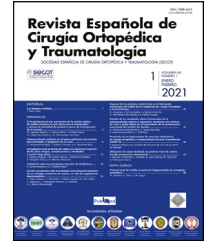




Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Elsevier hereby grants permission to make all its COVID-19-related research that is available on the COVID-19 resource centre - including this research content - immediately available in PubMed Central and other publicly funded repositories, such as the WHO COVID database with rights for unrestricted research re-use and analyses in any form or by any means with acknowledgement of the original source. These permissions are granted for free by Elsevier for as long as the COVID-19 resource centre remains active.



ORIGINAL PAPER

[Translated article] Has 2020 been a lost year in orthopaedic surgery and trauma training? Residents' perceptions

M. Vázquez Gómez*, M. Galipienso Eri, A. Hernández Martínez

Hospital Universitario Dr. Josep Trueta, Gerona, Spain

Received 21 April 2021; accepted 13 June 2021

Available online 14 July 2022

KEYWORDS

COVID-19;
Residents;
Traumatology;
Training

Abstract

Objective: The COVID-19 pandemic has affected specialised healthcare training at all levels. Surgical learning has been severely affected, and the impact on orthopaedic surgery residency training has so far not been assessed.

Material and methods: An online survey of 17 questions was sent via web link to orthopaedic surgery residents throughout Spain between February 10, 2021 and February 28, 2021. The effects of the COVID-19 pandemic on the care and training activities of residents were analysed. **Results:** A total of 307 orthopaedic surgery residents from all over Spain responded to the online survey. A total of 77.2% of the respondents had to suspend their rotations. Of these, 67.5% would like to resume the rotations they missed during the pandemic. A total of 69.7% of scheduled surgeries were suspended. Surgical activity was completely stopped for an average of 8 weeks. 66.8% of the residents consider that their surgical training has been affected and this will have repercussions on their future work. 49.5% considered the online training offered to be insufficient. Of the total number of respondents, 52.1% considered that the impact of the pandemic situation on their training situation was bad or very bad.

Conclusions: The data collection shows a negative impact on both theoretical and clinical training. This study highlights the need to continue offering quality training by maximising learning opportunities.

© 2021 SECOT. Published by Elsevier España, S.L.U. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

DOI of original article: <https://doi.org/10.1016/j.recot.2021.06.003>

* Corresponding author.

E-mail address: miguelvazquezgo@gmail.com (M. Vázquez Gómez).

<https://doi.org/10.1016/j.recot.2022.07.010>

1888-4415/© 2021 SECOT. Published by Elsevier España, S.L.U. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

PALABRAS CLAVE
COVID-19;
Residentes;
Traumatología;
Formación

¿Ha sido el 2020 un año perdido en la formación de cirugía ortopédica y traumatología? Percepción de los residentes

Resumen

Objetivo: La pandemia de la COVID-19 ha afectado a la formación sanitaria especializada a todos los niveles. El aprendizaje en el ámbito quirúrgico se ha visto gravemente afectado y hasta ahora no se ha valorado el impacto en la formación de residentes de traumatología.

Material y métodos: Se hizo llegar mediante un enlace web y redes sociales una encuesta en línea de 17 preguntas a los residentes de cirugía ortopédica y traumatología de todo el territorio español entre el 10 de febrero y el 28 de febrero de 2021. Se analizaron los efectos de la pandemia de la COVID-19 en la actividad asistencial y formativa de los residentes.

Resultados: Un total de 307 residentes de cirugía ortopédica y traumatología de toda España respondieron la encuesta. El 77,2% de los encuestados tuvo que suspender sus rotaciones. De estos, al 67,5% le gustaría retomar las rotaciones perdidas durante la pandemia. Un 69,7% de las cirugías programadas fueron suspendidas. La actividad quirúrgica estuvo completamente parada una media de 8 semanas. El 66,8% de los residentes considera que se ha visto afectada su formación quirúrgica y que esto repercutirá en su futuro laboral. El 49,5% considera insuficiente la oferta formativa en línea. Del total de los encuestados, el 52,1% considera que el impacto de la situación de pandemia respecto a su situación formativa ha sido malo o muy malo.

Conclusiones: La recogida de datos muestra un impacto negativo sobre la formación asistencial y teórica. Este estudio pone de manifiesto la necesidad de continuar ofreciendo una formación de calidad y maximizar las oportunidades de aprendizaje.

© 2021 SECOT. Publicado por Elsevier España, S.L.U. Este es un artículo Open Access bajo la licencia CC BY-NC-ND (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Introduction

The COVID-19 pandemic has posed the greatest threat ever faced by the Spanish healthcare system. On 14 March 2020, a state of alarm was declared in Spain, a fact that anticipated the subsequent restrictive measures, including the house confinement of the entire population. An extraordinary plan was adopted to minimise the spread of the infection and optimise health resources.

The restructuring of the healthcare system, together with the reduction of emergency activity, the suspension of non-essential outpatient consultations and scheduled surgery, has had a significant impact on medical and surgical practice in Spain. These measures, in addition to the reorganisation of surgical residents in other areas of the hospital due to the lack of healthcare personnel, have posed an unprecedented challenge to the training programmes of orthopaedic surgery and traumatology residents.¹

Restrictions imposed on academic meetings, teaching and in-service sessions as a strategy to minimise contagion have also forced training centres to resort to online platforms to continue and preserve resident education.² This has led to a proliferation of webinars and virtual scientific meetings.

It is essential to assess the impact of the pandemic on residency training programmes and to ensure the implementation of alternative strategies to cope with this situation. This study aims to provide an overview of the impact of the COVID-19 pandemic on the training of traumatology and orthopaedic surgery residents in Spain.

Methods

Study design

A cross-sectional study was conducted using an online survey distributed to trauma residents from 10th February to 28th February 2021.

Study population

The survey was sent via social networks (Whatsapp, Facebook, Twitter, and Instagram) as well as by e-mail to orthopaedic surgery and traumatology residents in Spain. To facilitate its dissemination, the survey was shared via a freely accessible link on the social networks of the authors of the study. It was also distributed through the Whatsapp groups of residents according to their year of training. Results were collected from 16 autonomous communities, with the exception of Cantabria.

Procedures

A questionnaire was developed to collect the opinion of residents on the impact of COVID-19 in the orthopaedic surgery and traumatology training programme. The correct understanding of the survey was validated by a group discussion with 2 residents and a department head: the 3 signatories of the study (MV, MG, and AH). A pilot test was carried out with a small group of trauma residents, modifying the questions based on the feedback received.

The final questionnaire was shared via the Google Forms tool (Google Form, Mountain View, CA, USA) through a web link via social media, messaging platforms and email to trauma residents.

The survey consisted of 17 single-response questions (Appendix in supplementary material). The questions included in the form were subdivided into the following groups:

- General demographic data.
 - Curriculum changes.
 - Care activity during the pandemic.
 - Online training.
 - Perspective on the impact of the pandemic.
- Data collection via the form was conducted from 10 February to 28 February 2021.

To increase response rates, follow-up messages were sent via social media and email in the first week after the initial consultation and 3 days before the form closed. It was limited to a single response per participant and IP (a unique number that identifies a device or computer on the internet).

Completion of the survey was completely voluntary and the anonymity of the resident was guaranteed, as no personal identification was required.

Results

Demographic data

A total of 307 orthopaedic surgery and traumatology residents from all over Spain responded to the survey. It is estimated that there are currently approximately 1215 active residents (according to the number of specialised health training places offered by the Ministry of Health), which represents a response rate of 25.26%.

The data collected include residents from all the autonomous communities in Spain, except Cantabria. In terms of stratification by years of training, there was a predominance of responses from residents at intermediate levels of training (R2 and R3).

The distribution of responses by Autonomous Community and years of residence is shown in Fig. 1.

Changes in the curricular programme

Of the residents surveyed, 77.2% ($n = 237$) stated that they had undergone changes in their curricular programme. Of these, 70.8% ($n = 168$) had to suspend their rotations to adapt them to the needs of the service, while the remaining 29.2% were relocated to other services according to the needs of each centre. Only 22.8% ($n = 70$) claimed to have completed their rotations according to the established schedule.

Once normality was restored, 9.1% ($n = 28$) recovered lost rotations, 57% ($n = 175$) did not recover them and do not plan to do so and 12.7% ($n = 39$) did not recover them but do plan to do so.

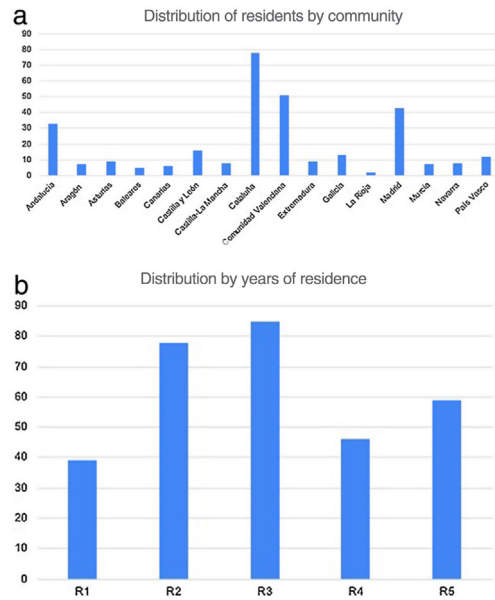


Figure 1 (a) Distribution of residents by community. (b) Distribution by years of residence.

Care activity

According to 69.7% ($n = 214$) of the residents surveyed, more than 60% of scheduled surgery was cancelled during the pandemic period. 26.7% ($n = 82$) refer that 30–60% of surgical activity was cancelled and 2.6% ($n = 8$) state that it was less than 30%.

The time (measured in weeks) during which scheduled surgery was completely stopped was around 10 weeks for 47.6% ($n = 146$).

Regarding telematic consultations, we asked what percentage of face-to-face consultations were telematic. More than 60% of consultations were telematic for 21.5% ($n = 66$), between 30% and 60% for 36.5% ($n = 112$) and less than 30% for 38.8% ($n = 119$). 3.3% ($n = 10$) stated that they had not consulted telematically.

Regarding the impact on the training of the residents with the change from face-to-face to telematic consultations, 65.8% ($n = 202$) stated that it had a negative impact on their training, while 34.2% ($n = 105$) considered that it did not have a negative impact on their training (Fig. 2).

With regard to the performance of on-call duty, 83.4% ($n = 256$) did not reduce the number of trauma duty shifts during the pandemic, while 16.5% ($n = 51$) claim to have reduced it.

During these visits, 73% ($n = 224$) noted a decrease in usual activity, 16% ($n = 49$) noted a partial decrease and 11.1% ($n = 34$) stated that they did not notice a decrease.

Considering that proximal femur fractures are the most frequent fracture in the ED, 35.8% ($n = 110$) think that they were reduced by less than 30%, 23.8% ($n = 73$) by 30–60% and 4.6% ($n = 14$) by more than 60%. Of all respondents, 35.8% ($n = 110$) state that the incidence of proximal femur fractures has not been reduced compared to the pre-pandemic era.

Regarding the service’s schedule of clinical sessions, 44% ($n = 135$) state that they were converted to telematics and

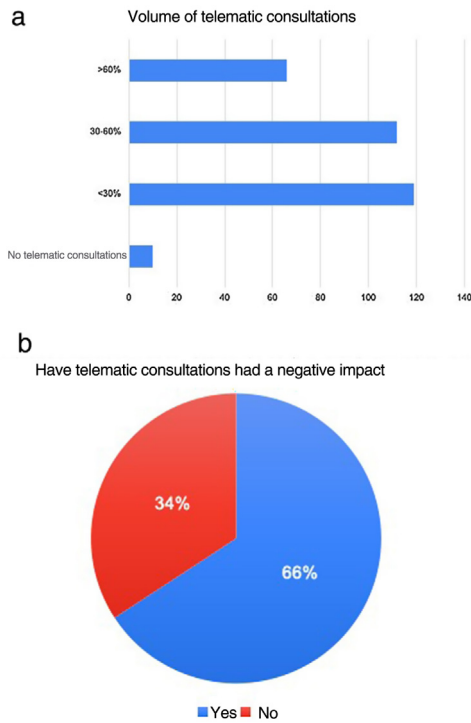


Figure 2 (a) Volume of telematic consultations. (b) Have telematic consultations had a negative impact?

13% ($n=40$) state that they were unchanged. Clinical sessions were discontinued altogether for 43% ($n=132$) of the residents who responded to the survey.

New learning strategies: online training

Online training in its new formats (virtual congresses and webinars or webinars) has been a good way of learning in surgical residents for 13.7% ($n=42$) and partially good for 49.5% ($n=152$). Of the total respondents, 36.8% ($n=113$) consider it is not a good learning pathway.

49.5% ($n=152$) consider the online provision that has attempted to make up for the lack of face-to-face courses to be insufficient and 18.6% ($n=57$) do consider it sufficient or partially sufficient 31.9% ($n=98$).

Subjective perspective on the impact of the COVID-19 on training programmes

The perceived impact of the pandemic was rated by participants as good by 1% ($n=3$), fair by 10.7% ($n=33$), bad by 52.1% ($n=160$) and very bad (one year lost) for 36.2% ($n=111$).

As a strategy to compensate for the negative impact of the pandemic, 48.2% ($n=148$) of the participants agreed with the extension of residence for the months affected by the pandemic (Fig. 3).

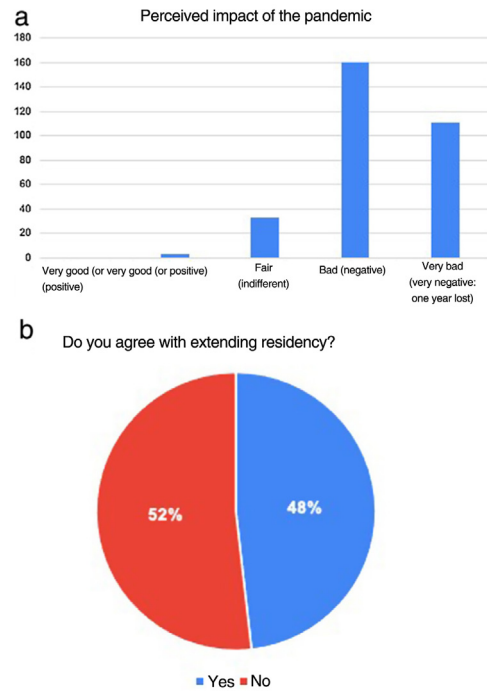


Figure 3 (a) Perceived impact of the pandemic. (b) Do you agree with extending residency?

Discussion

Our study shows that 3 out of 4 orthopaedic surgery and traumatology residents in our country have had their training programme significantly affected.

The COVID-19 pandemic has threatened the training programmes of residents in the different branches of medicine.^{3,4} Specialties such as internal medicine, pneumology or anaesthesia have managed to readapt their curricula to this new situation: critical patient management, airway control and ventilatory support, haemodynamic support options, infection prevention and control measures, etc.

On the other hand, surgical specialties such as ophthalmology, traumatology and general surgery have been greatly affected by reducing their care activity to the bare essentials.⁵⁻⁷

Telemedicine

As the results of our survey show, 96.8% of scheduled consultations have become telemedicine, which has had an impact on the training of 65.8% of residents. The pandemic has resulted in telemedicine becoming the safest form of outpatient clinical care in many hospitals.

Although it is a cost-effective tool, the experience of active clinical learning during telemedicine visits is undermined by the lack of an adequate physical examination.⁸ Nevertheless, "telemedicine" is a new skill that should be incorporated into current teaching programmes because of its proven advantages in chronic patient follow-up, in the postoperative period of hip or knee arthroplasty patients⁹ or in rehabilitation visits.¹⁰

Surgical skills

Surgical skills are among the most valuable competencies for trainee trauma surgeons. During the pandemic, surgical practice was substantially limited with the reduction of scheduled surgery. As stated by 69.7% of the residents surveyed, more than 60% of elective procedures were cancelled.

The cancellation of scheduled surgical procedures has not only hindered the surgical skills of residents but will also impact on their future employment, according to 66.8% of respondents.

A reality that highlights the need to promote technological innovation and to allocate time and resources to generate easily accessible tools that favour the training of future traumatologists.

In order to reinforce technical skills and manual dexterity, surgical simulation in virtual environments has proven to be a plausible option for training in traumatology and orthopaedics.^{11,12} A tool that should be complementary to traditional teaching methods.

E-learning

As a result of the COVID-19 pandemic, the learning curve in traumatology has undergone significant changes with respect to the programme established by the ministry. For most specialties, this situation has highlighted the need to transfer traditional forms of learning and knowledge dissemination to a virtual environment.^{13,14}

Online surgical training through live or recorded courses and seminars has proven to be effective but insufficient. This is a reality expressed by 81.4% of the residents surveyed, who felt that they had an insufficient or partially insufficient offer.

It is an established fact that online training is unlikely to replace the technical knowledge acquired in the operating theatre.¹⁵ It is therefore essential to look for training alternatives that enrich classroom teaching without reducing the quality of surgical teaching of the MIRs.

In the same way, in order to perpetuate and promote scientific research, traditional trauma congresses have been reinvented. Scientific dissemination via streaming platforms has been a far-reaching alternative. An option that, although it reduces the costs of a face-to-face conference, is not comparable to the human and working relationship of a face-to-face nature. presencial.¹⁶

Conclusion

This is the first cross-sectional study to provide relevant information on the impact of the COVID-19 pandemic on the training programmes of orthopaedic surgery and traumatology residents in Spain.

We have lived through a health crisis which, without overlooking the lives lost and having dealt with a disease that changed our lives, has posed a challenge to resident curricula when it comes to providing effective teaching strategies.

The results of the study show a negative impact on training, which highlights the need to continue to provide quality training that maximises learning opportunities.

Restructuring the current training plans with the inclusion of surgical simulation activities, fostering digital skills, implementing regulated webinars and considering the extension of the residency programme in selected cases should be taken into account to ensure quality training.

Limitations

This study has some limitations: (1) The response rate is low, the survey was shared through word of mouth, social networks and email, entrusting its dissemination to the authors of the study and its participants. (2) Participation was voluntary and open access. This means that there were no responses from specialists in training in Cantabria, nor could it be guaranteed that the responses obtained were exclusive to traumatology residents. (3) Finally, the denominator of the people who received the survey is uncertain, given the method of distribution.

Level of evidence

Level of evidence III.

Ethical responsibilities

Protection of humans and animals. The authors declare that no experiments on humans or animals have been performed for this research.

Conflict of interests

The authors have no conflict of interest to declare. Supplementary data

Supplementary data associated with this article can be found, in the online version, at [doi:10.1016/j.recot.2022.07.010](https://doi.org/10.1016/j.recot.2022.07.010).

References

1. Barik S, Paul S, Kandwal P. Insight into the changing patterns in clinical and academic activities of the orthopedic residents during COVID-19 pandemic: a cross-sectional survey. *Knee Surg Sports Traumatol Arthrosc.* 2020;28:3087–93, <http://dx.doi.org/10.1007/s00167-020-06274-0>.
2. Kogan M, Klein SE, Hannon CP, Nolte MT. Orthopaedic education during the COVID-19 pandemic. *J Am Acad Orthop Surg.* 2020;28:e456–64, <http://dx.doi.org/10.5435/JAAOS-D-20-00292>.
3. Rakowsky S, Flashner BM, Doolin J, Reese Z, Shpilsky J, Yang S. Five questions for residency leadership in the time of COVID-19: reflections of chief medical residents from an internal medicine program. *J Assoc Am Med Coll.* 2020;95:1152–4, <http://dx.doi.org/10.1097/ACM.00000000000003419>.
4. Wax RS, Christian MD. Practical recommendations for critical care and anesthesiology teams caring for novel coronavirus (2019-nCoV) patients [Directives concrètes à l'intention des équipes de soins intensifs et d'anesthésiologie prenant soin de patients atteints du coronavirus 2019-nCoV]. *Can J Anaesth.* 2020;67:568–76, <http://dx.doi.org/10.1007/s12630-020-01591-x>.
5. Bernardi L, Germani P, del Zotto G, Scotton G, de Manzini N. Impact of COVID-19 pandemic on general surgery training

- program: an Italian experience. *Am J Surg.* 2020;220:1361–3, <http://dx.doi.org/10.1016/j.amjsurg.2020.06.010>.
6. Silva N, Laiginhas R, Meireles A, Barbosa Breda J. Impact of the COVID-19 pandemic on ophthalmology residency training in Portugal. *Acta Med Port.* 2020;33:640–8, <http://dx.doi.org/10.20344/amp.14341>.
 7. Chang DG, Park JB, Baek GH, Kim HJ, Bosco A, Hey H, et al. The impact of COVID-19 pandemic on orthopaedic resident education: a nationwide survey study in South Korea. *Int Orthop.* 2020;44:2203–10, <http://dx.doi.org/10.1007/s00264-020-04714-7>.
 8. Tanaka MJ, Oh LS, Martin SD, Berkson EM. Telemedicine in the era of COVID-19: the virtual orthopaedic examination. *J Bone Joint Surg.* 2020;102:e57, <http://dx.doi.org/10.2106/JBJS.20.00609>.
 9. Zamora Navas P, Montañez Heredia E, Nieto Orellana J, González García C, Cano Obando L, Cárdenas Rebollo L, et al. Result of the implementation of telematic consultations in orthopaedic surgery and traumatology during COVID-19 laparoscopic surgery. Resultado de la implantación de consultas telemáticas en cirugía ortopédica y traumatología durante la pandemia COVID-19. *Rev Esp Cir Ortop Traumatol.* 2021;65:54–62, <http://dx.doi.org/10.1016/j.recot.2020.06.012>.
 10. Pastora-Bernal JM, Martín-Valero R, Barón-López FJ, Estebanez-Pérez MJ. Evidence of benefit of telerehabilitation after orthopedic surgery: a systematic review. *J Med Internet Res.* 2017;19:e142, <http://dx.doi.org/10.2196/jmir.6836>.
 11. Clarke E. Virtual reality simulation-the future of orthopaedic training? A systematic review and narrative analysis. *Adv Simul.* 2021;6:2, <http://dx.doi.org/10.1186/s41077-020-00153-x>.
 12. Logishetty K, Rudran B, Cobb JP. Virtual reality training improves trainee performance in total hip arthroplasty: a randomized controlled trial. *Bone Joint J.* 2019;101-B:1585–92, <http://dx.doi.org/10.1302/0301-620X.101B12.BJJ-2019-0643.R1>.
 13. Chick RC, Clifton GT, Peace KM, Propper BW, Hale DF, Alseidi AA. Using technology to maintain the education of residents during the COVID-19 pandemic. *J Surg Educ.* 2020;77:729–32, <http://dx.doi.org/10.1016/j.jsurg.2020.03.018>.
 14. Claps F, Amparore D, Esperto F, Cacciamani G, Fiori C, Minervini A, et al., European Society of Residents in Urology (ESRU). Smart learning for urology residents during the COVID-19 pandemic and beyond: insights from a nationwide survey in Italy. *Minerva Urol Nephrol.* 2020;72:647–9, <http://dx.doi.org/10.23736/S0393-2249.20.03921-1>.
 15. Ahmet A, Gamze K, Rustem M, Sezen KA. Is video-based education an effective method in surgical education? A systematic review. *J Surg Educ.* 2018;75:1150–8, <http://dx.doi.org/10.1016/j.jsurg.2018.01.014>.
 16. Figueroa F, Figueroa D, Calvo-Mena R, Narváez F, Medina N, Prieto J. Orthopedic surgery residents' perception of online education in their programs during the COVID-19 pandemic: should it be maintained after the crisis? *Acta Orthop.* 2020;91:543–6, <http://dx.doi.org/10.1080/17453674.2020.1776461>.