



Analysis of the impact of the pandemic on surgical residency programs during the first wave in Argentina: A cross – sectional study

René M. Palacios Huatuco^{a,*}, Julián E. Liaño^a, Laura B. Moreno^b, María S. Ponce Beti^c

^a General Surgery Service, Clínica Universitaria Reina Fabiola, Universidad Católica de Córdoba, Oncativo 1248, Córdoba Capital, Argentina

^b General Surgery Service, Nuevo Hospital San Roque, Bajada Pucará 1900, Córdoba Capital, Argentina

^c General Surgery Service, Hospital Militar Regional Córdoba, Cruz Roja Argentina 1174, Córdoba Capital, Argentina

ARTICLE INFO

Keywords:

Surgical education
COVID – 19
Surgical residents
Surgical training
Latin America

ABSTRACT

Introduction: COVID – 19 emerged as a global pandemic in 2020 and affected the teaching methods at all levels. Surgical education has also been significantly affected by this pandemic, but the effect remains unknown. We developed a survey in order to obtain more information on how this pandemic affected the training and education of surgical residency programs.

Material and methods: Cross-sectional study. We surveyed 195 residents of various surgical programs, from August 20th to September 30th, 2020, in Córdoba, Argentina. The effect of the COVID – 19 pandemic was analyzed on surgical training, on the academic program, and professional burnout.

Results: The volume of surgical cases performed during the pandemic decreased dramatically, affecting mainly residents of lower years. Comparing the number of cases (>7) that residents carried out per week (Pre pandemic vs pandemic), we found that PGY – 1: 47% vs 9%; $p = 0.01$ and PGY – 2: 46% vs 8%; $p = 0.03$. 83.2% reported that the impact of the pandemic affected their surgical training negatively and 45% were not adequately trained to carry out their surgical activity in the residency program. On the other hand, 71.3% affirmed that this health emergency allowed them to dedicate more time to the development of their academic training.

Conclusion: This is the first cross – sectional survey study that shows the impact of the pandemic on surgical residences during the first wave in Argentina. Surgical training performed by residents had a negative impact.

1. Introduction

In 2020, the coronavirus disease (COVID – 19) has affected 222 countries, areas, or territories, registering more than 79.2 million cases and more than 1.7 million deaths worldwide since the beginning of the pandemic [1]. The first reported case in Argentina was on March 3rd; four days later, the first fatality was registered in the country and in Latin America [2]. On March 6th, the first case of COVID – 19 was confirmed in Córdoba, the second most populated province, out of a total of 23 provinces that make up the Argentine Republic [3]. Until December 31st, 2020, the Ministry of Health of the Province of Córdoba registered a total of 126.893 cases and 2.496 deaths from COVID – 19 [4].

The current health crisis produced by the coronavirus pandemic and defined as an unprecedented situation led us to raise doubts, controversies, and dilemmas in health care in general, and in surgery in particular, understanding that the residents are probably as vulnerable

or maybe more than all professionals [5].

In this scenario, the Association of Residents and Attendees of General Surgery of Córdoba (ARCC), which represents a non-profit civil association, founded in 1989, with the purpose of promoting scientific activity among resident doctors, prepared a survey with the aim of obtaining more information on how the COVID – 19 pandemic affected the training and education of surgical residency programs in Córdoba, Argentina.

2. Material and methods

2.1. Study population

A cross – sectional study was carried out, supported by a digital survey tool (Google Forms). The survey presented 24 compulsory multiple-choice questions and was distributed through social networks such as WhatsApp, Facebook and Instagram, from August 20th to September

* Corresponding author. Universidad Católica de Córdoba, Oncativo 1248, Córdoba, X5004FHP, Argentina.

E-mail address: manuelpalacioshuatuco@gmail.com (R.M. Palacios Huatuco).

<https://doi.org/10.1016/j.amsu.2021.01.065>

Received 13 January 2021; Received in revised form 18 January 2021; Accepted 18 January 2021

Available online 28 January 2021

2049-0801/© 2021 The Authors. Published by Elsevier Ltd on behalf of IJS Publishing Group Ltd. This is an open access article under the CC BY-NC-ND license

(<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Table 1
Distribution of surgical programs.

Surgical Residence	n (%)
Head and neck surgery	4 (2%)
Cardiovascular Surgery	2 (1%)
Coloproctological Surgery	2 (1%)
Surgery in Emergentyology	3 (1.5%)
General Surgery	56 (29%)
Pediatric Surgery	11 (6%)
Plastic surgery	7 (4%)
Thoracic Surgery	4 (2%)
Vascular surgery	2 (1%)
Neurosurgery	6 (3%)
Obstetrics and Gynecology	32 (16%)
Ophthalmology	10 (5%)
Orthopedics and Traumatology	38 (19.5%)
Otorhinolaryngology	10 (5%)
Urology	8 (4%)
Total	195 (100%)

30th, 2020. All surgical residency programs were invited to participate in Córdoba, Argentina.

Before distribution, the survey was tested for internal validation until completed and reviewed by 10 ARCCC members. Only residents of surgical programs in the region were included in the analysis. Post-residency fellows were excluded.

All respondents participated voluntarily in this study and were advised that the information provided is confidential, and will not be used to identify individual responses. The survey is available in

Appendix A1.

Ethical approval was not required as all data collected was anonymized. The study was reported according to the STROCSS criteria [6] and registered at [ClinicalTrials.gov](https://clinicaltrials.gov) (NCT 04703400) which can be found via the following link: <https://clinicaltrials.gov/show/NCT04703400>.

2.2. Study of variables

The survey asked the demographic characteristics of the residents, the type of hospital where they carried out their surgical training (public/private/Armed Forces), the adherence of the training center to the resolution of the Ministry of Health 718/2020 (extension of the graduation and promotion of the academic year of the residents until September 30th, 2020 within the health services, to attend the health and social emergency produced by COVID-19) [7], the type and the year (Considering the National Decree 718/2020) of the training program, the work modality, the number of days of attendance at their institution and surgical practices, before and during the pandemic. Residents were asked whether these changes would affect their surgical training and overall preparation for their next professional step. The effects of the pandemic were also evaluated on the well – being and burnout of residents.

2.3. Statistical analysis

We entered the collected data into Microsoft Excel with a double-entry method to avoid errors during the process and SPSS 26 software

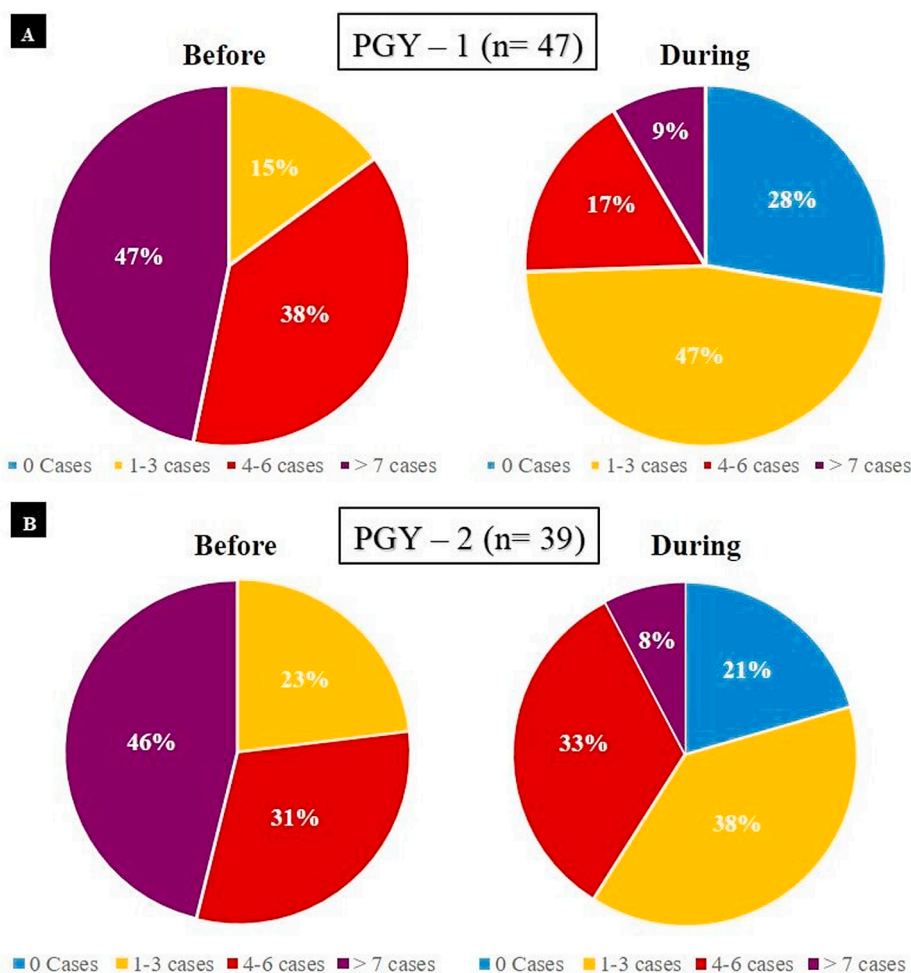


Fig. 1. Comparison of the volume of surgical cases performed pre – pandemic vs during pandemic: PGY – 1 (p = 0.01) and PGY – 2 (p = 0.03). **A:** 28% of the PGY – 1 did not perform any surgical practice. **B:** 21% of the PGY – 2 did not perform any surgical practice.

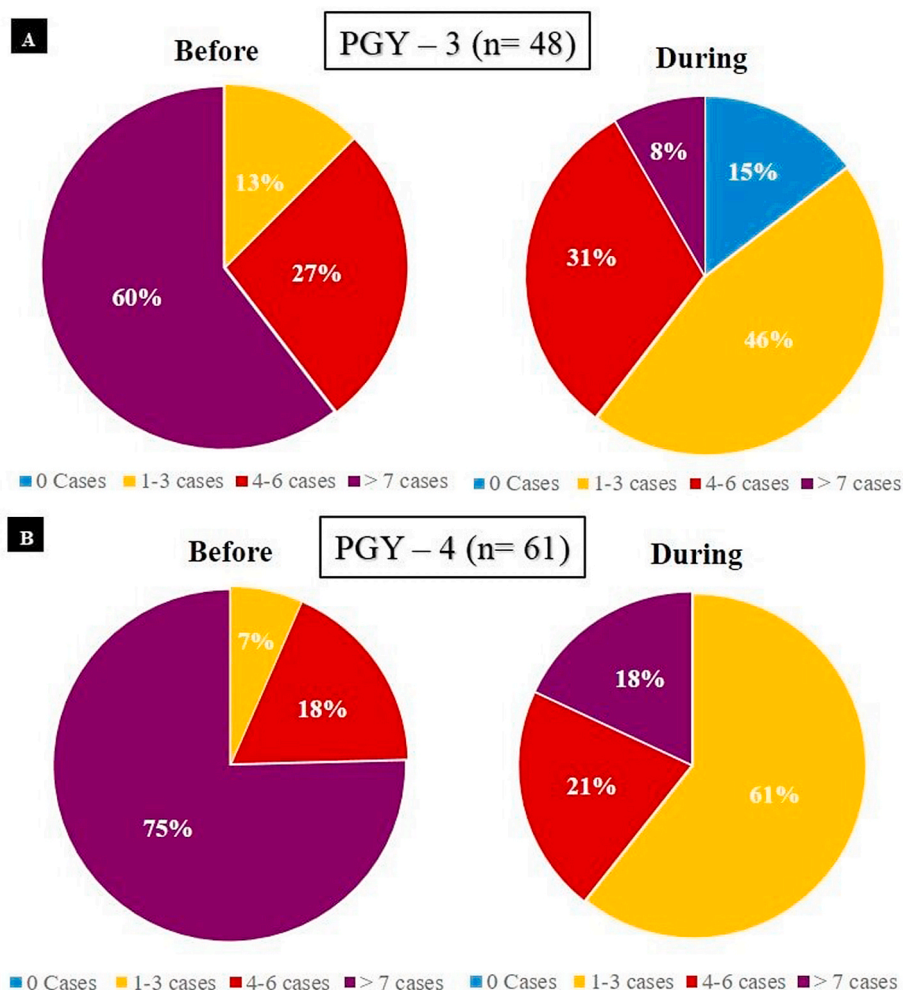


Fig. 2. Comparison of the volume of surgical cases performed pre – pandemic vs during pandemic: PGY – 3 ($p = 0.05$) and PGY – 4 ($p = 0.06$). **A:** 46% of PGY – 3 performed 1 to 3 cases during the week. **B:** 61% of the PGY – 4 carried out 1–3 cases during the week.

was used for statistical analysis. For descriptive analysis, variables were presented with frequencies, percentages, and pie charts. A Chi-square test was used to compare categorical variables. A value of $p < 0.05$ was considered significant.

3. Results

3.1. Information about residents

A total of 195 resident physicians participated in this survey. 59.4% ($n = 116$) were men and the age of 66.7% ($n = 130$) ranged between 26 and 30 years old. Most of them belonged to public hospitals (48.2%; $n = 94$) followed by private ones (44.1%; $n = 86$), while 7.7% ($n = 15$) belonged to Armed Forces hospitals. The distribution of the type of surgical residency program can be seen in Table 1.

67.7% ($n = 132$) mentioned that the hospitals where they carried out their academic and surgical training adhered to National Decree 718/2020; concerning this, 24% ($n = 47$) and 20% ($n = 39$) were first and second clinical postgraduate year (PGY – 1 and PGY – 2), respectively. On the other hand, 56% ($n = 109$) belonged to the upper years (PGY – 3 and PGY – 4). 22.5% ($n = 44$) planned to finish the residency program or seek a training scholarship later.

3.2. Analysis of surgical training and academic activity

Considering the changes in the protocols concerning operating

rooms, recommended by different national and international scientific surgical societies more recognized as the American College of Surgeons (ACS), the Society of American Gastrointestinal and Endoscopic Surgeons (SAGES) and the Argentine Society of Infectiology (SADI) [8–10], 52% ($n = 101$) did not participate in scheduled surgeries and/or emergencies of COVID-19 patients and 7.2% ($n = 14$) were not authorized to enter the operating room.

Regarding the number of surgical procedures performed by residents per week, before and during the pandemic, we found a significant decrease (Fig. 1) (see Fig. 2).

83.2% ($n = 164$) reported that the impact of the COVID-19 pandemic negatively affected their surgical training and 45% ($n = 87$) stated that they were not adequately trained to carry out their surgical activity in the residency program.

Most of the residents (55%; $n = 107$) mentioned that academic activity increased by 25–75% during the pandemic, in terms of weekly classes and athenaeums, through virtual platforms. 71.3% ($n = 139$) affirmed that this health emergency allowed them to dedicate more time to developing their academic training and 33% ($n = 64$) suggested that their training should be extended after graduation of the academic year.

3.3. Working hours and professional burnout

In the pre – COVID – 19 era, 52% ($n = 101$) attended their hospital between 4 and 6 days a week. During the pandemic, 55% ($n = 107$) stated that work teams were organized, with an alternate regime to

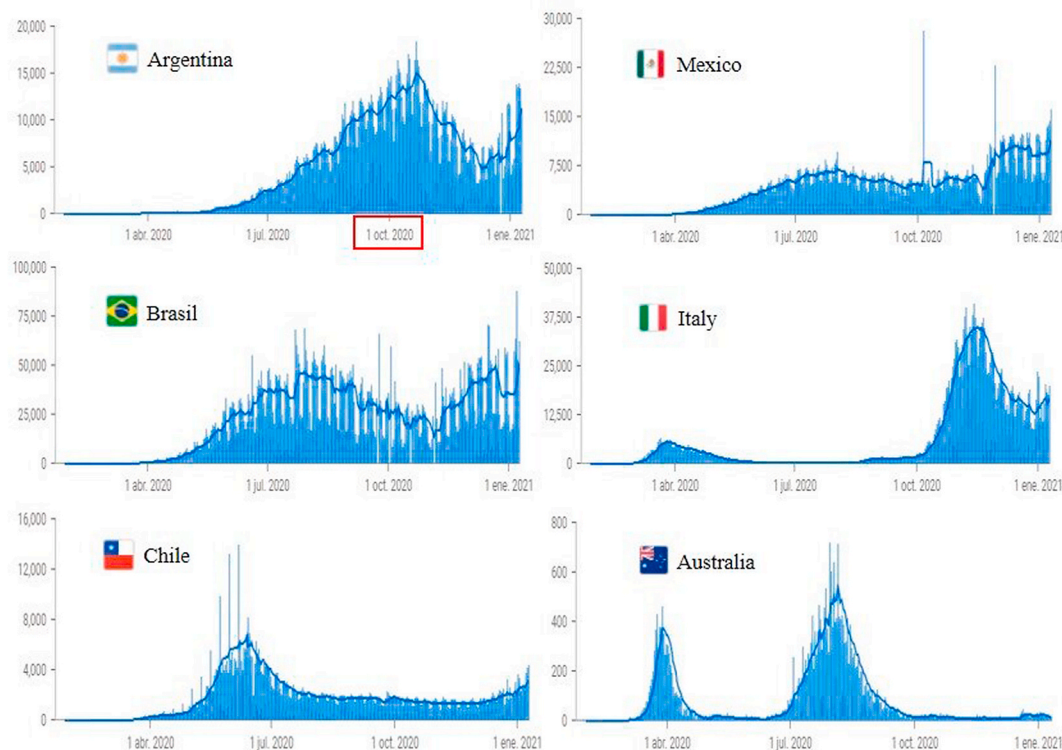


Fig. 3. Evolution of the pandemic during 2020 in Argentina and the rest of the world, demonstrating the period of the first wave (Source: Johns Hopkins University).

avoid contact between health personnel, with a subsequent period of isolation; consequently, 65% ($n = 127$) did not attend their working hours for 5 days or more per month. Despite having more free time, 52.3% ($n = 102$) reported feeling more exhausted than usual. 34% ($n = 66$) were reorganized to assist patients in areas other than their surgical program. Most of the residents (70.3%; $n = 137$) reported concern about the possible transmission of COVID – 19 to family and friends, while 39% ($n = 76$) about contracting COVID – 19 themselves. Finally, 49% ($n = 96$) increased stress at work, due to a greater number of patients, sick people, and consequently more responsibility.

4. Discussion

In Argentina, the Health Residence is a postgraduate educational system for the recently graduated doctor, which aims to complement the comprehensive training of the professional, exercising in the responsible, efficient and ethical performance of the corresponding disciplines, through the adjudication and personal supervised execution of complexity acts and progressive responsibility [11]. In this system, surgical education is intended to provide resident physicians with a base of surgical knowledge, technical competence, and clinical judgment for the management of surgical patients [12].

Understanding the concern of residents of surgical programs, the ARCC conducted this survey in order to evaluate the effects of the COVID – 19 pandemic on surgical training (volume of surgical cases performed by residents before and during the pandemic), academic program and professional burnout.

During the pandemic, different societies and government agencies around the world made recommendations for surgical procedures based on the experience of other coronavirus epidemics [13] or according to the epidemiological context in their country of origin, with little scientific evidence [8,10]. In Argentina, the basic principles of prevention and infection control, and the standard precautions recommended by the World Health Organization [9,14] were applied. In this context, teaching methods have been modified at practically all levels. Face – to –

face classes were suspended, and virtual learning was implemented instead, as well as the reduction of the number of attendant residents in the same shift to reduce the exposure of health personnel [15].

Consequently, we found that the elective surgical activity performed by the residents was drastically reduced or absent during the pandemic. Likewise, the surgical demand in the emergency room decreased and conservative treatments were chosen in several situations. Considering the National Decree 718/2020 (extension on the graduation of the residents of the last year of the educational program) and the recommendation that the evaluations of cases and surgeries should be left in the hands of the professionals with more experience, the exposure of the residents in the operating room was limited, generating a reduction in surgical experience, mainly in residents of lower years (PGY – 1 and PGY – 2). These results are similar to other studies [16–19]. However, before the current global pandemic, surgical education has had to respond with new technologies, treatments and procedures to the dynamic changes in the knowledge of surgical disease, the demand in the supervision of resident doctors, and the demands for the patient safety [20].

In our study, the impact of COVID – 19 on the educational program was positive, even though all face – to – face academic activities, external and internal rotations were suspended. 71.3% mentioned that this health emergency allowed them to dedicate more time to the development of their academic training, through scheduled virtual meetings (classes and conferences) on widely disseminated platforms. On the other hand, as the backlog of surgical procedures begins to be tackled, surgical research is unlikely to be at the forefront of healthcare system providers' minds. However, if we are to avoid a drought in scientific discovery and advancement, academic surgical authorities should encourage the restart of clinical research, perhaps via modified protocols and processes to ensure safe, efficient, and effective studies [21].

Another important discovery in this analysis was regarding the well-being and burnout of residents of surgical programs during the pandemic. The depletion rate was higher than the traditional rates reported in the literature [16,22,23]. A national survey of general surgery

residents in the United States reported a burnout rate of 33.1% [16]. However, in our study 52.1% of the survey respondents reported greater exhaustion than usual during the COVID – 19 pandemic. This suggests that burnout is not only associated with work hours, longer patient lists, sicker patients, increased responsibility, but also the stress of contracting the virus and taking it home with friends and family.

A peculiarity that occurred in the territory of the Argentine Republic was the period of social, preventive and mandatory isolation, with an approximate duration of seven months (March 20th to November 8th, 2020), being considered as “one of the longest quarantines all over the world”. Consequently, the peak of greatest contagion of this first wave occurred in October and this would explain why in Argentina the effects of the pandemic in surgical residences occurred later, compared to other Latin American countries such as Bolivia, Brazil, Chile, Colombia, Mexico, Peru (Fig. 3). On the other hand, many countries in Asia, Oceania, and Europe have already faced the phenomenon of the second wave of COVID – 19 cases.

Our study is limited by selection bias, wherein residents who have been most affected by the pandemic may not have had time to answer our survey and by the implementation of this study in a single province (Córdoba, Argentina) that was moderately affected by the COVID – 19. Policies in hospitals on permitted operations are dynamic and we have presented data for only a specific period. Future research might consider developing and evaluating contingency plans for graduate medical education in all surgical residency programs in order to maximize education when the next wave arrives.

5. Conclusion

This is the first cross – sectional survey study that shows the impact of the pandemic on surgical residences during the first wave in Argentina. The effect on training residents with surgical programs remains unknown. We can estimate that it will have long-term effects, both positive and negative, and it is important to value a more innovative approach in the training of our professionals through virtual tools and complement each other in the fields of research and academic productivity.

Funding

No source to be stated.

Informed consent

Not applicable.

Provenance and peer review

Not commissioned, externally peer-reviewed.

Declaration of competing interest

The authors declare that they have no conflict of interest.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.amsu.2021.01.065>.

References

- [1] World Health Organization Report [online], <https://www.who.int/emergencies/diseases/novel-coronavirus-2019>, 2020. (Accessed 29 December 2020).
- [2] Ministry of Health of the Nation, New coronavirus (COVID-19) daily report. Buenos Aires, 2020 [online], <https://www.argentina.gob.ar/coronavirus/informe-diario>. (Accessed 9 March 2020).
- [3] Ministry of Health of the Province of Córdoba, Daily Report. 2020 [online], <https://www.cba.gov.ar/informe-diario-de-casos-y-medidas>. (Accessed 8 March 2020).
- [4] Ministry of Health of the Province of Córdoba, Daily Report. 2020 [online], <https://www.cba.gov.ar/informe-diario-de-casos-y-medidas>. (Accessed 31 December 2020).
- [5] A. Rimmer, Covid-19: what do trainees need to know? *BMJ* 368 (2020) m1276, <https://doi.org/10.1136/bmj.m1276>.
- [6] R. Agha, A. Abdall-Razak, E. Crossley, N. Dowlut, C. Iosifidis, G. Mathew, for the STROCSS Group, The STROCSS 2019 guideline: strengthening the reporting of cohort studies in surgery, *Int. J. Surg.* 72 (2019) 156–165.
- [7] Ministry of Health of the Nation of the Argentine Republic, Promotion and Discharge of Residents - Extension: Resolution 718/2020, 2020 [online], <https://www.argentina.gob.ar/normativa/nacional/resoluci%C3%B3n-718-2020-336125/texto>. (Accessed 6 April 2020).
- [8] American College of Surgeons, Surgical Care and Coronavirus Disease 2019 (COVID-19), Issue 1, 2020 [online], <https://www.facs.org/covid-9/newsletter/032020> (Accessed: 20 March 2020).
- [9] A Colque, MI Staneloni, W Cornistein, et al., Recomendaciones Interinstitucional para prevenir COVID-19 – SADI / SATI / ADECI / INE, 2020, pp. 1–23 [online], http://www.adeci.org.ar/images/01_recomendaciones.pdf (Accessed: 22 March 2020).
- [10] Society of American Gastrointestinal and Endoscopic Surgeons, SAGES and EAES Recommendations Regarding Surgical Resident Response to COVID-19 Crisis, 2020 [online], <https://www.sages.org/recommendations-surgical-response-covid-19/>. (Accessed 30 March 2020).
- [11] Ministry of Health of the Nation of the Argentine Republic. Health residence. Resolution 323/2002, Article 1 – 12, 2002 [online], <http://servicios.infoleg.gob.ar/infolegInternet/anexos/70000-74999/74853/norma.htm> (Accessed: 31 May 2002).
- [12] M. Kogan, S.E. Klein, C.P. Hannon, M.T. Nolte, Orthopaedic education during the COVID-19 pandemic, *J. Am. Acad. Orthop. Surg.* 28 (2020) e456–e464, <https://doi.org/10.5435/JAAOS-D-20-00292>.
- [13] J.Y. Kim, J.Y. Song, Y.K. Yoon, S. Choi, Y.G. Song, S. Kim, et al., Middle East respiratory syndrome infection control and prevention, *Guideline for Healthcare Facilities* 47 (2015) 278–302, <https://doi.org/10.3947/ic.2015.47.4.278>.
- [14] World Health Organization, Operational Planning Guidance to Support Country Preparedness and Response COVID-19. Strategic Preparedness and Response, 2020 [online], <https://www.who.int/publications/i/item/draft-operational-planning-guidance-for-un-country-teams>. (Accessed 22 May 2020).
- [15] T.M. Coe, K.M. Jogerst, N.M. Sell, D.J. Cassidy, C. Eurboonyanun, D. Gee, et al., Practical techniques to adapt surgical resident education to the COVID-19 era, *Ann. Surg.* 272 (2020) e139–e141, <https://doi.org/10.1097/SLA.0000000000003993>.
- [16] H. Aziz, T. James, D. Remulla, L. Sher, Y. Genyk, M.E. Sullivan, M.R. Sheikh, Effect of COVID-19 on surgical training across the United States: a national survey of general surgery residents, *J. Surg. Educ.* 30 (2020) S1931–S7204, <https://doi.org/10.1016/j.jsurg.2020.07.037>.
- [17] P.E. Pelargos, A. Chakraborty, Y.D. Zhao, Z.A. Smith, I.F. Dunn, A.M. Bauer, An evaluation of neurosurgical resident education and sentiment during the coronavirus disease 2019 pandemic: a north American survey, *World Neurosurg* 140 (2020) e381–e386, <https://doi.org/10.1016/j.wneu.2020.05.263>.
- [18] A.K. Kapila, M. Schettino, Y. Farid, S. Ortiz, M. Hamdi, The impact of coronavirus disease 2019 on plastic surgery training: the resident perspective, *Plast Reconstr Surg Glob Open* 8 (2020), e3054, <https://doi.org/10.1097/GOX.0000000000003054>.
- [19] M.E. Huamanchumo-Suyon, D. Urrunaga-Pastor, P.J. Ruiz-Perez, P.K. Rodrigo-Gallardo, C.J. Toro-Huamanchumo, Impact of the COVID-19 pandemic on general surgery residency program in Peru: a cross-sectional study, *Ann Med Surg* 60 (2020) 130–134, <https://doi.org/10.1016/j.amsu.2020.10.031>.
- [20] O. Daodu, N. Panda, S. Lopushinsky, T.K. Varghese Jr., M. Brindle, COVID-19 - considerations and implications for surgical learners, *Ann. Surg.* 272 (2020) e22–e23, <https://doi.org/10.1097/SLA.0000000000003927>.
- [21] C. Sohrabi, G. Mathew, T. Franchi, A. Kerwan, M. Griffin, J. Soleil C Del Mundo, et al., Impact of the coronavirus (COVID-19) pandemic on scientific research and implications for clinical academic training - a review, *Int. J. Surg.* (21) (2021 Jan 11) S1743–S9191, <https://doi.org/10.1016/j.ijsu.2020.12.008>.
- [22] D.B. Hewitt, R.J. Ellis, J.W. Chung, E.O. Cheung, J.T. Moskowitz, R. Huang, et al., Association of surgical resident wellness with medical errors and patient outcomes, *Ann. Surg.* (2020 Apr 8), <https://doi.org/10.1097/SLA.0000000000003909>.
- [23] K.Y. Bilimoria, J.W. Chung, L.V. Hedges, A.R. Dahlke, R. Love, M.E. Cohen, et al., National cluster-randomized trial of duty-hour flexibility in surgical training, *N. Engl. J. Med.* 374 (2016) 713–727, <https://doi.org/10.1056/NEJM>.