

# Impact of the SARS-CoV-2 pandemic on the General Surgery residency at the General Hospital of Mexico

## Impacto de la pandemia por SARS-CoV-2 en la residencia de Cirugía General en el Hospital General de México

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### ABSTRACT

**Objective:** To demonstrate the impact of the SARS-CoV-2 pandemic on the training of General Surgery residents at the Hospital General de México, in order to implement new teaching strategies. **Material and methods:** An intentional search was performed in the institutional database of surgical procedures, identifying those performed by residents of the General Surgery service from November 2019 to February 2020, prior to the SARS-CoV-2 pandemic, and compared with the procedures performed in March and April 2020, after the beginning of the pandemic. **Results:** Group 1: 1,494 surgical procedures were found with the following distribution of surgeries performed by surgery residents: R1 = 279 (18.67%), R2 = 444 (29.71%), R3 = 531 (35.54%) and R4 = 240 (16.06%). With the following monthly average (n = 373.5): R1 = 69.75, R2 = 111, R3 = 133 and R4 = 60. Group 2: 42 surgical procedures with the following distribution: R1 = 3 (7.14%), R2 = 19 (45.23%), R3 = 14 (33.33%) and R4 = 6 (14.28). **Conclusions:** The SARS-CoV-2 pandemic decreased the number of procedures to which surgical specialty residents were exposed, potentially triggering a slowdown in practical skills or even a setback.

### RESUMEN

**Objetivo:** Demostrar el impacto de la pandemia por SARS-CoV-2 en la formación de residentes de Cirugía General del Hospital General de México, para implementar nuevas estrategias de enseñanza. **Material y métodos:** Se realizó una búsqueda intencionada en la base de datos institucional de procedimientos quirúrgicos, identificando los realizados por los médicos residentes del servicio de Cirugía General de noviembre del 2019 a febrero del 2020, previo a la pandemia por SARS-CoV-2 y se comparó con los procedimientos realizados en marzo y abril del 2020, posterior al inicio de la pandemia. **Resultados:** Grupo 1: se encontraron 1,494 procedimientos quirúrgicos con la siguiente distribución: R1 = 279 (18.67%), R2 = 444 (29.71%), R3 = 531 (35.54%) y R4 = 240 (16.06%). Con el siguiente promedio mensual (n = 373.5): R1 = 69.75, R2 = 111, R3 = 133 y R4 = 60. Grupo 2: 42 procedimientos quirúrgicos con la siguiente distribución: R1 = 3 (7.14%), R2 = 19 (45.23%), R3 = 14 (33.33%) y R4 = 6 (14.28). **Conclusiones:** La pandemia por SARS-CoV-2 disminuyó el número de procedimientos a los que se exponen los residentes de las especialidades quirúrgicas, pudiendo desencadenar en una desaceleración en las competencias prácticas o, incluso, un retroceso.

### INTRODUCTION

The COVID-19 pandemic presents challenges in the training of surgical specialty residents worldwide. The exposure to surgical procedures to which they are

subjected decreased substantially, due to the reconversion of centers with high surgical demand, such as the General Hospital of Mexico "Dr. Eduardo Liceaga", to care of patients with SARS-CoV-2 virus infection, sometimes in an exclusive way,

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partly as a result of the fact that scheduled surgical procedures were suspended to reduce the risk of hospital infection of healthy patients and mortality in carriers of the virus.<sup>1</sup> In addition, all rotations through other hospitals were suspended.

The technologies currently implemented, applied to the simulation of surgical procedures, have been replacing the surgical training that was previously performed directly on patients, largely to reduce the surgical risk of patients undergoing surgery performed by trainees. Simulation in surgery has been used worldwide as a strategy to try to mitigate the impact that the pandemic has had on the practical learning curve of residents in surgical specialties. The objective of this work is to expose the estimated impact that the COVID-19 pandemic has had on the direct exposure of general surgery residents to surgical procedures.

## MATERIAL AND METHODS

We conducted a retrospective, observational, cross-sectional, and descriptive study. An intentional search was made in the institutional surgical procedures database, which is collected ambispectively (both in retrospective and prospective ways), to identify the procedures in which the resident physicians of the General Surgery Service intervened between November 2019 and February 2020, prior to the pandemic caused by the SARS-CoV-2 virus (Group 1). A monthly average of procedures was obtained and compared with those performed in March and April 2020, the period corresponding to the hospital reconversion for pandemic care (Group 2).

It was divided into four groups taking as a parameter the year the resident was attending and the surgical procedures that were assigned to the academic year, which is usually performed in our hospital unit. Subsequently, the procedures were grouped by specialty clinic in which they were performed, which resulted in wall and soft tissue surgery (WST), hepatopancreato-biliary surgery (HPB), emergency surgery (URG), scheduled night surgery (SNS), upper digestive tract surgery (UDT) and neck

surgery (NS). The total number of residents per year is, in the first year 22, second year 21, third year 16 and in the fourth year 16.

For the comparison of the difference in number of procedures between groups, Student's t-test was used, assigning a value  $< 0.05$  as a statistically significant difference.

## RESULTS

For group 1, a total of 1,494 surgical procedures were found with the following distribution by academic grade: R1 = 279 (18.67%), R2 = 444 (29.71%), R3 = 531 (35.54%) and R4 = 240 (16.06%), with the following monthly average (n = 373.5): R1 = 69.75, R2 = 111, R3 = 133 and R4 = 60.

In group 2 there were 42 surgical procedures with the following distribution by academic grade: R1 = 3 (7.14%), R2 = 19 (45.23%), R3 = 14 (33.33%) and R4 = 6 (14.28%).

### When analyzing the number of procedures by specialty clinic, the following distributions were found.

WST for R1 there was a 100% reduction in the number of surgeries (group 1 = 12.75 vs group 2 = 0;  $p < 0.05$ ). For R2 there was a significant reduction (group 1 = 64 vs group 2 = 5;  $p < 0.05$ ), as well as for the R3 (group 1 = 13 vs group 2 = 0;  $p < 0.05$ ), and for the R4 group (group 1 = 0.3 vs group 2 = 0;  $p < 0.05$ ).

WST surgery: no procedures were performed by R1 or R2. For R3 there was a significant reduction in surgeries between groups (group 1 = 53 vs group 2 = 2;  $p < 0.05$ ). In the group analysis for R4, similarly, there was reduction in the number of surgeries (group 1 = 29 vs group 2 = 4;  $p < 0.05$ ).

URG surgery: there was a significant decrease in surgeries performed by R1 (group 1 = 54 vs group 2 = 3;  $p < 0.05$ ), likewise for R2 (group 1 = 42 vs group 2 = 14;  $p < 0.05$ ), for R3 (group 1 = 65 vs group 2 = 11;  $p < 0.05$ ) and for R4 (group 1 = 7.8 vs group 2 = 1;  $p < 0.05$ ).

SNS: in scheduled night surgery no procedures were performed by R4, there was a 100% reduction of procedures for R1 (group 1 = 3 vs group 2 = 0;  $p < 0.05$ ), for R2 (group 1 = 2.3

vs group 2 = 0;  $p < 0.05$ ) and for R3 (group 1 = 0.3 vs group 2 = 0;  $p < 0.05$ ).

UDT surgery: no procedures were found to be performed by R1, with a reduction in the number of procedures for R2 (group 1 = 0.8 vs group 2 = 0;  $p < 0.05$ ), for R3 (group 1 = 1.3 vs group 2 = 1;  $p < 0.05$ ) and for R4 (group 1 = 6.5 vs group 2 = 1;  $p < 0.05$ ).

Neck surgery: no procedures were found for R1, with a reduction in surgeries for R2 (group 1 = 1.8 vs group 2 = 0;  $p < 0.05$ ), for R3 (group 1 = 0.3 vs group 2 = 0;  $p < 0.05$ ) and for R4 (group 1 = 17 vs group 2 = 0;  $p < 0.05$ ).

## DISCUSSION

Education during the COVID-19 pandemic has changed the teaching methods at virtually all levels. Face-to-face classes have been discontinued and instead have been implemented virtually, as well as reducing the number of residents present on the service in the same shift to reduce personnel exposure.<sup>2</sup>

In recent decades, numerous factors, including social, professional, and legal factors have forced all surgical training programs to seek alternative methods of resident training. Within such hands-on learning methods in the surgical setting, simulation-based training has taken on great relevance to replace or amplify real-patient procedural experiences with artificially conceived, guided exercises that evoke or reproduce substantial aspects of the real world in an interactive and safe manner.<sup>3</sup>

Simulation, when properly integrated into learning and competency testing, plays an important role in the acquisition of the critical and reflective thinking skills necessary to provide competent and safe patient care.<sup>4</sup> Bloom first described a classification system of different learning objectives for students in 1956, consisting of three "domains": cognitive, affective, and psychomotor.<sup>5</sup> It is therefore considered that these three characteristics must be present to achieve learning and skill development using simulators.

A wide variety of simulation-based activities exist, ranging from inanimate video trainers, human anatomical model simulators until more recent virtual reality computer-based trainers. Currently, inanimate trainers are widely implemented in all surgical training programs and

serve as the main platform for laparoscopic skills training.<sup>4</sup>

Regarding the transfer of skills acquired during simulation training into an operative environment, a systematic review conducted in 2008 evaluated 10 randomized controlled trials, concluding that the skills acquired appeared to be transferable, assessing some parameters such as performance time and ability to complete the procedure. However, methodological weakness was noted since, in most studies, trainees received simulation training concurrently with real patient training and the strength of the conclusion was limited by variability in the methodology of the included studies.<sup>6</sup>

More recently, in 2014, a systematic review including 16 randomized controlled trials, with a total of 309 participants, it was found that the sham literature consistently showed benefits in terms of operative time and performance scores.<sup>7</sup> However, it was again acknowledged that more studies, with homogeneous methodology, are required before it can be concluded that simulation skills are directly transferable toward real-patient procedures.

With respect to the adjustments that have been made worldwide in hospital centers because of the COVID-19 pandemic, multiple studies have been published describing the role of the surgical service in different hospital centers. In New York, one of the cities most affected by the pandemic, the work plans of the surgical specialties were adapted to reduce the exposure of the residents, as well as to support the areas that required more personnel to face the pandemic, reserving teams of residents who could replace the previous ones in the event of contracting the disease.<sup>8</sup> On the other hand, a study described, within the action plan for continuing resident training, strategies to reduce exposure, as well as to reduce the impact of the cessation of normal activities performed by surgical residents, even using inexpensive and homemade materials.<sup>9</sup> In the same way, the teaching method was changed from a classroom model to a distance model through online platforms, which allowed academic sessions to be conducted in a non-face-to-face manner to comply with the recommendations of social distancing.<sup>10</sup>

To our knowledge, there are only studies that subjectively measure the impact of the COVID-19 pandemic; in the first of these, and one of the most important, the authors conducted surveys of residents who were doing the urology subspecialty in Italy, to assess the impact of the pandemic in terms of both academic training and the decrease in routine procedures performed prior to the pandemic, compared to the stage of reconversion for pandemic care, in which the perception of the residents was analyzed.<sup>11</sup>

In our work, this same was done but in an objective manner, having taken as a basis the procedures found in the hospital database, which are those to which a resident was routinely exposed prior to the COVID-19 pandemic.

Thus, we found that for the first academic year of the general surgery residency, the services in which the greatest number of surgical procedures were performed were WST surgery, where there was a reduction in the total number of procedures after the hospital reconversion, and URG surgery, where there was also a significant reduction in the number of surgeries performed. In the second academic year, residents in the WST and URG services were most affected, with a statistically significant reduction in the number of surgeries performed. For third year residents, this difference was greater in the WST and URG services. And finally, for fourth year residents WST, neck, UDT, and URG surgeries showed also significant lower procedure numbers given the characteristics of the surgeries performed by these services.

It is important to emphasize that this article provides an overview of the significant decrease in the number of procedures performed by general surgery residents. This was due to the specific assignment of residents in our unit to exclusive care of COVID patients. Most of these patients were not exposed to any surgical procedures during the hospital's conversion to pandemic care.

## CONCLUSION

The COVID-19 pandemic has decreased the number of procedures to which surgical residents are exposed and may lead to a slowdown or even a decline in practical skills.

It will be a challenge to apply the necessary instruments to evaluate the competencies of the residents according to their academic year, to adapt the teaching to generate specialists with all the competencies stipulated in the objectives of the academic plans.

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