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Impact of COVID-19 pandemic on plastic surgery training in Europe

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Received 5 May 2021; accepted 14 November 2021

KEYWORDS

COVID-19;
Plastic surgery;
Training;
Coronavirus;
Pandemic

Summary *Background:* The COVID-19 pandemic has disrupted the functioning of global society and healthcare systems, including surgical departments. We aimed to assess alterations in plastic surgery training in Europe during the COVID-19 pandemic.

Methods: A 34-question survey was emailed in January and February 2021 to 54 National Associations of Plastic, Reconstructive, and Aesthetic Surgeons throughout European countries. The questions concerned the general profile of plastic surgery trainees, plastic surgery department, and training organization during the COVID-19 pandemic and its influence on respondents' health. The acquisition of responses was finalized at the end of February 2021.

Results: All 71 of the respondents reported alterations in planned courses, workshops, and conferences. Organizational changes included team rotation 62%, followed by redeployment to another department 45.1%. Reduction in admissions to the plastic surgery departments was more significant during the 1stst wave than the 2nd wave of COVID-19 pandemics. During the interim period, admission restrictions were proportional to the infection number. The most frequently reported surgical procedures performed were skin cancer surgeries, trauma, and burns (79%, 77%, and 77%). The majority, 62% of the respondents, noticed the negative impact of pandemics on training; 53.5% think their manual skills and clinical knowledge may deteriorate because of the pandemic. Respondents noticed that their mental (50.7%) and physical (32%) health worsened, along with feeling more stressed in general (57%).

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Conclusion: The COVID-19 pandemic limited plastic surgery departments' activities and implementation of the plastic surgery training program in all European countries involved in our study.

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Introduction

The COVID-19 pandemic has disrupted the functioning of global society and healthcare systems. The continuing dilemmas have changed the surgical activities in many countries, including reshaping the work organization in surgical departments, redeployment, change in number and types of procedures performed, restricted access to operating theaters, and changes in treatment protocols.^{1–5}

The ongoing COVID-19-related epidemiological situation has affected the organization and implementation of plastic surgery training worldwide.^{6–11} The residents had to postpone exams and fellowships, partial transfer of education to online platforms, a noticeable loss of time of training, and expected prolongation of overall training.^{6–10} Besides, this complicated situation also affects their mental health and personal life. Increased anxiety levels seem to result from the risk of infection, concerns regarding the loss of operational experience, and uncertainty about the future of their residency.¹² To date, many studies have been published on plastic surgery residents' training during the COVID-19 pandemic.^{6–10,12–14} They all show a wide variety of problems within an examined country, but none of them is related to the situation in Europe as a whole. As epidemiological situation varies between the countries, it is essential to understand the concerns of training systems in the European continent's conditions. Therefore, we decided to survey plastic surgery training and the well-being of plastic surgery residents during the pandemic. This article aims to identify issues, check whether they are consistent with the literature, and propose solutions to improve the training of plastic surgery residents and the plastic surgery departments' organization.^{2,5,6,10} **Methods**

A 34-question "Plastic Surgery Training during COVID-19 Pandemic Survey" was designed using Google Forms (Appendix 1 - AS1). It was emailed with an online link to 54 National Associations of Plastic, Reconstructive, and Aesthetic Surgeons, throughout European countries, and directly emailed to Hospital Plastic Surgery Departments in the biggest cities in each European country. Emails were sent in January 2021 via a dedicated account: plastic.surgery.covid@gmail.com. Including two "friendly reminders", overall, 713 emails were sent. At the end of February 2021, the acquisition of responses was finished. The survey covered four major groups [AS1] of questions addressing: general profile of plastic surgery trainee respondent, plastic surgery department organization during the COVID-19 pandemic, plastic surgery training during a pandemic, and pandemics' influence on respondents' physical and mental health. The survey consisted of 33 closed-ended questions and one open-ended question. Twenty-six questions had a single response possible, and seven questions

Year of plastic surgery training (%)

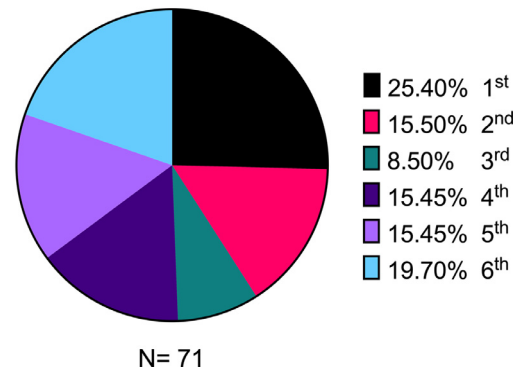


Figure 1 Graph represents the distribution of respondents in context of year of training.

had multiple answers possible. The following timeframes were taken on the first wave - 23.01.2020 to 31.05.2020, the interim period - 01.06.2020 to 30.09.2020, and the second wave - 01.10.2020 to 28.02.2021.^{15,16} The visualization was prepared in GraphPad PRISM 9.1, (CA, USA) and Datawrapper (Berlin, Germany). Data on COVID-19 cases number were acquired and retrieved from <https://ourworldindata.org/coronavirus>.¹⁶ Fisher's exact test and R-Spearman correlation were used to analyze the data (GraphPad PRISM 9.1, CA, USA).

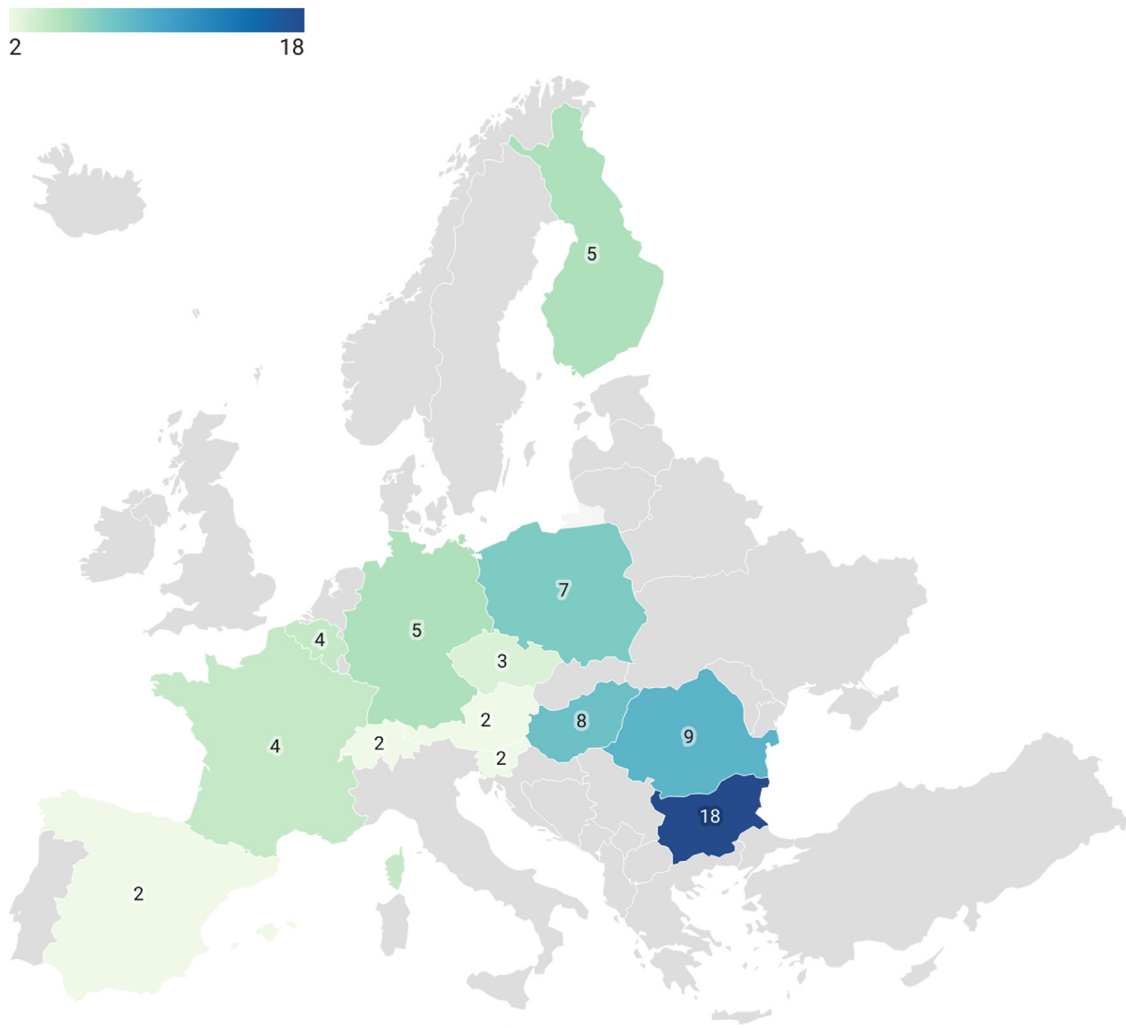
Results

The general profile of respondents

A total of 71 survey responses were collected and included in the analysis. The respondents consisted of 45/71 (63.4%) male and 26/71 (36.6%) female plastic surgery trainees. For the majority of respondents 67/71 (94.4%), plastic surgery was the first specialty. A total of 52.1% of respondents (57/71) were in the 25–30 years range during the survey, followed by 38% (27/71) in the 30–35 years range. In that order, 5.6% (4/71) and 4.2% (3/71) of respondents declared 35–40 and 40–45 years range. Additionally, 49.3% of respondents were within the 1st–3rd year of residency (25.4%, 15.5%, and 8.5%, respectively), followed by 15.5% of participants in the 4th and 5th year. Finally, 19.7% of participants were finishing their training (14/71) (Figure 1)

The survey was completed by representatives of 13 European countries, for details see Figure 2.

Survey respondents' representations on Europe map



Map: WP • Created with Datawrapper

Figure 2 Survey respondents' representations on Europe map.

Plastic surgery department organization during the COVID-19 pandemic

The level of the decrease in admission during the first wave, the interim period, and the second wave was questioned with a gradual scale of 20% decrement versus pre-pandemic admission rates (Figure 3 and 4).

Admissions were entirely suspended during the first and second waves (12/71 and 7/71). Significant limitations of admissions (<20%, 20-40%, and 40-60%) remained comparable during both waves of COVID-19 pandemic and composed 63.4% of responses. During the second wave, five respondents (5/71) from Finland (4/5) and Germany (1/5) reported unaffected level admissions (Figure 4B). The interim period was reported with increased resume to pre-pandemic admission levels (33.8%, 24/71); however, 26/71 (36.62%) of residents reported major limitations of admissions, especially in the Czech Republic, Romania, and Spain (Figure 4B). They were followed by an increased number

of total cases of the COVID-19/million citizens versus other countries (Figure 4A).

Total COVID-19 cases/million were correlated with reported reduction of admission in respondents' countries in each of three phases of COVID-19 pandemic (first wave, the interim period, and second wave). Admissions' limitation in both waves revealed insignificant correlation with total cases/million citizens ($r=0,053$, $p=0,66$ and $r=0,159$, $p=0,19$). However, during the interim period, the admissions' rates limitation correlated positively with total cases/million ($r=0,318$, $p=0,007$).

The three most frequently reported surgical procedures performed during the first and second wave were skin cancer surgeries, trauma, and burns (79%, 77%, and 77%) (Figure 5). 23/71 (32.4%) answers contained only these procedures. In three cases, either trauma or skin cancers or burns were the only performed procedures. Thirty-eight respondents mentioned conducting emergency reconstructions (54%) and 25 (35%) included hand surgeries. The

Admissions' rates versus prepandemic period

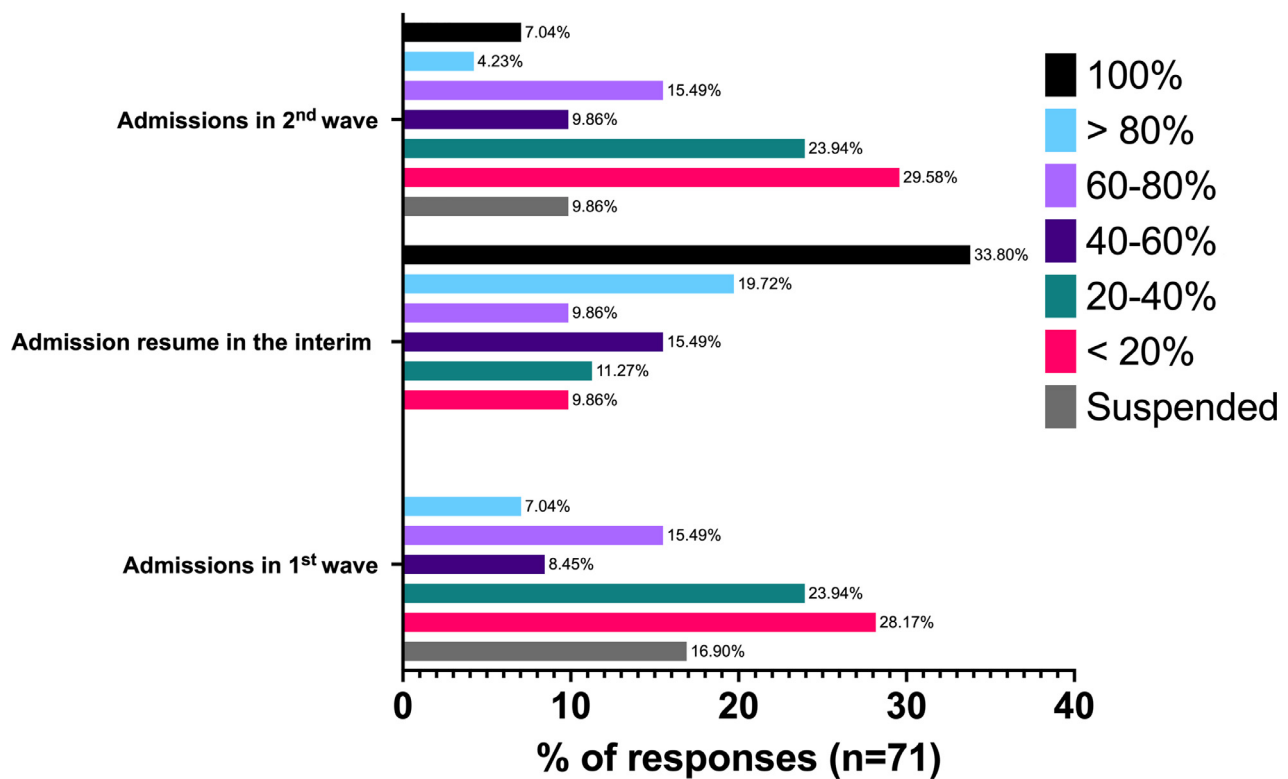


Figure 3 Rates of admission to the plastic surgery departments. Admission rates were exhibited as % of average admission before the COVID-19 pandemic.

least frequently reported procedures were elective reconstructions (19/71, 27%) and elective esthetic procedures (14/71, 20%; Figure 5). However, 29/71 (40.8%) respondents acknowledged the need to switch the anesthesia type from general to local due to pandemic (anesthesia switch needed a few times - 26/71 (36.6%) and many times - 3/71 (4.2%), Appendix A2). The majority of respondents' hospitals (57/71, 80.3%) required COVID-19 tests before patient admission. Either polymerase chain reaction (PCR) test or an antigen test: 49/71 and 8/71, respectively. Additionally, 52/71 (73.2%) of respondents stated that pandemic affected the patients' stay in the hospital. A total of 25/71 (35.2%) respondents admitted that the patient's stay was rarely shortened while 27/71 (38%) frequently assessed it. Telemedicine services were utilized during outpatient consultations - 21/71 (29.6%), for communication with patients in the department - 11/71 (15.5%), and the least frequently for surgical qualification - 4/71 (5.6%). In addition to, 41/71 (51.7%) of respondents did not use telemedicine services. The organization of work in plastic surgery departments during the pandemic was altered. The most common organizational change was team rotation 62% (44/71), followed by redeployment to another department 45.1% (32/71), creating a separate section for patients with COVID-19 within the plastic surgery department 29.6% (21/71). In 14.1% (10/71) cases, the plastic surgery department was transformed into COVID-19 unit, and in 5.6% (4/71) part of the

staff quit the department. Despite that 30/71 (42.3%) of respondents were offered COVID-19 training courses in their hospital. Over half of the respondents (39/71, 54.9%) were redeployed to another department to treat patients with COVID-19. Yet, 25/71 (35.2%) respondents treated COVID-19 patients in the plastic surgery department, while 18/71 (25.4%) did not treat COVID-19 patients at all. All respondents had access to personal protective equipment (PPE) at their departments. However, 26/71 (36.6%) declared that access/amount or level of protection was insufficient. The minority of the respondents (12/71, 16.9%) were not tested for SARS-CoV-2 infection. The rest of the respondents were tested: due to having symptoms (19/71, 26.8%) after contact with a person who had COVID-19 (37/71, 52.1%) or had mandatory tests at regular intervals (31/71, 43.7%). In concordance with hospital/country policies regarding physician's exclusion from work after confirmed exposure to COVID-19, 46/71 (64.8%) physicians were excluded, 15/71 (21.1%) were excluded only if they had symptoms, while 10/71 (14.1%) confirmed exposure to COVID-19 did not exclude physicians from work.

Further questions concerned training during the pandemic. All of the respondents had alterations in their plans for attending courses, workshops, and conferences. However, 45.1% (32/71) respondents had some of the activities canceled, 40.8% (29/71) had activities rescheduled for the indefinite future, 31% (22/71) had changed form of activi-

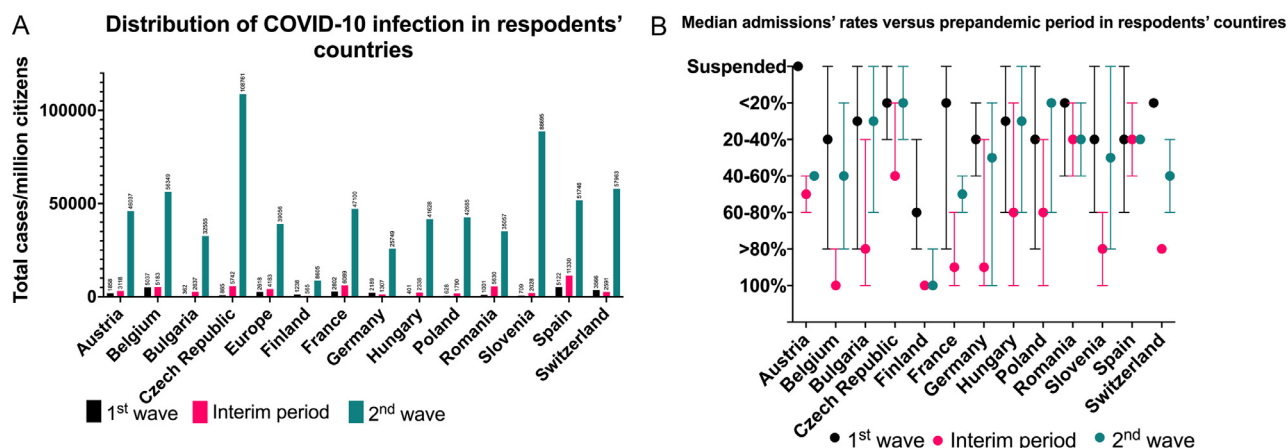


Figure 4 (A) COVID-19 infections in 1st wave, interim period and 2nd wave in surveyed countries expressed as total cases/million citizens [data source: Max Roser, Hannah Ritchie, Esteban Ortiz-Ospina and Joe Hasell (2020) - "Coronavirus Pandemic (COVID-19)". They are published online at OurWorldInData.org. Retrieved from: '<https://ourworldindata.org/coronavirus>' [Online Resource]]; (B) Median admissions' rates in surveyed countries in first wave, interim period, and second wave of COVID-19 pandemic (median \pm range).

Procedures performed during 1st and 2nd wave of COVID-19 (multiple answers)

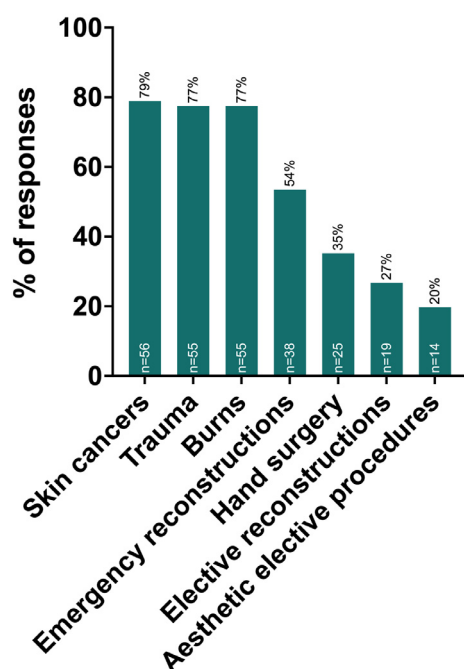


Figure 5 Type of procedures performed in plastic surgery departments during the first and the second wave of COVID-19. Above bars - % of responses, at the bottom - number of absolute responses.

ties (remote), and 26.8% (19/71) had activities rescheduled for a new date. Survey participants were asked if they were provided with the additional educational and research activities due to limited training in their department (multiple answers possible question). A total of 40.8% (29/71) had no additional activities, 39.4% (28/71) attended on-

line webinars, 36.6% (26/71) attended online conferences and courses, 31% (22/71) were writing research articles, 18.3% (13/71) had access to textbooks, 9.9% (7/71) had online transmission, 5.6% (4/71) had other activities, 2.5% (2/71) had intraoperative video recordings, and 1.4% (1/71) had cadaveric sections. Compared to the time before the pandemic, 46.5% (33/71) of respondents admitted spending more time on self-study learning, 28.2% (20/71) - less time, and 25.4% (18/71) - the same amount of time. Regarding the possible prolongation of plastic surgery residency, 45.1% (32/71) of respondents did not know if it will be prolonged, 43.7% (31/71) declared no prolongation, and 11.3% (8/71) declared prolongation. Nonetheless, 18.3% (13/71) of respondents reported difficulties with finishing residency training in due time, 31% (22/71) declined to have any problems, and 50.7% (36/71) were not concerned (not applicable). Trainees were asked about their opinions on the pandemic's impact on training. The majority 62% (42/71) of the respondents, noticed mostly negative consequences (e.g., fewer procedures), 35.2% (25/71) declared both positive and negative consequences, and 2.8% (2/71) mostly positive impact. Over half of the respondents - 53.5% (38/71) think that their manual skills and clinical knowledge may be deteriorated because of the pandemic, 25.4% (18/71) contradict this statement, and 21.1% (15/71) do not know.

The further section covered the trainee's physical and mental health during the pandemic. 71.8% (51/71) of respondents have not become infected with SARS-CoV-2. Out of 28.2% respondents who were infected, 16.9% (12/71) were infected during professional activities, 8.5% (6/71) do not know where they have become infected, and 2.8% (2/71) were infected outside of the workplace. Although without statistical significance ($p=0.33$, professional activities vs. unknown+outside the workplace), the majority of respondents (66.2%, 47/71) were not excluded from work because of SARS-CoV-2 infection (not applicable), 14.1% (10/71) were excluded for 14-30 days, 11.3% (8/71) were excluded for less than 14 days, 5.6% (4/71) were excluded for 30-60 days, and 2.8% (2/71) were excluded for

more than 60 days. Regarding the pandemic's impact on respondents' physical health, a similar percentage of respondents declared: no effect (33.8%, 24/71), change for the worse (32.4%, 23/71), and "hard to say" answer (29.6%, 21/71), only 4.2% (3/71) admitted that their physical health changed for better. Nearly half of the respondents (50.7%, 36/71) determined the impact of the pandemic on one's mental health as change for the worse, 26.8% (19/71) chose "hard to say" answer, 21.1% (15/71) declared no impact on their mental health, and only one respondent admitted change for better. The next question investigated everyday stress levels during the pandemic. In addition, 57.7% (41/71) of respondents felt more stressed, 36.6% (26/71) declared no change in everyday stress level during the pandemic, and 5.6% (4/71) of respondents felt less stressed. But in a more significant part, 90.1% (64/71) of respondents have not tried mental health support, 5.6% (4/71) tried with no benefit, and 4.2% (3/71) benefited from mental health support. Plastic surgery trainees spent their time-off during the pandemic mostly on household duties (67.6%, 48/71), other hobbies (49.3%, 35/71), quality time with family (49.3%, 35/71), learning new skills (not related to surgery) (43.6%, 31/71), physical activities (39.5%, 28/71), other (28.2%, 20/71), taking care of their mental health (9.9%, 7/71), and spiritual activities (7%, 5/71). Four participants filled the last and only open-ended question ("Is there anything more you wish to add (something you would like to share with your colleagues)?"), answers enclosed in Appendix Table A2.

Discussion

Both the first and second waves of the pandemic significantly affected admissions to plastic surgery departments in all countries involved in the study. During the first wave, every department limited the admissions, while during the second wave, no restrictions were needed in some departments (7.04% respondents). It may suggest better preparation for the second wave and using protocols developed during the first one. The level of restrictions was proportional to the extent of SARS-CoV-2 infection number only during the interim period.

During the COVID-19 pandemic, previously established work organization in plastic surgery departments was disturbed, and work is focused on emergency cases, postponing elective reconstructions, and esthetic procedures.^{7,10,13,17} Our survey showed that the treatment during the pandemic concentrated on trauma, burns, and skin cancers.

However, 73.2% of our respondents reported shortening of patients' stay or changing the type of anesthesia from general to local (40.8%) in the departments, which may be dictated by minimizing the risk of contamination.⁴ Testing patients before the admission protects the healthcare workers from COVID-19 exposure and decreases the risk of inter-patient transmission. The majority of our respondents indicated that either a PCR test or an antigen test was required before admission (80.3%).

To avoid situations when the whole staff must be quarantined, it is essential to change the work organization. The most common change and difference mentioned by Armstrong et al. is team rotation, which was confirmed in our survey (62% of respondents).³

It was reported that plastic surgeons had to treat the SARS-CoV-2+ patients. A total of 45.1% of our respondents were transferred to another department, and 35.2% had a separate section for patients with COVID-19, created within the plastic surgery departments. Nevertheless, in this unpredictable situation, innovative management can allow suitable department reorganization.¹⁸ Although 74.6% of our respondents had to treat the SARS-CoV-2+ patients, most of them (57.7%) were not offered any training dedicated to managing such patients. Lack of mandatory training in treating SARS-CoV-2+ patients before redeployment to ICU departments may increase anxiety levels among residents. While access to PPE is fundamental, 36.6% of respondents indicated that the access, the amount, or protection level of it was insufficient.¹⁹

One of the utmost issues was the difficulty in completing the residency training mentioned by Armstrong et al.^{3,19} The decreased number of operations due to COVID-19 is among the greatest concerns of surgical residents.²⁰ As they felt the lack of proper training Zingaretti et al.,⁶ it is substantial to provide residents with substitutive activities in the department. Even though 46% of our respondents spent more time on self-study during the pandemic than before, 40.8% of them were left without any additional educational support in their departments. Yet, 62% of respondents mainly noticed the pandemic's negative impact on their training, and 53.5% thought that their manual skills and knowledge could be less adequate in the future.

Hamidian Jahromi et al. mentioned many potential methods to fill the lack of training: relevant reading materials, videos recorded during operations, training on mannequins, animals, and others.⁷ Other studies show the benefits of online education.^{6,9,21} The most frequent additional educational activity reported by the respondents was to attend online webinars (39.4%). Even though telemedicine may benefit plastic surgery departments' work, more than 50% of our respondents did not use it at all. Only 1.37% of them trained with cadaver dissection and only 2.74% watched intraoperative videos. It is worth mentioning that no specialized devices are needed to record operating procedures, as GoPro cameras are used with great results.²²

COVID-19 pandemic has also affected other aspects of residents' lives and their stress levels increased.¹² The majority of the respondents felt more stressed in general (57.7%). Nonetheless, 50.7% reported worsening of their mental and 32.4% physical health. Despite that, only 9.59% of them tried mental health support, and only 4.1/3% benefited from it. Regular online meetings addressing residents' well-being can be organized to improve their general mental health.²³ A pandemic provides extra time-off work due to isolation, quarantine, lockdown, team rotation, or limited hospital admissions, when one can focus on other activities. According to the survey, our respondents used it well, spending it mostly on household duties, hobbies, passions, spending quality time with family, learning new skills, or doing physical activities. Leisure time activities are necessary as they decrease the risk of burnout, especially when treating COVID-19+ patients what is more stressful, work-demanding, and poorly related to plastic surgery.^{24,25}

Despite high variance of responses within countries and low response rate, our results reflect plastic surgery res-

idents' situation in individual countries mentioned previously in the literature.

Conclusion

Undoubtedly, the COVID-19 pandemic limited plastic surgery departments' activities, residents' work, and implementation of plastic surgery residency training programs in all European countries involved in our study. The limitations slightly varied between the countries as the epidemiological situation differed. The modifications in the organization of work forced the residents to use other additional forms of training. Webinars and self-education have become an indispensable part of education. The responses and answers from 13 countries reflect the situation of plastic surgery residents in Europe and are described in previously conducted research regarding the situation in individual countries.

Funding

None.

Ethical approval

Anonymous survey study does not bear the characteristics of a medical experiment and does not require an opinion Bioethics Committee in Poland.

Declaration of Competing Interest

None.

Acknowledgments

We gratefully acknowledge the contribution of all survey respondents, who took valuable time apart from their daily activities to participate in this work. We are also grateful to all mentors who contribute to the international online education of plastic surgery residents during the COVID-19 pandemic.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:[10.1016/j.bjps.2021.11.090](https://doi.org/10.1016/j.bjps.2021.11.090).

References

- Mazingi D, Navarro S, Bobel MC, Dube A, Mbanje C, Lavy C. Exploring the impact of COVID-19 on progress towards achieving global surgery goals. *World J Surg* 2020;44(8):2451-7 Aug PMID:32488665PMCID: PMC7266415. doi:[10.1007/s00268-020-05627-7](https://doi.org/10.1007/s00268-020-05627-7).
- Ducournau F, Arianni M, Awwad S, et al. COVID-19: initial experience of an international group of hand surgeons. *Hand Surg Rehabil* 2020;39:159-66.
- Armstrong A, Jeevaratnam J, Murphy G, et al. A plastic surgery service response to covid-19 in one of the largest teaching hospitals in europe. *J Plast Reconstr Aesthet Surg* 2020;73:1174-205.
- Markeson D, Freeman Romilly N, Potter M, Tucker S, Kalu P. Restarting plastic surgery: drawing on the experience of the initial COVID-19 pandemic to inform the safe resumption of services. *J Plast Reconstr Aesthet Surg* 2020;73:2121-6.
- de Berker HT, Bressington MJ, Mayo IM, Rose A, Honeyman C. Surgical training during the COVID-19 pandemic: challenges and opportunities for junior trainees. *J Plast Reconstr Aesthet Surg* 2021;74:644-710.
- Zingaretti N, Contessi Negrini F, Tel A, et al. The impact of covid-19 on plastic surgery residency training. *Aesthetic Plast Surg* 2020;44:1381-5.
- Hamidian Jahromi A, Arnautovic A, Konofaos P. Impact of the COVID-19 pandemic on the education of plastic surgery trainees in the united states. *JMIR Med Educ* 2020;6:e22045.
- Kumar S, More A, Harikar M. The impact of COVID-19 and lockdown on plastic surgery training and practice in India. *Indian J Plast Surg* 2020;53:273-9.
- Reed AJM, Chan JKK. Plastic surgery training during COVID-19: challenges and novel learning opportunities. *J Plast Reconstr Aesthet Surg* 2021;74:407-47.
- Pagotto VPF, Abbas L, Goldenberg DC, et al. The impact of COVID-19 on the plastic surgery activity in a high-complexity university hospital in Brazil: the importance of reconstructive plastic surgery during the pandemic. *Eur J Plast Surg* 2020;1-6.
- Training, A.o.S.i. and England, T.R.C.o.S.o., COVID-19. The implications for surgical trainees in the delivery of care and training. 2020 https://mcusercontent.com/2db94ddc48ad9a433004a8ac7/files/989e84ca-d7af-4c61-a669-a1154437013a/ASiT_The_15_Specialty_Associations_Letter_to_Surgical_Trainees_COVID19.pdf
- Collins C, Mahuron K, Bongiovanni T, et al. Stress and the surgical resident in the COVID-19 pandemic. *J Surg Educ* 2021;78:422-30.
- Kapila AK, Schettino M, Farid Y, Ortiz S, Hamdi M. The impact of coronavirus disease 2019 on plastic surgery training: the resident perspective. *Plast Reconstr Surg Glob Open* 2020;8:e3054.
- Navia A, Tejos R, Yañez G, et al. Adapting plastic surgery residency training during COVID-19: the experience of a Chilean university hospital. *Aesthetic Plast Surg* 2020;44:2344-6.
- Bontempi E. The Europe second wave of COVID-19 infection and the Italy "strange" situation. *Environ Res* 2021;193:110476.
- Max Roser H.R., Ortiz-Ospina E. and Hasell J.. Coronavirus pandemic (COVID-19). 2020: Published online at OurWorldIn-Data.org
- Kara M, Akduman B, Işık YM, Gürsoy K, Koçer U. Impact of COVID-19 outbreak on plastic surgery: taken precautions, distribution of surgical procedures and changes in admissions to outpatient clinic. *J Plast Reconstr Aesthet Surg* 2021;74:890-930.
- Leng C, Challoner T, Hausien O, Filobos G, Baden J. From chaos to a new norm: the Birmingham experience of restructuring the largest plastics department in the uk in response to the COVID-19 pandemic. *J Plast Reconstr Aesthet Surg* 2020;73:2136-41.
- Cho DY, Yu JL, Um GT, et al. The early effects of covid-19 on plastic surgery residency training: the university of Washington experience. *Plast Reconstr Surg* 2020;146:447-54.
- Collins C, Mahuron K, Bongiovanni T, et al. Stress and the surgical resident in the COVID-19 pandemic. *J Surg Educ* 2021;78(2):422-30. doi:[10.1016/j.jsurg.2020.07.031](https://doi.org/10.1016/j.jsurg.2020.07.031).

21. Abi-Rafeh J, Azzi AJ. Emerging role of online virtual teaching resources for medical student education in plastic surgery: COVID-19 pandemic and beyond. *J Plast Reconstr Aesthet Surg* 2020;73:1575–92.
22. Navia A, Parada L, Urbina G, Vidal C, Morovic CG. Optimizing intraoral surgery video recording for residents' training during the COVID-19 pandemic: comparison of 3 point of views using a GoPro. *J Plast Reconstr Aesthet Surg* 2020 Nov 851748–6815(20)30565–9Epub ahead of printPMID:33199220PMCID: PMC7648881. doi:10.1016/j.bjps.2020.10.068.
23. Yan M, Cantwell SR, Mason M, et al. Impact of COVID-19 on a plastic surgery residency education program: outcomes of a survey. *J Plast Reconstr Aesthet Surg* 2021;74(3):644–710. doi:10.1016/j.bjps.2020.10.026.
24. Qureshi HA, Rawlani R, Mioton LM, et al. Burnout phenomenon in U.S. plastic surgeons: risk factors and impact on quality of life. *Plast Reconstr Surg* 2015;135(2):619–26 FebPMID:25357156 . doi:10.1097/PRS.0000000000000855.
25. Lai J, Ma S, Wang Y, et al. Factors associated with mental health outcomes among health care workers exposed to coronavirus disease 2019. *JAMA Netw Open* 2020;3(3):e203976 Mar 2PMID:32202646PMCID: PMC7090843. doi:10.1001/jamanetworkopen.2020.3976.