of clinical care models, research, training, and the promotion of formal and non-formal education programs in this subspecialty.

Another identified point is the lack of recognition of pediatric anesthesiology in Colombia, contrary to the global trend towards the subspecialization of medicine in an attempt at improving safety and quality in care. Additionally, the progress of surgery would not have been possible without advances in the field of anesthesia, to the point of leading to the development of surgical subspecialties. (3) However, in Colombia, the establishment of pediatric anesthesiology training programs has not been possible, as government entities consider it non-pertinent and restrictive for the practice of the specialty. (6)

Children are not small adults, as their physiological, psychological, pharmacological, procedural, and pathological differences pose clinical challenges that need to be addressed with specific knowledge and precise skills. (3,4) It is precisely because of the recognition of these differences and particularities that the anesthetic care of the pediatric population requires additional training, especially for the management of children under two years of age, the neonatal population, critically ill children, and high-risk surgical procedures.

Now, the increase in morbidity and mortality, difficulties in accessing health care, and the absence of research to increase the body of knowledge in this discipline are adverse consequences of the failure to recognize pediatric anesthesia. As reported in the literature, perioperative mortality, cardiac arrest, and anesthesia-related adverse events are two to three times higher in children compared to adults, particularly in middle- and low-income countries (3), a risk that increases five to ten times when children are managed by anesthesiologists without specific training. (13) The APRICOT study (14) has also shown

that the experience of the anesthesiologist facing a child is crucial, to the point that for every additional year of experience there is a 1% reduction in severe respiratory events and a 2% reduction in cardiovascular events.

On the other hand, diminished quality of anesthesia training for residents as well as limited time assigned to pediatric anesthesia during residency training play a significant role. According to the National Higher Education Information System (SNIES), close to 120 anesthesiologists graduate every year from specialization programs in Colombia, after spending between two to five months in pediatric anesthesia rotations, an insufficient time to acquire a deep understanding and the necessary skills to care for critically ill pediatric patients, children under two years of age, or those undergoing high-risk procedures. Although residents are supposed to acquire the minimum necessary competencies during this rotation, no studies have been conducted to determine whether this time is sufficient or whether the acquired competencies guarantee safe care, at least for low-risk patient populations undergoing elective low-risk procedures or emergency surgeries. (7)

Future research should focus on standardizing the minimum case exposure load required in pediatric anesthesia according to the Colombian context and to international standards. Also, research should seek to answer the question of whether these minimum criteria can be met in pediatric anesthesia rotations of two or three months duration, or in the lower complexity hospitals where the clinical rotations take place. (16)

In the same vein, the disparity in case exposure among anesthesiology residents poses a significant challenge in the field of pediatric anesthesiology training. Adding to the perceptions of the participants, a study conducted in a high-complexity Colombian hospital showed that during a three-year residency program with integrated pediatric anesthesia training throughout the residency, of the total cases to which the residents were exposed, only 19% corresponded to pediatric surgery cases. Moreover, although 70% of residents met the minimum standards recommended by Ascofame and ACGME, the number of cases by age group, especially in patients under three months and three years of age, was not significant. (16) This reality raises questions about the adequacy of pediatric anesthesia rotations, as well as the ability of hospitals where the rotation is conducted to provide the necessary exposure.

It should also be mentioned that the lack of financial compensation for training in pediatric anesthesia is one of the main barriers to the practice and growth of this discipline in Colombia. In some countries, the costs associated with pediatric anesthesia are not attractive to health system payers, and for specialists, additional training does not translated into a significant increase in their income. (13) This situation adds to the sacrifices derived from the decision to train in this area — as described by the participants — including the need to train abroad, resign from work, stop receiving a salary, dedicate exclusive time to study, and leave family and friends.

Additionally, the need for a state policy that recognizes the specialized training of human talent as a pillar to build health equity and ensure that services reach the pediatric population without them having to travel is evident. (17) Furthermore, in both international and local contexts, it is imperative to prioritize safety and quality in perioperative care for children by promoting education and awareness of safe practices for this population.

It should be added that this research describes the importance of strengthening competencies for the practice of pediatric anesthesia — which is becoming an imperative both globally and locally — with the primary objective of ensuring a safe clinical environment conducive to the well-being of children. (18) This implies ensuring multidisciplinary care, supported by specialized human talent in pediatric care, equipped with clear competencies and a perfect team work synergy. Additionally, it is now known that general anesthesiologists should possess generic competencies for the perioperative management of emergency or elective low-complexity procedures in healthy patients over two years of age. (3)

Additionally, the competencies for anesthesiologists proposed internationally by the European Board of Anaesthesia-European Union of Medical Specialists (EBA-UEMS) and locally by the Colombian Society of Anesthesiology and Resuscitation (S.C.A.R.E.), ranging from disease management and patient preparation to quality, health management, and economics, highlight the need for a comprehensive approach that encompasses both technical and non-technical skills, and that promotes professionalism, ethics, and research. However, future research projects are needed to thoroughly study the minimum necessary competencies and Entrustable Professional Activities (EPA) in pediatric anesthesiology for anesthesiology residents and general anesthesiologists, as well as the best way to acquire them during graduate training.

The development of specialized competencies for administering anesthesia to high-risk children is essential to ensure optimal care in complex clinical situations. Both the European Training Requirements in Anesthesiology and the American Council of Graduate Medical Education outline the standards and competencies necessary for anesthesiologists specialized in pediatric anesthesia. They encompass a wide range of clinical and procedural skills, from preoperative evaluation to advanced pain management and neonatal and pediatric intensive care. Additionally, even more specialized competencies include neonatal management, regional and neuraxial anesthesia, invasive monitoring, high-complexity procedures, and advanced resuscitation, among others. (19) Besides technical skills, the American Council of Graduate Medical Education emphasizes the importance of compassionate care, comprehensive medical knowledge,

professionalism, system-based practice, continuous learning, and communication skills to provide comprehensive and high-quality care to pediatric patients in high-risk situations. (20)

As far as the above is concerned, in a qualitative focus group study with pediatric surgeons and endoscopists, nurses, pediatric anesthesiologists, and parents, an analysis of the interviews identified eleven domains of professionalism for the pediatric anesthesiologist, including expertise, continuous team improvement, expressive communication, active listening, care coordination, medical hierarchy, leadership, teamwork, personality traits and physical image and responsibility for the patient. (21)

As a result of this research, various strategies emerged to optimize and promote training in pediatric anesthesia for both graduate students as well as practicing anesthesiologists. From various perspectives, this study has emphasized the importance of generating arguments to support decisions related to the relevance of educational programs in health areas. This includes discussing topics such as the academic load of the pediatric anesthesia rotation, its homogenization and standardization, greater participation and responsibility of referral centers, and simulation environments. Similarly, it discusses the importance of high-quality formal educational programs such as a specialization or advanced training, and the strengthening of continuing education and academic dissemination events. All this is driven by the interest in strengthening this specialty in the country, training leaders who are sources of knowledge transmission in intermediate and small cities in Colombia, as well as opening training opportunities for the entire anesthesiology profession.

Finally, this pioneering research aimed at exploring this problem in Colombia describes the limitations of pediatric anesthesia practice in Colombia, proposes minimum and specialized competencies for the anesthetic management of the pediatric population, and suggests strategies for strengthening and promoting training in pediatric anesthesia, based on the perception of a group of healthcare professionals related to anesthesia during pediatric surgical care. It is a first step towards the development of new initiatives and research projects that support the relevance of training in this subspecialty in Colombia.

Strengthening education in pediatric anesthesiology is considered essential from the perspective of the relevance of medical education, recognizing the physiological, anatomical, psychological, pharmacological, pathological, and surgical particularities of children. This implies implementing educational processes that allow to acquire competencies in pediatric anesthesiology, as well as promote research and continuing education for healthcare professionals, the ultimate aim being to ensure safe and quality surgical care for the pediatric population, while meeting the specific needs and challenges posed by anesthesia in this group of patients.

It is imperative to continue with research lines that delve into the identified limitations of pediatric anesthesia practice, as well as standardize the minimum and specialized competencies of this discipline, particularly concerning procedural and case load. Additionally, it is necessary to study the impact of different strategies for teaching and learning this discipline as a subspecialty of anesthesiology.

It is important to recognize that this research does not have the scope to determine the recommended number of cases in pediatric anesthesia for an anesthesiology resident or a practicing anesthesiologist. Furthermore, it has limitations such as the homogeneity of the anesthesiology residents given that, out of the five, only one had not rotated in a 100% pediatric hospital, limiting the transferability of the data in rotations carried out in other hospitals. However, information regarding this situation emerged during the interviews, as residents share their experiences regarding the types of pediatric anesthesiology rotations in different hospitals, resulting in indirect experience. Likewise, the minimum competencies, specialized competencies, and procedures mentioned in the study came from participant descriptions. Therefore, only those which were identified are made explicit, considering that the study does not have the scope to address all the competencies or procedures described in the literature.

CONCLUSION

This study identifies three key themes: the limitations in the practice of pediatric anesthesia in Colombia, the need to strengthen competencies in this discipline, and strategies to optimize specialized training. It also reveals perceived training needs and proposes approaches to improve safe practice and education in pediatric anesthesiology. The findings offer a comprehensive vision that can guide policies, practices, and future research projects in this specialty.

ETHICAL RESPONSIBILITIES

Protection of human and animal subjects

The authors declare that no experiments were carried out on humans or animals for this research. The authors declare that the procedures followed were in accordance with the ethical standards of the relevant human experimentation committee and with those of the World Medical Association and the Declaration of Helsinki.

Data Confidentiality

The authors declare that they have followed the protocols of their work sites regarding the publication of patient data.

Right to privacy and informed consent

The authors declare that no patient data appear in this article. The authors have obtained informed consents from the patients and/or subjects referred to in the article. Those documents are kept by the corresponding author.

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Authors' contributions

JSCH: Study planning, data collection, data analysis, result interpretation, and manuscript writing.
NRC: Study planning, data analysis, result interpretation, and manuscript writing.

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Supplementary Content 1. Participant characterization.

No.	Pseudonym	Participant Group	Profession	Years of Experience	Current Workplace	Relationship with General Anesthesiologists Treating Children	Relationship with Pediatric Anesthesiologists	Relationship with Anesthesiology Residents	Teaching Activities with Anesthesiology Residents	Observations
1	Helena	Nursing	Professional Nurse	8 years	Mixed Hospital	Yes	Yes	Yes	No	Worked for seven years in a 100% pediatric hospital
2	Lorena	Nursing	Professional Nurse	6 years	Pediatric Hospital	Yes	Yes	Yes	No	Last two years of experience in a 100% pediatric hospital and currently pursuing a specialization in nephrology nursing
3	Constanza	Nursing	Nursing Assistant	14 years	Pediatric Hospital	Yes	Yes	Yes	No	N/A
4	María Juliana	Nursing	Nursing Assistant	9 years	Pediatric Hospital	Yes	Yes	Yes	No	Has worked in mixed hospitals and is currently pursuing a degree in health administration
5	Milena	Nursing	Nursing Assistant	13 years	Pediatric Hospital	Yes	Yes	Yes	No	Has worked in mixed hospitals and is currently pursuing a nursing degree
6	Linda	Nursing	Nursing Assistant	16 years	Pediatric Hospital	Yes	Yes	Yes	No	N/A
7	Sofía	Surgeons	Pediatric Urologist	6 years	Pediatric Hospital and Mixed Hospital	Yes	Yes	Yes	No	Holds a master's degree in health sciences and is currently pursuing a specialization in education for health professionals. Trained in national and international institutions
8	Violeta	Surgeons	Otolaryngologist	12 years	Pediatric Hospital and Mixed Hospital	Yes	Yes	Yes	No	Holds a master's degree in education and has non-formal training in pediatric otolaryngology. Trained in national institutions
9	Tomás	Surgeons	Orthopedist	2 years	Pediatric Hospital and Mixed Hospital	Yes	Yes	Yes	No	Has non-formal training in pediatric orthopedics and reconstructive surgery. Trained in national and international institutions
10	Miguel	Surgeons	Pediatric Surgeon	17 years	Pediatric Hospital and Mixed Hospital	Yes	Yes	Yes	No	Fellow in pediatric renal and liver transplantation. Trained in national and international institutions
11	Abelardo	Surgeons	Pediatric Neurosurgeon	17 years	Pediatric Hospital	Yes	Yes	Yes	No	Has worked in mixed hospitals, trained in national institutions, and currently leads the pediatric neurosurgery service in a pediatric hospital

No.	Pseudonym	Participant Group	Profession	Years of Experience	Current Workplace	Relationship with General Anesthesiologists Treating Children	Relationship with Pediatric Anesthesiologists	Relationship with Anesthesiology Residents	Teaching Activities with Anesthesiology Residents	Observations
12	Iván	Anesthesiologists	Anesthesiologist with non-formal training in pediatric anesthesia	9 years	Mixed Hospital	Yes	Yes	Yes	Yes	Worked for nine years in a pediatric hospital. Trained in epidemiology and public health, with non-formal training in pediatric liver transplantation
13	Matías	Anesthesiologists	Anesthesiologist with non-formal training in pediatric anesthesia	10 years	Pediatric Hospital	Yes	Yes	Yes	Yes	Holds a diploma in university teaching. Only has experience in pediatric anesthesiology
14	David	Anesthesiologists	Pediatric Anesthesiologist with a fellowship in pediatric cardiovascular anesthesia	10 years	Pediatric Hospital	Yes	Yes	Yes	Yes	Has been a volunteer for 14 years in a foundation that operates on children with cleft lip and palate. Trained in national and international institutions
15	Claudia	Anesthesiologists	General Anesthesiologist	6 years	Mixed Hospital	Yes	No	Yes	Yes	30-40% of patients are children. Holds a master's degree in regional anesthesia
16	Martín	Anesthesiologists	General Anesthesiologist	6 years	Mixed Hospital	Yes	No	Yes	Yes	Master's candidate in physiology. Experience with pediatric anesthesia has been sporadic, mainly in emergency surgical and neonatal anesthesia
17	Joaquín	Anesthesiology Residents	Third-year Resident	Duration of residency. Pediatric anesthesia rotation 3 months	Mixed Hospital	Yes	Yes	Yes	No	Completed pediatric anesthesia rotation in the last semester of the second year of training in a pediatric hospital. Limited exposure to pediatric population outside the rotation. Residency duration 3 years
18	Olivia	Anesthesiology Residents	Third-year Resident	Duration of residency. Pediatric anesthesia rotation 3 months	Mixed Hospital	Yes	Yes	Yes	No	Exposed to neonatal anesthesia during a one-month rotation in the NICU and a rotation in a high-risk obstetric institution. Completed pediatric anesthesia rotation at the beginning of the third year of training in a pediatric hospital. Residency duration 3 years

No.	Pseudonym	Participant Group	Profession	Years of Experience	Current Workplace	Relationship with General Anesthesiologists Treating Children	Relationship with Pediatric Anesthesiologists	Relationship with Anesthesiology Residents	Teaching Activities with Anesthesiology Residents	Observations
19	Sandra	Anesthesiology Residents	Third-year Resident	Duration of residency. Pediatric anesthesia rotation 3 months	Mixed Hospital	Yes	Yes	Yes	No	Completed pediatric anesthesia rotation at the beginning of the third year of residency in a pediatric hospital. Has had contact with pediatric population in mixed hospitals since the first year of training. Residency duration 4 years, with a one-month rotation in neonatology
20	Esperanza	Anesthesiology Residents	Third-year Resident	Duration of residency. Pediatric anesthesia rotation 3 months	Mixed Hospital	Yes	Yes	Yes	No	Completed pediatric anesthesia rotation in the second half of the second year of training in a pediatric hospital. Has had contact with pediatric population in mixed hospitals since the first year of training. Residency duration 4 years, with a one-month rotation in neonatology
21	Valentina	Anesthesiology Residents	Third-year Resident	Duration of residency. Pediatric anesthesia rotation 3 months	Mixed Hospital	Yes	Yes	Yes	No	Completed pediatric anesthesia rotation at the beginning of the third year of training in a mixed hospital, with most patients being pediatric orthopedic surgery cases. Exposed to pediatric population since the first year of training in mixed hospitals. Residency duration 4 years, with a one-month rotation in neonatology

Source: Authors.

Supplementary Content 2. Interview guide.

TOOL

Universidad de La Sabana
Master's in Medical Education

Semi-structured Interview

Date:

Academic background:

Type of healthcare institution where you work (pediatric or mixed):

Experience with pediatric anesthesia (years):

Good morning, afternoon, or evening (depending on the time of the interview)

First of all, I want to greet you and thank you for participating in this research project; for me, it is very gratifying to have your support, and I am sure that your contributions will be very helpful in solving the problem I am studying.

The following interview is part of a research project for the master's degree in medical education. It aims to describe the perception of a group of healthcare professionals involved in anesthesia during pediatric surgical care in Bogotá, regarding training in pediatric anesthesiology in Colombia.

The information provided will be used solely for academic purposes and handled with strict confidentiality.

Questions:

1. Can we start by sharing a bit about your experience and the relationship you have or have had with pediatric anesthesiology? How much experience or relationship do you have with pediatric anesthesia? How did your relationship with this specialty begin?

a. What is your profession or role in pediatric surgical care, and how does it involve anesthesia in children?

b. Could you tell me about a particularly positive experience you have had with pediatric anesthesia?

c. Could you tell me about a case you have experienced or witnessed that had a negative outcome related to pediatric anesthesia?

d. Currently, how do you feel or what emotions do you have when assigned to a case involving anesthesia for a child?

2. From your perspective, what training should an anesthesiologist receive to prevent possible complications related to anesthesia during surgery in a child?

a. Based on your expertise, what are the differences in management between pediatric and adult anesthesia?

b. What competencies, knowledge, or skills do you consider essential for an anesthesiologist to manage a child, and how can they be acquired?

3. From your perspective, how would you rate the training in pediatric anesthesia received during anesthesiology residency?

a. How sufficient is it for the anesthetic management of children? What aspects of the training do you think require further depth to prevent complications related to anesthesia in children?

4. As you may know, in 2016 the Ministry of Health and Social Protection considered that creating a specialization in pediatric anesthesiology was not pertinent. This decision was made based on the consideration that there are no active programs in pediatric anesthesia in the country and that the creation of new subspecialties could deprive professionals graduating from approved anesthesiology programs from the opportunity to practice the competencies of their specialty. What do you think about this decision?

a. What are the main health challenges for Colombian children related to not having enough professionals with expertise or training in pediatric anesthesia?

b. In Colombia, what barriers do healthcare professionals face who wish to train in pediatric anesthesiology?

c. In a country like Colombia, what would happen if anesthesiologists managing anesthesia in children had training in this discipline? What alternatives could be implemented to strengthen the competencies of anesthesiologists to care for children in various regions of Colombia?

To conclude this session, I want to thank you for your valuable participation in this research work. You have provided relevant information to help improve anesthesia care for children in Colombia; I commit to sharing the results with you once they are published.

Thank you very much, have a good day, good afternoon, or evening (depending on the time of the interview).

Source: Authors.