Original article Doi: 10.18004/sopaci.2022.diciembre.19

Impact on the training of resident physicians in general surgery due to the pandemic generated by the SARS-CoV-2 virus

Impacto en la formación de médicos residentes en cirugía general por la pandemia generada por el virus SARS-CoV-2

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ABSTRACT

Introduction: the training process of general surgery residents was globally affected by the SARS-CoV-2 pandemic and there is a need to reinvent itself with new training programs. The objective was to study the impact of the pandemic on the training of general surgery residents. **Materials and methods:** Observational study carried out at the Hospital de Clínicas de Paraguay, taking two groups: graduates (not affected by the pandemic) and residents (trained during the pandemic). **Results:** 46 respondents: 10 were graduates and 36 residents. The average number of minor surgeries and appendectomies performed by a graduate and a first-year resident went from 25.8 and 56.6 to 7.8 and 14.5, respectively. When comparing herioplasties and conventional cholecystectomies between graduates and second-year residents, they went from 42 and 55 to 20.3 and 21.1. 56.3% of residents did not take simulation courses, and all classes became virtual. **Conclusion:** the pandemic affected the training of residents, with a significant decrease in the volume of surgeries performed, from 50 to 75%. The increase in the use of virtual platforms helped to not interrupt the teaching-learning process.

***Keywords*:** COVID-19, SARS-CoV-2, coronavirus infections, pandemics, general surgery, medical education, postgraduate programs

RESUMEN

Introducción: el proceso formativo de los residentes de cirugía general fue afectado a nivel global por la pandemia de SARS-CoV-2 y surge la necesidad de reinventarse con nuevos programas de formación. El objetivo fue estudiar el impacto de la pandemia en la formación de los residentes de cirugía general. **Materiales y métodos:** estudio observacional realizado en el Hospital de Clínicas de Paraguay, tomando dos grupos: egresados (no afectados por la pandemia) y residentes (formados durante la pandemia). **Resultados:** 46 encuestados: 10 fueron egresados y 36 residentes. El promedio de cirugías menores y apendicectomías realizadas por un egresado y un residente de primer año pasó de 25,8 y 56,6 a 7,8 y 14,5 respectivamente. Al comparar herioplastias y colecistectomias convencionales entre egresados y residentes de segundo año pasaron de 42 y 55 a 20,3 y 21,1. 56,3% de los residentes no realizó curso de simulación, y todas las clases pasaron a ser virtuales. **Conclusión:** la pandemia afectó la formación de los residentes, con una disminución importante en el volumen de cirugías realizadas, de un 50 a 75%. El aumento en la utilización de plataformas virtuales colaboro a no interrumpir el proceso enseñanza - aprendizaje.

Palabras clave: COVID-19, SARS-CoV-2, infecciones por coronavirus, pandemias, cirugía general, educación médica, programas de postgrado

INTRODUCTION

The SARS-CoV-2 pandemic has changed all human activities radically. This has also become evident in the healthcare sector, pedagogical activities organized, risk of contagion to the healthcare professional, less health professionals available, and fewer surgical patients taken care of. In addition, fewer surgeries have been performed, lengths of stay (LoS) have been shorter, and there have been less doctors on call, and less involvement in sur-

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Date of reception: 15/09/2022 - Date of acceptance: 12/11/2022

geries that are key to train residents not only in general surgery but also in other medical specialties. [1,2]

The pandemic has arranged health professionals differently and with different scenarios. It has required dramatic changes, and impacted professionals in training (medical and nursing students, for example) by reducing their attendance to hospital in 83.86%; damage to residents—who have had to focused on call in 60% of the cases and these have become more spaced out in 18.82%—is not much lower. Also, they have had to limit their surgical training [3].

Back on March 10, 2022, the Paraguayan Ministry of Public Health and Wellbeing reported the very first case of SARS-CoV-2 in Paraguay. This event was followed by a national quarantine across the country that included social isolation, school and college lockdowns, and closures of centers with all sorts of social interactions. On the health level, the medical attention of patients with underlying diseases, severe or emergency cases was prioritized. Also, a team working system was organized to reduce the exposure of the treating personnel to the virus due to danger of mass contagion. [4]

It is important to understand and comprehend how the consequencies of the pandemic have affected the training of general surgeons regarding the need for looking for solutions and different ways of moving forward with the training process—learning, continuing medical educational in the COVID-19 era, and introduction of new techniques for the training process. Now the paradigm has changed, and the models of learning are not focused on surgical knowledge *per se* anymore. Instead, redistribution strategies should be developed for academic and practical activities not only to teach general surgery but also get residents involved and prepared for new non-surgical roles like pandemic healthcare response if the number of patients with COVID-19 goes off the charts again [1,2].

The objective of this investigation is to describe the impact or the consequencies of the SARS-CoV-2 pandemic in the training process of residents of I and II Chair of General Surgery at *Hospital de Clínicas* who were involved in the specialization course in General Surgery, FCM – UNA held in Asunción, Paraguay from March 2020 through February 2021.

MATERIALS AND METHODS

This is a descriptive, observational, quantitative, cross-sectional study with non-probabilistic sampling of consecutive cases. The target population was representative of postgraduates in general surgery and residents in general surgery, all from *Hospital de Clínicas* (I and II Chair of General Surgery).

Group #1—postgraduates—was elected since during their medical training, the SARS-CoV-2 pandemic was non-existent. On the contrary, group #2—residents—were actually affected by the pandemic during their medical training. The following inclusion criteria were used for the study: postgraduates from 2019 and 2020, and residents who were already working as residents of first, second, and third year.

Authorization was requested from the corresponding Heads of General Surgery (from I and II Chair of General Surgery) from the Faculty of Medical Sciences of the National University of Asunción, Paraguay so a survey could be submitted to postgraduates, residents, and obtain the corresponding data.

The data mining technique was a survey submitted through Google-meet platform. Survey was built around a questionnaire of open and closed questions of the study subjects, postgraduates, and general surgery residents. Survey was coded and loaded in an electronic spreadsheet (Excel, Microsoft), and then analyzed using descriptive statistics.

Ethical principles were observed in this study at all times. Since it was a prospective study, primary sources or data were used in most of the information collected. The principle of confidentiality of the study subjects was observed too. Afterwards, a copy with the results was delivered to the different heads of the different surgical units that participated in the surveys in the first place.

RESULTS

A total of 46 surveys were submitted (26 to women and to 20 men). Out of the total, 10 were postgraduates (group #2), and 36 were residents (group #2) ***(see table 1)***.

When asked, postgraduates said that all the theoretical and practical classes of their residency program in general surgery took place on-site unlike the residents' classes who claimed that 100% of their theoretical activities were conducted online.

A total of 93% of respondents used an online platform for the entire asynchronous training process (Classroom), while Google-meet® and Zoom® platforms were used for the synchronous theoretical classes. We should mention that 75% of the residents were not involved in any previous training programs of the aforementioned platforms.

The mean number of surgeries performed was significantly lower during the pandemic. From a mean number of 55 open cholecystectomies performed by postgraduates down to 21.1

Table 1. Demographic characteristics of residents and postgraduates

Group	N	%	Mean age
First-year residents	11	23.9%	25.5 years old
Second-year residents	13	28.3%	26 years old
Third-year residents	12	26.1%	27.2 years old
Postgraduates	10	21.7%	28.8 years old
Total	**46**	**100%**	**-**

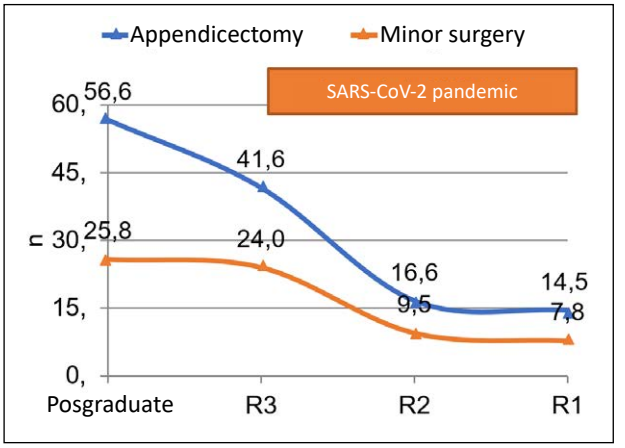

Figure 1. Mean surgeries performed by general surgery postgraduates and residents. Note: postgraduates were not affected by the SARS-CoV-2 pandemic. R3, third-year resident; R2, second-year resident; R1, first-year resident. N = 46

Table 2. Mean surgeries performed by general surgery postgraduates and residents at *Hospital de Clínicas,* Asunción, Paraguay

Type of surgery	R1	R2	R3	Postgraduates
Minor surgery	7.8	9.5	24	25.8
Appendicectomy	14.5	16.6	41.6	56.6
Hernioplasty	*	20.3	22	42
Conventional cholecystectomy	*	21.1	25.6	55
Laparoscopic cholecystectomy	#	#	35	40
Colectomy	#	#	22.1	23.3
Gastrectomy	#	#	1	1
Thoracotomy	#	#	0.5	0.6

*Note: R1, first-year resident; R2, second-year resident; R3, third-year resident. * Non eligible procedure for first-year residents according to the program. # Non eligible procedure for first- or second-year residents according to the program.*

performed by second-year residents. Same thing happened with other surgeries like appendicectomies, from a mean number of 56.6 procedures performed by postgraduates down to 41.6 performed by third-year residents, and 14.5 by first-year residents ***(see table 2 and figure 1)***.

A total of 56.3% out of all respondents did not do any simulation training. The remaining 43.7% did so in simulation models designed to train suture techniques in biological tissues (porcine tissue) and/or practice with laparoscopic training boxes to acquire the skills needed to perform laparoscopies.

During the pandemic, 95% of respondents said they participated in courses, congresses and/or online webinars on surgical updates.

When the use of personal protective equipment (PPI) was studied, all residents claimed they used biological biosafety PPIs. The following data on the type of mask used were obtained: KN95 in 62.2% of respondents, N95 in 16.2%, and surgical masks in 21.6%. A total of 56.8% of the residents surveyed became infected with SARS-CoV-2.

DISCUSSION

The SARS-CoV-2 pandemic has changed surgery units dramatically from fewer surgeries being performed just by prioritizing emergency surgeries only to rearranging the entire bed system. Also, due to the patients' fear of contagion of going to health centers seeking medical attention. [1,3]

Regarding the introduction of information and communication technologies (ICT), the department of training, as it is the case with all universities nationwide, used platforms to move forward with the process of training—learning. This means that the department of training had to reinvent itself to move forward with the transmission and transfer of knowledge. Still, a significant imbalance was seen between practical and theoretical activities because although students had the opportunity to participate in their postgraduate classes, courses or congresses online, they could only do so in their theoretical postgraduate classes. [1,5,6]

Regarding the simulation courses that became necessary to replace practical activities and surgical skill training, according to respondents, 56.3% of the residents did not conduct any simulation courses, which damaged the training process. However, the study conducted by Uribe discusses the creation of several simulation centers introduced by the departments of training to alleviate the deficit. [5]

When the mean number of surgeries performed by postgraduates and residents was compared, a lower number of appendicectomies was seen (up to 75%) when postgraduates were compared to first-year residents. Hernioplasties and conventional cholecystectomies performed between postgraduates and second-year residents were compared too. Here there was, also, an additional reduction of 50%. This reduction was seen everywhere and affected the residents' training mainly. As a matter of fact, in Chile, Uribe et al. say confirmed that, with the pandemic, surgeries dropped 90% in some residency programs.[5] Also, according to Rabe et al., the way to assess students changed too. Transition from personal on-site to online examinations made skills much more difficult to assess due to the lack of real-world demonstrations of the concepts and skills learned. [6]

In our study, 56.8% of the residents got infected and had to quarantine, which extended the no contact periods with the patients even further and reduced the number of surgeries performed. Brooks et al. say that quarantine was associated with negative psychological effects like post-traumatic stress syndrome, confusion, and even wrath. [7]

CONCLUSION

Before the pandemic, classes of the general surgery residency program were on-site. After the pandemic, they all became online classes.

The mean number of appendicectomies performed dropped down to 75% when, prior to the pandemic, general surgery postgraduates were compared to first-year residents who had their medical training during the pandemic. Overall, the number of all types of surgeries dropped dramatically.

Less than half the residents used simulations like their learning method during the pandemic performing sutures in ex-vivo tissues in anatomical models or in laparoscopic training boxes.

Almost all respondents participated in online courses, congresses or webinars during the pandemic.

A total of 80% of respondents used N95 or KN95 masks during the pandemic, and 56.8% of the residents who responded to the survey became infected with SARS-CoV-2 (COVID-19).

Authors' contributions: All the authors contributed equally to develop the protocol, its application, and drafting of final report, and corrections.

Conflicts of interest: None whatsoever.

Financing: the authors declare that they have not received any type of funding for the realization of this article.

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