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Training Tendencies of Laparoscopic Surgery in Mexico-Results from a National Survey

Alejandro Weber-Sánchez* and Denzil Garteiz Martínez

Department of Surgery Hospital Ángeles Lomas, Universidad Anáhuac México

***Address for Correspondence:** Alejandro Weber Sánchez, Department of Surgery Hospital Ángeles Lomas, Universidad Anáhuac México, Vialidad de la Barranca s/n Consultorio 410, Colonia Valle de las Palmas, Huixquilucan, C.P. 52763, México, Tel: +52-555-246-9527; ORCID ID: orcid.org/0000-0002-0223-9133; E-mail: awebersanchez@gmail.com

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ABSTRACT

Introduction: Laparoscopic surgery has been performed in Mexico since 1989, but no reports about training tendencies exist. We conducted a national survey in 2015, and here we report the results concerning training characteristics during the surgical residence of the respondents.

Materials and Methods: A prospective study was conducted through a survey questioning demographic data, laparoscopic training during pre and post surgical residency and other of areas of laparoscopic practice. The sample was calculated and survey piloted before application. Special interest in this report was placed on type and quality of training received. Data are reported in percentages.

Results: 1,151 questionnaires were compiled and 90% of the calculated sample analyzed. 90.25% of the respondents were male. Participation included respondents from almost every State of Mexico. 51.59% did not have theoretical and only 52.51% had practical training. 98.89% were exposed to laparoscopic cholecystectomy, 69.03% to antireflux surgery, 64.86% diagnostic laparoscopy and 55.56% appendectomy. Exposure to other procedures was less than 35%.

77% performed more than 10 cholecystectomies as the principal surgeon, appendectomy 50.6%, and antireflux surgery 60.1%. 15 to 26% never performed basic procedures as the principal surgeon. Many residents denied having even assisted in advanced laparoscopic procedures. 52.4% rated training quality as inappropriate. Seventy five percent decided to take some kind of extra training in laparoscopy after their residency.

Conclusion: To our knowledge, this is the first national survey to report the tendencies in training and practice of laparoscopy before 2015 in Mexico. It is a good representation of the reality with which laparoscopy has slowly evolved in our country. More than half the respondents consider having had an inadequate training program. Training was focused on basic laparoscopic procedures such as cholecystectomy but advanced procedures were very seldom taught. Most respondents affirmed to require additional laparoscopic training after their residency.

Keywords: Survey; Questionnaire, Surgical resident education; Minimal invasive surgery training; Laparoscopy, Training

INTRODUCTION

Laparoscopic surgery has been performed in Mexico since 1989 when the first mini-invasive cholecystectomy was performed, the first also in Latin America. Since then, its practice has extended to many other procedures. However after 30 years, there have been no studies about the training of laparoscopic surgery in Mexico. In order to obtain some insight on this topic, we conducted a national survey in 2015, to made a deep and wide range investigation and analysis of laparoscopic surgery in Mexico, and made a deep research and discussion on the existing problems. This paper reports the results of the section of the survey about training characteristics and exposure concerning laparoscopic surgery during the surgical residence of the respondents, comparing with other similar surveys in the world, which is of great significance to guide the next step of laparoscopic surgery training in this country.

MATERIALS AND METHODS

A prospective, cross-sectional study was conducted from April 2014 to March 2015, by means of a structured survey directed to all general surgeons in the country. Included in the survey were surgeons and surgical residents of any age or sex, from any Mexican State that wished to participate in the survey. Questions were uploaded in the websites of the two main Mexican Surgical Societies: Asociación Mexicana de Cirugía Endocópica (AMCE) and Asociación Mexicana de Cirugía General (AMCG) during one year to allow a high number of surgeons to participate. A pilot of this survey was conducted previously during a National Surgery Congress to evaluate its accuracy. None of the organizations had any ethical concerns.

Non-randomized probabilistic sample calculation was made using the basic formula for modified finite populations derived from Anderson and Burstein [1], with the addition of 10% per non-response rate 95% CI, 3% sample error and $p = 0.5$, $q = 0.5$. For calculations, we used double of the number of active registered surgeons in AMCG, which is the largest national surgical association in Mexico. The final result of the sample calculation was 968.

The survey, paid for by the main author, and approved by the board of the two associations, questioned demographic data, laparoscopic training pre and post surgical residence, active laparoscopic practice, equipment and resources and another of areas of opportunity.

In the section of the survey we report here, surgical residents and surgeons were asked to answer whether they received formal practical or theoretical training during their residency program (theoretical refers to class discussions; literature reviews and structured subject based teaching on laparoscopic surgery topics), to define which procedures they were exposed to during the residency, the number of procedures performed during the residency program and if they participated as the principal or assisting surgeon. Their perception about the quality of their surgical training, and also if they received additional (external) training, by means of advanced courses, fellowships or high specialty training.

Data was also obtained on procedures most frequently performed during their surgical residence. Data were reported with descriptive analysis, reported in percentages and by means of graphs.

RESULTS

A total of 1,151 questionnaires were compiled. Twenty-three surveys were discarded, because they were inappropriate for analysis, but there were some of the surveys with questions left unanswered. Of the participants, 1018 (90.25%) were male, and 110 (9.75%) female. Their age ranged from 20 to more than 70 years-old. Only 3.7% were younger than 30 years and were supposed to be surgical residents. The third decade of life 30-39 years-old, formed the largest group of participants (29.3%). 25.3% of them finished their residency before 1990, and 21.1% in the five years previous to the survey.

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Regarding the State of Mexico where they performed their residency, 48% of them did it in Mexico City, 7.9% in Nuevo León, 6.1% in Jalisco, 4.7% in the State of Mexico and 4.1% in Guanajuato. The rest of the Mexican States had 3% or less of the respondent surgeons, 1.9% of them made their residency abroad. Two States, Tlaxcala and Campeche had no respondents.

Theoretical *vs* practical laparoscopic training during residency program

To the question ¿Did you have formal training in laparoscopic surgery? Fifty-two (4.5%) did not answer, 567 (51.59%) said they did not have formal theoretical training, and 581 (52.51%) answered they had practical training. (Figure 1 & 2).

Type of laparoscopic procedures to which they were exposed to during the residency

When asked to define to which laparoscopic procedures they were exposed to during the residency, 431 out of 1151 (37.44%) surveyed did not answer this question.

Of those who answered, 712 (98.89%) said to have been exposed to laparoscopic cholecystectomy and 497 (69.03%) to laparoscopic antireflux surgery. The third and fourth procedure were diagnostic laparoscopy and appendectomy, with 467 (64.86%) and 400 (55.56%) of positive responses. Other laparoscopic procedures in much less percentage (Figure 3).

Number of procedures performed as primary surgeons during the residency program

For analysis purposes, the number of laparoscopic procedures performed as primary surgeons, were grouped into three groups: Group A, no procedures; Group B, 1 to 9 procedures; and Group C, more than 10 procedures.

For laparoscopic cholecystectomy, 77% affirmed to have performed more than 10 procedures as the principal surgeon. For appendectomy and antireflux surgery these percentages were 50.6% and 60.1%, respectively, in many other advanced procedures, the answers were less than 20%. 15 to 26% never performed basic procedures as the principal surgeon. More than 50% admitted to have participated as surgical assistant in more than 10 cases of basic surgical procedures, but a great number of residents denied having participated or even assisted in advanced laparoscopic procedures (Figure 4).

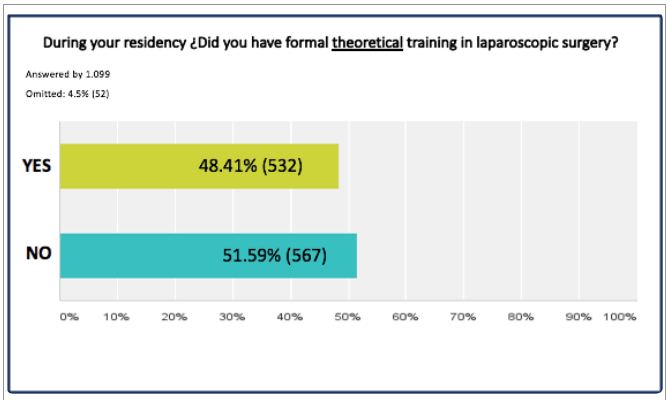


Figure 1: Answer to the question about having formal theoretical training.

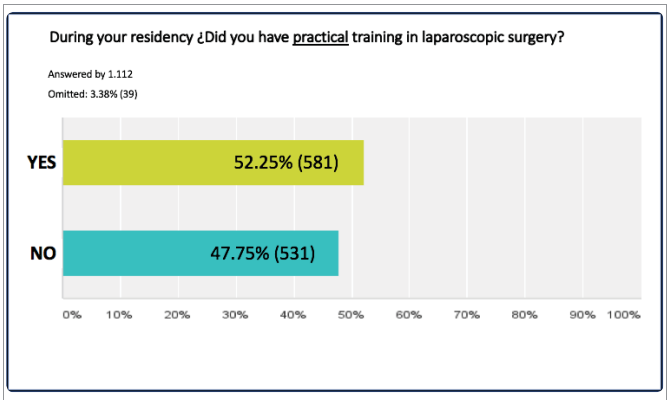


Figure 2: Answer to the question about having practical training.

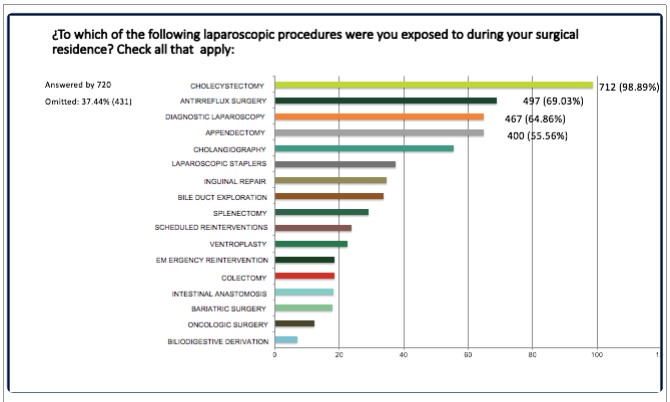
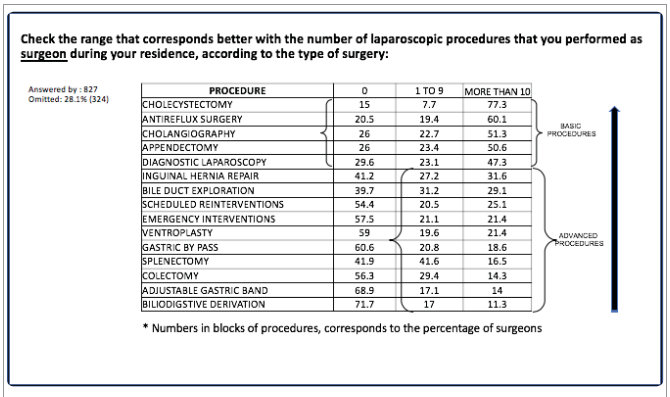


Figure 3: Laparoscopic procedures to which the respondents were exposed during the residence.



PROCEDURE	0	1 TO 9	MORE THAN 10
CHOLECYSTECTOMY	15	7.7	77.3
ANTIREFLUX SURGERY	20.5	19.4	60.1
CHOLANGIOGRAPHY	26	22.7	51.3
APPENDECTOMY	26	23.4	50.6
DIAGNOSTIC LAPAROSCOPY	29.6	23.1	47.3
INGUINAL HERNIA REPAIR	41.2	27.2	31.6
BILE DUCT EXPLORATION	39.7	31.2	29.1
SCHEDULED REINTERVENTIONS	54.4	20.5	25.1
EMERGENCY INTERVENTIONS	57.5	21.1	21.4
VENTROPLASTY	59	19.6	21.4
GASTRIC BY PASS	60.6	20.8	18.6
SPLENECTOMY	41.9	41.6	16.5
COLECTOMY	56.3	29.4	14.3
ADJUSTABLE GASTRIC BAND	68.9	17.1	14
BILIODIGSTIVE DERIVATION	71.7	17	11.3

Figure 4: Percentages of surgeons that performed different laparoscopic procedures as surgeons.

Quality and mode of training

To the question about quality of formal training in laparoscopy during their residency, 52.4% rated it as not appropriate and 75% did not receive additional (outside their residency program) training. Of those who did have the opportunity to have training external to their residence, 50% did it through basic theoretical, theoretical and practical courses or tutorial rotations. Less than 25% had access to advanced courses, fellowships or high specialty training (Figure 5).

Surgeons were also asked if they received additional training after their residency program. Less than 50% took an advanced course,

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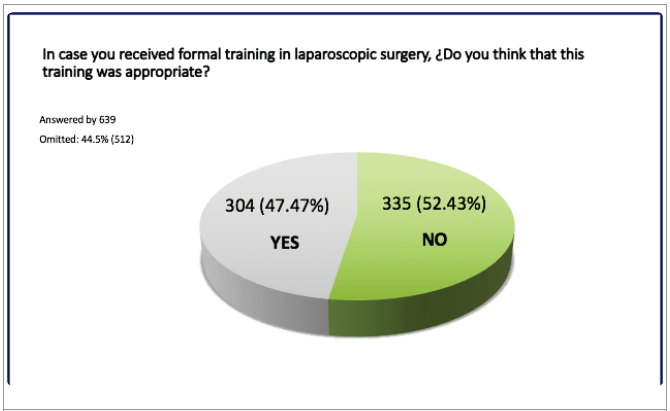

Figure 5: Answer to the question about quality of formal training in laparoscopic surgery.

while only 9% participated in a highly specialized training program. Seventy five percent decided to take some kind of extra training in laparoscopy on their own within the first year after finishing their residency program.

DISCUSSION

Due to the benefits of minimally invasive techniques for the majority of surgical procedures in terms of cosmesis, postoperative pain, length of hospital stay, and return to daily activities, laparoscopy has replaced the open surgical approach. The surgical competencies required to perform laparoscopy are challenging and require trainees go through an intensive learning period [2]. The learning of laparoscopy has changed since its introduction in general surgery, but it is of outmost importance to have information about how this process occurred among the surgeons who are now in current practice, in order to have adequate plans to better instruct future surgeons, because minimally invasive surgery is a necessary tool in the armamentarium of today's general surgeon.

This is the report of the largest survey ever conducted in Mexico, to describe the tendencies of different issues regarding training and practice of laparoscopic surgery before 2015. More than 90% of the calculated sample was obtained and participation of surgeons from almost every State of Mexico, gave us confidence that the results show the reality of surgical residences in the country regarding laparoscopic surgery for the surgeons that answered the questionnaire.

The vast majority of respondents were males and surgeons already in surgical practice. Only 3.7% of respondents were younger than 30 years of age, which makes us assume they were still surgical residents. Almost half of the participants did their surgical residence in Mexico City, and 22.8% were distributed in four other main Mexican States. Except for 1.9% who were trained abroad, the rest were scattered in less than 3% of all other States except two, that were not represented. This may reflect that the surgeons in those places did not want to respond, or in those States laparoscopic training was not accessible for training at that time.

More than half of the participants, answered they did not have formal theoretical training. And 47.75% did not have a formal practical training either. This may in part correspond to those who were trained before the 1990s, when laparoscopy was not even available yet in Mexico or other countries [3]. On the other hand, almost half of the participants finished the residency after that date. In the early phases of laparoscopy in Mexico, it was common for these procedures to be performed at teaching hospitals, by only few faculty surgeons, without having a formal academic program, who were trained with short courses, to back up the resident's training. These residents would be exposed to laparoscopic procedures and learn on a tutorial basis. But reality is not the same for all countries, a recent survey conducted on Nigerian postgraduate trainees revealed that 90.7% of respondents surveyed had not attended any training program in laparoscopy [4].

More than one third, 431 out of 1151 (37.44%) of the surveyed surgeons, did not define which procedures they were exposed to during the residency. This makes us assume that they were trained before the laparoscopic era in Mexico in the beginning of that period. More than 50% admitted to have participated in more than 10 cases of basic surgical procedures. As expected, 98.89% affirmed to have been exposed to laparoscopic cholecystectomy. An unexpected result was that 69.03%% answered to have assisted to laparoscopic antireflux surgery during their residency. This seems unusual since this is a complex procedure that requires advanced surgical skills, and is not one of the most common surgeries in most teaching hospitals. It is possible that, since this was a novel procedure that was popularized and extended by mini invasive surgery in Mexico, most faculty surgeons would want to perform such procedures more frequently. The third procedure was diagnostic laparoscopy 64.76%, followed by appendectomy, with 55.56% of positive responses. Less than 35% admitted to have assisted to laparoscopic inguinal hernia repair and less than 22%, ventral hernia repair. This is perhaps related to the fact that these two procedures, even now a days, are performed by less than half of the surgeons all around the world, who still consider that open hernia repair has advantages over the mini invasive approach.

The opportunity to be primary surgeon is limited, as has been reported in other similar surveys as Qureshi, et al. [5] in Canada. When questioned about performing laparoscopic procedures as surgeon, 77.3% affirmed to have performed more than 10 of cholecystectomies as the principal surgeon. For appendectomy and antireflux surgery, these percentages were 50.6 and 60.1%, respectively. It must also be noted that 15%, 26% and 20.5% respectively of the respondents, never performed these same mini invasive procedures as the principal surgeon, and in other advanced procedures, the answers were less than 20%. Naturally, it was more common for residents to participate as assistant surgeons. But the reality is different as for other parts of the world as Nigeria as reported by Balogun, that revealed that 66.7% of respondents had not participated in more than four laparoscopic procedures during their rotation, and forty-six percent of them reported that their experience in laparoscopy was mainly by observation of the procedures [4].

For many surgical residents, basic and advanced procedures were not taught with sufficient cases during the residency. Most of them felt that they required additional training during or after their residency if they wanted to improve their skills and be confident to perform them. Three quarters of surgeons surveyed, did not receive additional (outside their residency program) training. Of those who did have the opportunity to have training outside their program, 50% did it through basic theoretical or theoretical and practical courses or tutorial rotations, and less than 25% had access to advanced courses, fellowships or high specialty training. Most surgeons admitted to have acquired experience after their residence through self-practice and not thorough specialized courses or training.

More than half of the surveyed, responded that their training in laparoscopy during their residency program was not adequate, this

pattern repeats in other countries. A pan-European survey for training of European urology residents in laparoscopy, showed a cohort of only 23% who stated they would have satisfactory laparoscopy skills at the end of their training [6]. But in others, like the survey conducted in Canada, 90% of residents feel comfortable performing basic laparoscopic procedures, while only 8% feel comfortable performing advanced procedures at the end of their training [5].

Integrating laparoscopic procedures to the surgery residency programs has been very irregular in most hospitals in Mexico. According to SAGES's Position Paper, basic laparoscopic procedures for program curricula should include cholecystectomy, appendectomy and diagnostic laparoscopy, and all other procedures should be considered as "advanced", for training purposes [7]. As with the teaching of any other skills, laparoscopic procedures need to be taught in the context of scientific and clinical background, accompanied by a structured theoretical and academic program. Most teaching hospitals in Mexico at that time, were based on the Academic Program for Postgraduate Courses of the Universidad Nacional Autónoma de México for open (general) surgery training. Even the 2016 version of this program, the only mention of laparoscopic procedures corresponds to cholecystectomy [8]. No other minimally invasive procedures is formally included as part of the teaching process in surgical residencies.

In contrast with open surgery training, in which the resident develops skills as an assistant during operations with a supervisor, and is able to make small but constant progress until he is able to do the procedure as surgeon, laparoscopic training ideally should include previous laboratory skills development. Surgical trainers, animal models and virtual reality simulators were not commonly available in teaching hospitals in Mexico and therefore, most residents needed to take extracurricular courses, or wait until their residency programs were concluded in order to enroll in short training courses that included this type of practice. Most residents did not feel trained in skills such as two-handed instrument manipulation, complex dissection or intracorporeal suturing, all considered necessary for advanced laparoscopic procedures. Most current surgical training programs did not follow the current evidence about proficiency-based structured simulation training with deliberate practice.

During our research, we found that other developing countries such as Brazil, have reported similar problems with the integration of laparoscopic surgical skills into the traditional surgery residency programs. In their publication in 2015, Nacul, et al. [9] describe some of the obstacles that were common to many hospitals in Latin America for the development of laparoscopic surgery teaching models. Among them are lack of trained faculty, misinformation even in surgical specialists, high equipment costs, lack of organization in the academic programs, improvised inclusion of teaching methods without an adequate step by step training method, etc. Our survey shows that Mexican surgical residents at that time were probably subject to many of these obstacles and required completion of their learning curves after finishing their residency program.

Surgical residency programs in Mexico and other developing countries need to be better structured to include a more complete laparoscopic curriculum. When compared to the American College of Surgeon's skills requirements we found that the curriculum for residents should be divided in three phases: during the first one, residents are trained in basic and advanced laparoscopic skills which include familiarization with laparoscopic instruments, video systems, induction of pneumoperitoneum, trocar placement, intra and extra corporeal suturing, camera skills, etc. After the resident has shown competence in these skills, a secondary phase includes procedures of general surgery such as: appendectomy, inguinal hernia repair, cholecystectomy and bile duct exploration, ventral hernia repair, antireflux surgery, intestinal and colon resection, splenectomy and bariatric surgery. Finally, residents are trained in laparoscopic complication resolution, crisis management and other team based skills [10].

It is important to increase the type and number of cases to which a resident is exposed to during the residency, as well as to implement formal teaching programs to accompany their training, in order to improve surgeon's practice in laparoscopy when they become practicing physicians. Teaching hospitals and surgical departments need to update their surgical knowledge and expertise, and possibly standardize training in minimally invasive surgery, teaching at least the basic laparoscopic skills [11]. Not only for surgical residents, but for senior surgeons as well. Training is needed not only for residents, but also for consultants. As Galfano states, it is important that residents are trained in centers were minimally invasive surgery is already widely available [11].

According to the pan European survey conducted by Fourriel, up to 40% of centers have no training facilities for laparoscopy available. It has been shown that self-built, cheap, dry laboratories are as efficient in training as the industrial ones, [6,12] so that it is not a matter of costs, but a matter of interest that resident training facilities for laparoscopic surgery should be optimized.

Since 1994 we direct a Diploma Course on advanced laparoscopy endorsed by Anahuac University. The course is offered for residents and surgeons who come to our hospital to be exposed to an important number of basic and advanced laparoscopic procedures, by well-trained and experienced surgeons; a large videolibrary; a vast quantity of written material; and endoscopic trainers for at least two hours-a-day of practice. Throughout the years, this kind of training has been useful for most of them to initiate or continue their training and later to start their active practice as surgeons. We and others strongly believe that watching surgical videos, observing live surgeries and using (low-cost or not) dry laboratories are fundamental steps in acquiring the basic skills in laparoscopy, as the modular training proposed by Stolzenburg, et al. for prostatectomy [13,14]. This is confirmed by the survey in Canada in which eighty percent of residents felt that skills lab training translated to improved performance in the operating room [5].

A great debate is currently ongoing about credentialing in minimally invasive surgery training [15]. It is advisable that educational authorities certify the residents' training centers [5]. The laparoscopic approach to abdominal surgery should be considered a fundamental part of all surgical residency programs, along with training in traditional open procedures.

Residents should graduate form their residency programs being able to solve the most common surgical problems and laparoscopy is an essential tool for some of them. After that, each individual may choose to complement their training with special courses or fellowships in more advanced areas. These data and these suggestions were presented at a National Conference of the AMCG in 2015, and we are confident that to date, many programs have modified their training programs.

CONCLUSIONS

To our knowledge, this is the first national survey to report the tendencies in training and practice of laparoscopy before 2015 in Mexico. As in many other developing countries, the introduction of this new technology has been subject to many obstacles.

Our survey is a good representation of the reality with which laparoscopy has slowly evolved. The percentage of respondents from the different States in Mexico also seems to depict, how laparoscopy was initially introduced in the most developed locations (Mexico City, Nuevo Leon and Jalisco), while other States reported extremely low rates of respondents. Most large teaching hospitals in Mexico are located in these principal States and residents from smaller cities or rural states were subject to very low exposure to laparoscopy.

Although most respondents seem to have had at least some exposure to basic laparoscopic procedures such as cholecystectomy, appendectomy and diagnostic laparoscopy, it is clear that very few were taught to perform more advanced procedures.

It seems accurate to state that most hospitals in Mexico, at that time, were not prepared to offer solid training and academic skills. With approximately half the respondents affirming to not having a theoretical program to introduce the new technology and almost another half reporting to have had no practical training, it is easy to explain why more than 50% of the respondents said that their training was inappropriate and 75% required additional experience after their residency.

Although we can conclude that, in general terms, teaching hospitals were not technically equipped and academically organized to offer better conditions for residents, it is our impression, that both Mexican surgical associations (AMCG and AMCE) made an extraordinary effort to include laparoscopy in their annual conferences and courses, and this motivated residents to search for additional training opportunities and push for better hospital programs. It will be interesting to repeat this survey in a few years and observe how these tendencies have changed.

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