

# Innovation and challenges: minimally invasive surgery training in Latin America

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## ABSTRACT

**Objective.** Our objective was to assess the current status of minimally invasive surgery (MIS) training in Latin America and to identify the primary hurdles for the acquisition of laparoscopic skills.

**Materials and methods.** An anonymous survey was launched on various social media in November 2022. Surgeon responses were analyzed.

**Results.** 131 pediatric surgeons from 98 surgical institutions in 16 Latin-American countries replied to the survey. MIS training during residency was found in 45.9% of the surgeons with >20 years' experience, and in 95.2% of the surgeons with <10 years' experience. A median of 3 courses (IQR: 2; 5) had been completed by 116 surgeons (88.5%), 70.2% of them ≤3 days long, and 85.4% self-funded. The primary hurdles to attend them were the lack of financial resources and/or the absence of local courses (80%). Virtual courses were regarded as a recommendable option to acquire laparoscopic skills by 100 (76.3%) respondents.

**Conclusions.** MIS training in Latin America has exponentially increased in the last decades. However, training programs have room for improvement, which means training is highly surgeon-dependent, since courses are selected and self-funded by surgeons themselves.

**KEY WORDS:** Latin America; Minimally invasive surgery; Training; Simulation.

## INNOVACIÓN Y RETOS: FORMACIÓN EN CIRUGÍA MÍNIMAMENTE INVASIVA EN AMÉRICA LATINA

### RESUMEN

**Objetivos.** Nuestro objetivo fue evaluar la situación actual de la formación en cirugía mínimamente invasiva (CMI) pediátrica en Latinoamérica e identificar los principales obstáculos para la adquisición de habilidades laparoscópicas.

DOI: 10.54847/cp.2024.04.10

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*This work was presented at the 56<sup>th</sup> Argentinian Pediatric Surgery Congress and the 2023 IPEG Conference.*

Date of submission: May 2024

Date of acceptance: September 2024

**Material y métodos.** Se distribuyó una encuesta anónima durante Noviembre 2022 utilizando diferentes plataformas de redes sociales y se analizaron las respuestas para el total de los cirujanos.

**Resultados.** Ciento treinta y un cirujanos pediátricos de 98 centros quirúrgicos en 16 países latinoamericanos respondieron la encuesta. Se observó formación en CMI durante la residencia en el 45,9% de los cirujanos con >20 años de experiencia en la especialidad, ascendiendo a 95,2% en el grupo con <10 años de experiencia. Una mediana de 3 cursos (RIC 2; 5) fueron realizados por 116 cirujanos (88,5%), el 70,2% con duración ≤3 días y 85,4% autofinanciados. Las principales dificultades para asistir fueron la falta de recursos económicos y/o la carencia de cursos locales (80%). Los cursos virtuales fueron considerados una opción recomendable para adquirir habilidades laparoscópicas por 100 (76,3%) encuestados.

**Conclusiones.** La formación en CMI en Latinoamérica aumentó exponencialmente en las últimas décadas, sin embargo, habiendo programas formativos deficientes, la misma es muy dependiente del cirujano, quien selecciona y autofinancia los cursos.

**PALABRAS CLAVE:** América Latina; Cirugía mínimamente invasiva; Educación; Simulación.

## INTRODUCTION

Minimally invasive surgery (MIS) has emerged as an innovative paradigm in surgical practice, with significant benefits including less postoperative pain, reduced wound-related morbidity, and a shorter hospital stay for pediatric patients, among others<sup>(1)</sup>.

In Latin America, similarly to other world regions, training in the various surgical specialties –including pediatric surgery– has adapted to this by including the acquisition of MIS technical skills. However, although laparoscopic courses have been reported in countries such as Haiti or Dominican Republic<sup>(2,3)</sup>, and even MIS training programs in the US and Canada<sup>(4-6)</sup>, these courses are exceptional, mostly on-site, and rarely specific to pediatric

**Table 1. Categories and number of questions included in the survey.**

<i>Category</i>	<i>Number of questions</i>
Respondents' basic demographic information	2
Data on the respondents' experience in their medical specialty and specific MIS experience	2
Respondents' perceptions on the role of simulation in the MIS learning process	2
Inclusion of MIS-related theoretical and hands-on content in the respondents' academic training	2
Comprehensive data on the MIS courses completed by the respondents, including number, modality, level, duration, funding, and personal view	9
Identification of the hurdles faced by the respondents when trying to complete MIS courses	2
Respondents' view on the quality and usefulness of virtual MIS courses	1
Availability and daily use of simulators in the respondents' practice	4
MIS accreditation and certification in the respondents' country	2
Application of the acquired MIS knowledge and skills in daily clinical practice	4

surgery<sup>(7,8)</sup>. In addition, none of them has allowed MIS training to become standardized nationally.

Contrarily to developed countries, Latin American nations may pose unique challenges related to low- and middle-income countries' hurdles in the implementation of advanced MIS training methods<sup>(9)</sup>.

The main objective of this article was to assess the current status of pediatric MIS training in Latin America and to identify the primary hurdles for the acquisition of laparoscopic skills.

## MATERIALS AND METHODS

An anonymous survey was launched among Latin-American pediatric surgeons on Google Forms® from November 1 to November 30, 2022, through various social media –Instagram®, Telegram®, Facebook®, and WhatsApp®.

It consisted of a total of 30 questions on various aspects relating to Minimally Invasive Surgery (MIS) training and practice. Questions were distributed in the categories featured in Table 1.

All surgeon responses were analyzed. Subsequently, they were divided into subgroups according to experience in MIS and the relevant specialty.

Quantitative variables were expressed as median and interquartile range, whereas qualitative variables were reported as frequencies and percentages.

## RESULTS

131 pediatric surgeons from 98 institutions in 16 Latin American countries replied to the survey (Table 2). Of all the respondents, 37 (28.2%) had more than 20 years'

experience in pediatric surgery, 34 (26%) between 10 and 20 years, and 60 (45.8%) less than 10 years.

According to self-perception, 29 (22.1%) reported having great experience in MIS, 55 (42%) moderate experience, 29 (22.1%) little experience, and 18 (13.7%) very little experience.

MIS training in the educational period (residency/concurrence/fellowship) was noted in 45.9% of the surgeons with more than 20 years' experience in the specialty, in 73.6% of the surgeons with 10-20 years' experience, and in 95.2% of the surgeons with less than 10 years' experience. This translated into a 107.4% increase in MIS training during residency (Fig. 1). When asked if they were undergoing or had undergone a both theoretical and hands-on training program including simulated technical skills in MIS, 84 respondents (64.1%) replied "yes."

116 surgeons (88.5%) had completed MIS courses, with a median of 3 (IQR: 2; 5), 85.4% of them being self-funded. Of these surgeons, 74 (63.8%) had attended exclusively on-site courses, 7 (6%) had attended virtual courses, and 9 (7.8%) had attended hybrid courses. The remaining 26 (22.4%) had completed courses with at least two modalities. The courses varied in length, with ≤3-day courses representing 70.2% of the cases.

Only 17 surgeons had received funding for at least one of the courses from either a sponsor or their work institution. 29.4% of them were from Argentina, 18.7% from Peru, and the remaining ones from Brazil, Chile, Colombia, Costa Rica, Ecuador, Honduras, and Mexico. All respondents from Bolivia, El Salvador, Guatemala, Nicaragua, Paraguay, Dominican Republic, and Venezuela had self-funded 100% of their courses.

95% of the respondents said the courses had been very important in their learning process. The skills acquired were put into practice following the courses in 76 surgeons (65.5%).

**Table 2. Total of respondents by country and work institutions.**

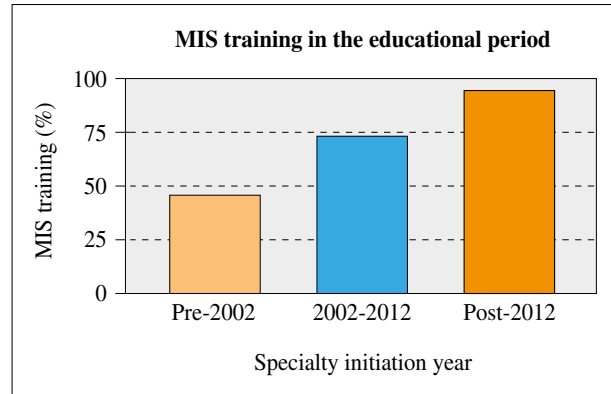
Country	Respondent pediatric surgeons	Work institutions
Colombia	27	25
Peru	20	7
Ecuador	16	16
Argentina	15	9
Dominican Republic	13	7
Mexico	8	8
Chile	6	5
Costa Rica	6	4
Guatemala	4	3
Honduras	4	4
Paraguay	4	1
Bolivia	2	2
Brazil	2	2
Venezuela	2	2
El Salvador	1	1
Nicaragua	1	2
Total	131	98

Among the primary difficulties encountered in attending MIS courses, the lack of financial resources and/or the absence of local courses accounted for 80% of the cases, with the proportion varying according to each country (Fig. 2). The lack of time was a hurdle for 48.5%. It is worth noting that this difficulty was related to the need to travel to another town to complete the courses in 60.9% of the cases.

Even though some surgeons had simulation spaces in their institution, they also reported difficulties when using them for training purposes, such as lack of time (58.8%) and absence of a standardized training program (41.2%).

Virtual courses were regarded as a recommendable option to acquire laparoscopic skills by 100 (76.3%) respondents. Among the surgeons who disagreed, only 1 (3.2%) had completed at least one virtual course.

Regarding MIS simulation or training spaces, 82 surgeons (62.6%) had access to them, but 62% of them made little to no use of those. The remaining 49 respondents with no access to these spaces (37.4%) blamed it on the lack of a dedicated space in their work institution (87.8%), the unavailability of material due to economic reasons (35%), and local unavailability (35%). As for the importance granted by each surgeon to the role of simulation in the learning process, it was essential for 50% of the surgeons with very little experience in MIS, and for 76% of the surgeons with great experience.



**Figure 1. MIS training during residency.**

## DISCUSSION

Our study revealed an inversely proportional correlation between experience in the specialty and exposure to MIS during residency, as demonstrated by the high percentage of individuals with recent contact with MIS vs. those with more than 20 years' experience (97.5% vs. 45.9%). This highlights how MIS adoption has increased in Latin America in the last two decades.

However, there was a lack of specific MIS training programs during the learning process in 35.9% of the surgeons. This could mean extracurricular training is carried out through courses, typically short (70.2%  $\leq$  3 days long) and isolated, which surgeons join on their own initiative, and which are mostly self-funded. As a result of this, significant heterogeneity in terms of experience may arise within a surgical team, thus making MIS implementation more difficult if other members are not so proficient in it. On the other hand, due to the lack of programs offering MIS training, surgeons constantly face the typical difficulties related to training courses –lack of time and/or resources. This is especially frequent in places where local courses are not available, which forces surgeons to travel, pay for accommodation and food, deal with course registration fees, and face a loss of profit.

As a potential solution to this, telesimulation has experienced significant growth in the last years, even within Latin America, mostly as a result of the COVID-19 pandemic<sup>(10)</sup>, which has allowed visual platforms to be used for training purposes. Some reports corroborate the effectiveness of telesimulation in the acquisition of essential skills, with an efficacy similar to that of on-site simulation<sup>(11-14)</sup>. This means that, in this modality, the presence of a local expert would cease to be an essential requirement, which would allow the time and logistic hurdles associated with on-site courses to be surmounted. The greatest achievement of virtual courses is for the participant to be able to complete them anywhere.



**Figure 2.** Primary hurdles to complete MIS courses by country.

However, even though virtual courses play a significant role in facilitating access to courses in Latin America, they still represent a financial cost for surgeons, who have to find the right course at the right time and on their own initiative.

Another survey finding which is also worth noting is the fact that the more experienced MIS surgeons are, the more importance they grant to simulation in terms of surgical skill acquisition.

It should also be highlighted that MIS skills should be a key requirement for all pediatric surgeons. In this respect, an institutional response coordinated at all levels is essential, with the involvement of training institutions and national and even international organizations to make the acquisition of these skills compulsory during training. This approach should not be limited to sporadic theory or practice only, and it requires education to be standardized in order to ensure homogeneous MIS training.

The limitations of this study include potential sampling and survey biases, since subjective pediatric surgeon responses were collected. To avoid that, the survey was launched as extensively as possible, and respondents were encouraged to elaborate in the most detailed and sincere fashion possible. Interviewer biases did not play any role as the survey was online and anonymous. Therefore, even if the survey did not provide a definitive solution for these issues, it did allow us to have a clearer idea of the current status of MIS training in Latin America. It also helped us learn how to approach these problems so that training becomes more homogeneous and standardized among Latin American pediatric surgeons.

In conclusion, MIS training in Latin America during the educational period has increased significantly in the last years. However, such growth is heterogeneous and lacks standardized training programs. Currently, training is highly surgeon-dependent, since surgeons are faced with

important hurdles such as travel and assistance expenses, self-funding, and lack of courses and experienced local trainers. Virtual courses stand as a solution to some of these hurdles as they provide greater access to learning.

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