

# The Impact of Coronavirus Disease 2019 on Plastic Surgery Training: The Resident Perspective

Ayush K. Kapila, MD, MRCS\*  
 Michela Schettino, MD†  
 Yasser Farid, MD‡  
 Socorro Ortiz, MD‡  
 Moustapha Hamdi, MD, PhD\*

**Background:** The coronavirus disease 2019 (COVID-19) pandemic has led to marked changes in surgical training, including that of plastic surgery residents. We performed a survey to gain an insight into the self-reported current and future impact of COVID-19 on plastic surgery residents.

**Methods:** A 20-point questionnaire was designed by a panel of surgical trainees and trainers, which was filled in by Belgian plastic surgery residents and their international network of peers between 19 and 26 April 2020—week 6 of stringent Belgian lockdown measures. Questions covered the impact of COVID-19 on surgical activity, surgical training, and the future of training.

**Results:** Thirty-five of 38 plastic surgery residents in Belgium filled in the questionnaire, as did 51 of their international peers from 9 other countries. Decreased surgical activity of >75% was reported by 86% of Belgian trainees and by 73% of international colleagues. All consultations were stopped for 26% of Belgian trainees and 37% of international peers. Forty-six percents of Belgian trainees and 27% of international peers were reassigned to different departments. Eighty-five percent of all trainees felt surgical training had suffered, yet 54% of Belgian residents and 39% of international peers felt training should not be prolonged. Anxiety regarding the pandemic was present in 54% of Belgian residents and 69% of international colleagues.

**Conclusions:** This is the first report, expressing the voice of a representative group of plastic surgery residents, showing a significant impact of COVID-19 on training and activity. A joint effort is needed to provide continued forms of education by virtual education and skills-based learning. (*Plast Reconstr Surg Glob Open* 2020;8:e3054; doi: [10.1097/GOX.0000000000003054](https://doi.org/10.1097/GOX.0000000000003054); Published online 16 July 2020.)

## INTRODUCTION

The coronavirus disease 2019 (COVID-19) pandemic has had an immense impact worldwide on society and healthcare.<sup>1</sup> This has led to a significant reorganization of hospitals, wards, and operating theaters.<sup>2-4</sup> Surgical residents have also seen a substantial alteration of their responsibilities and their training.<sup>5-8</sup> Many of our colleagues have been asked to swap the operating theater for emergency triage or the intensive care unit to help where needed.

At the same time, we must remember the age-old adage of surgical training: see one, do one, teach one.<sup>9</sup> In

light of the current pandemic, we are seeing a significant decline in surgical activity.<sup>10-13</sup> This in turn has a critical impact on the training of surgical residents due to lessened operating activity and therefore decreased learning opportunities. This is particularly true for plastic surgery trainees, as our training involves both emergency and elective procedures, a number of which may be for aesthetic purposes.<sup>14-16</sup> To this aim, we evaluated the self-reported surgical activity of plastic surgery residents, their current role in the hospital, the impact on their training, and the effect on their future.

## METHODS

A questionnaire was designed by a panel of plastic surgery residents and responsible trainers across 3 hospitals and 2 universities in Brussels, Belgium (see **appendix, Supplemental Digital Content 1**, which displays the questionnaire used in this study, <http://links.lww.com/>

From the \*Department of Plastic and Reconstructive Surgery, University Hospital (UZ) Brussels, Brussels, Belgium; †Department of Plastic and Reconstructive Surgery, Erasme Hospital Brussels, Brussels, Belgium; and ‡Department of Plastic and Reconstructive Surgery, Brugmann Hospital Brussels, Brussels, Belgium.

Received for publication May 1, 2020; accepted June 24, 2020.

Copyright © 2020 The Authors. Published by Wolters Kluwer Health, Inc. on behalf of The American Society of Plastic Surgeons. This is an open-access article distributed under the terms of the [Creative Commons Attribution-Non Commercial-No Derivatives License 4.0 \(CCBY-NC-ND\)](https://creativecommons.org/licenses/by-nc-nd/4.0/), where it is permissible to download and share the work provided it is properly cited. The work cannot be changed in any way or used commercially without permission from the journal.

DOI: [10.1097/GOX.0000000000003054](https://doi.org/10.1097/GOX.0000000000003054)

**Disclosure:** The authors have no financial interest to declare in relation to the content of this article.

Related Digital Media are available in the full-text version of the article on [www.PRSGlobalOpen.com](http://www.PRSGlobalOpen.com).

**PRSGO/B453**). This was sent out by the Belgian Residents of Plastic Surgery Organization<sup>17</sup> to all plastic surgery residents in Belgium from years 3 to 6, as the first 2 years of training involve rotations in general surgery. Residents were in turn asked to spread the questionnaire to their network in other countries, to compare the Belgian resident perspective with a snapshot view internationally. The questionnaire was filled in anonymously in the sixth week of stringent Belgian lockdown measures between 19 and 26 April 2020. The data were stored and analyzed securely in the primary institution.

In total, 20 questions were asked. The first section explored demographic and academic data, such as age, country, year of training, and place of training. The second section asked questions regarding surgical activity, specifically, an estimation of the reduction in their personal surgical activity, the type of surgical activity, whether they were still performing consultations and if these were in person or by telephone. We further explored whether residents had been reassigned to other departments and whether they had been infected by COVID-19. The third section was about their current and future training. They were asked about whether their head of department had organized continuous education, whether they had had more time for research or for improving theoretical knowledge regarding their specialty, and whether they still had adequate supervision. Further questions included how they think the COVID-19 measures have impacted on their training, if they feel their training should be prolonged in the future, and whether the pandemic has affected them psychologically, going forward. The answers were analyzed and verified by the panel. Responses from Belgium were filtered as one entity, and responses from the resident's network were filtered into another entity to allow a snapshot evaluation internationally.

## RESULTS

The survey ran for 1 week and was completed by 86 plastic surgery residents across 10 countries. In Belgium, 35 of 38 plastic surgery trainees in their last 4 years of training answered the survey questions (92.1%), giving a representative overview of plastic surgery trainees in our country. The average age among these was 31 years. Nine trainees were in their third year, 8 in their fourth year, 9 in their fifth year, and 9 in their sixth year.

Fifty-one responses from 9 other countries were recorded: India (13), Romania (12), Israel (6), Italy (6), Colombia (6), United Kingdom (5), France (1), The Netherlands (1), and Slovakia (1). The average age of the international residents was 31 as well. Here, answers were accepted from all years of training due to varying training systems.

### Surgical Activity

Thirty-four percent (12 of 35) of Belgian plastic surgery residents reported a decline in surgical activity of 90%–100%, 52% (18 of 35) reported a reduction of 75%, 11% (4 of 35) reported a decline of 50%, and 3% (1 of 35) reported a fall of 25%. In this group, 6% (2 of 35) were not performing any surgery at all; 11% (4 of 35) were still performing

some form of elective surgery, besides emergencies and cancers. Fifty-seven percent (20 of 51) of respondents reported performing skin cancer procedures, and 46% (16 of 35) were still partaking in breast reconstructions.

Forty-five percent (23 of 51) of the international group of residents had a 90%–100% decrease in surgical activity, 27% (14 of 51) had a 75% reduction, 20% (10 of 51) had a 50% drop, and 6% (3 of 51) had a 25% decrease. One respondent did not notice any change in his surgical activity. Of these residents, 27% (14 of 51) had stopped any form of surgical activity, 4% (2 of 51) were still doing elective procedures besides cancers and emergencies, 35% (18 of 51) were performing skin cancer procedures, and 18% (9 of 51) were still doing breast reconstructions (Fig. 1).

With regard to consultations, 26% (9 of 35) of Belgian residents reported not performing any form of consultations, 40% (14 of 35) were doing only consultations in person, and 34% (12 of 35) were undertaking a combination of physical and telephone consultations. For our international respondents, 37% (19 of 51) were not doing any consultations, 16% (8 of 51) were undertaking only telephone consultations, 18% (9 of 51) were doing only consultations in person, and 29% (15 of 51) were doing a combination of both (Fig. 2).

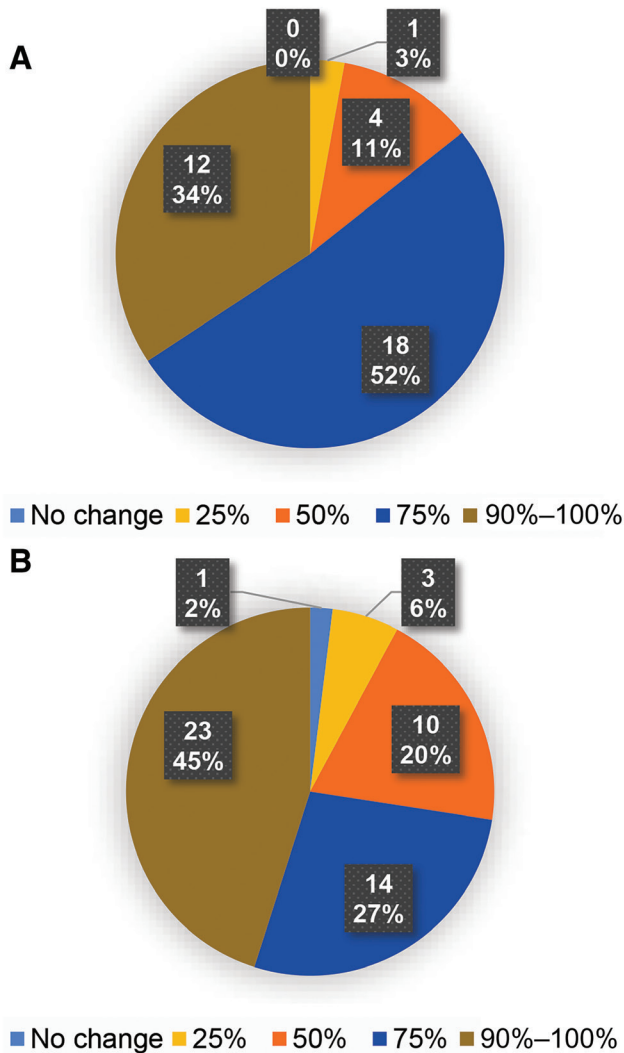
In Belgium, 46% (16 of 35) of plastic surgery residents were asked to work in different departments, when compared with 27% (14 of 51) among their international peers. Of the 16 residents in Belgium, 31.2% (5 of 16) were working in the emergency department only, another 31.2% in the COVID-19 medical unit only, and 31.2% in both the emergency department and the COVID-19 unit. One resident was asked to work in the intensive care unit (ICU). Among our international colleagues, 64% (9 of 14) were helping in the COVID-19 medical unit, 21% (3 of 14) in ICU, 1 in both ICU and the emergency department, and 1 in all 3 mentioned departments.

Of the 86 residents who responded, 5 (6%) reported to have been infected by the COVID-19 virus, diagnosed by a polymerase chain reaction (PCR) swab test or a computed tomographic scan. None had had a serology test. Of these 5 residents, 4 were from Belgium, giving an infection rate of 11.5% (4 of 35) in Belgian plastic surgery residents. The higher proportion in Belgian plastic surgery residents may be linked to the higher number of residents who were asked to work in COVID-19-related departments. In Belgium, 2 of our resident colleagues who tested positive for COVID-19 had been working in COVID-19 medical units.

Nonetheless, in Belgium, as of 1 May 2020, there is no generalized testing for healthcare staff, and this is only done on the onset of symptoms. As such, this number does not include residents displaying COVID-19 symptoms who were sent into quarantine without being tested (especially in the early phases of the pandemic when testing capacity was lower) and those who were infected without showing symptoms (asymptomatic carriers). A future study examining immunity by antibodies may reflect the true infection rate more accurately.

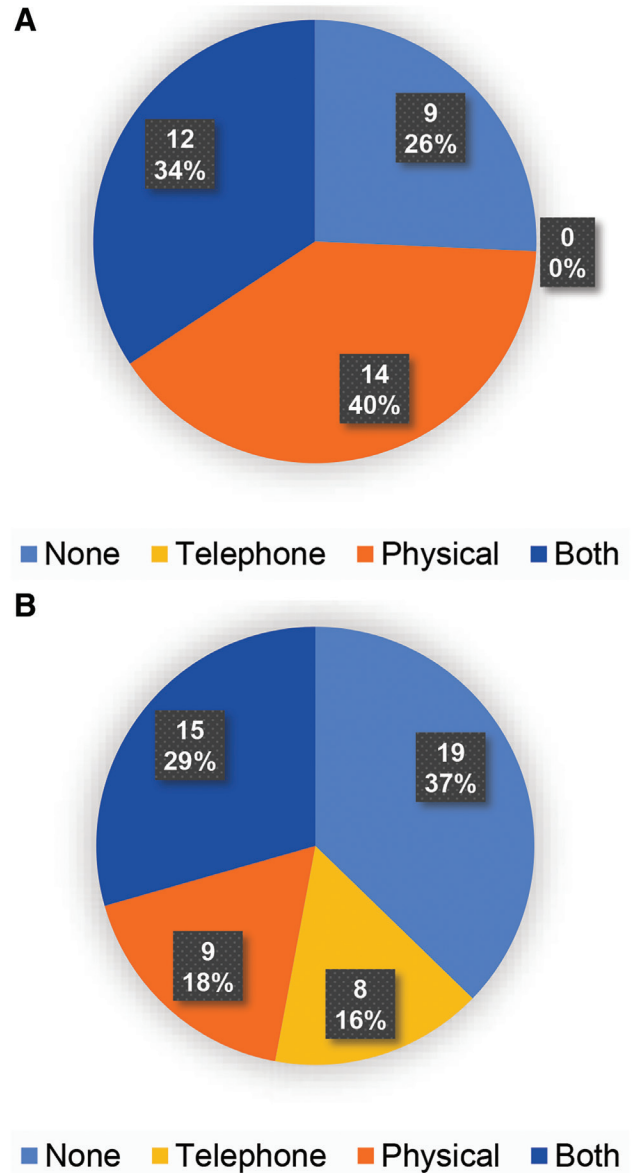
### Surgical Training

Among Belgian residents, 20% (7 of 35) of plastic surgery residents reported that they did not have adequate



**Fig. 1.** Decline in surgical activity. A, The graph shows that 34% (12 of 35) of Belgian plastic surgery residents reported a decline in surgical activity of 90%–100%, 52% (18 of 35) a reduction of 75%, 11% (4 of 35) a decline of 50%, and 3% (1 of 35) a fall of 25%. B, The graph shows that 45% (23 of 51) of the International group of residents had a 90%–100% decrease in surgical activity, 27% (14 of 51) a 75% reduction, 20% (10 of 51) a 50% drop, and 6% (3 of 51) a 25% decrease. One respondent did not notice any change in his surgical activity.

supervision or guidance from their responsible trainer, whereas 31% (11 of 35) felt they did; 49% (17 of 35) did not comment on how adequate their supervision was. This was similar among their international peers: 20% (10 of 51) did not feel they had adequate supervision, 39% (20 of 51) felt they did, and 61% (31 of 51) did not comment. In Belgium, 60% (21 of 35) of trainees received continuous education by their department head and internationally 71% (36 of 51) did. Seventy-seven percent of all respondents (41 of 57) reported that this was by webinars and/or journal clubs by videoconference. In Belgium, 74% (26 of 35) managed to do an increased amount of research activity during this time, and 91% (32 of 35) felt they had more time to deepen the theoretical aspect of their specialty.



**Fig. 2.** Changes in consultation activity. A, The graph reflects that 26% (9 of 35) of Belgian residents reported to be not currently performing any form of consultations; 40% (14 of 35) were doing only consultations in person; and 34% (12 of 35) were undertaking a combination of physical and telephone consultations. No residents were doing telephone consultations alone. B, The graph shows that for our international respondents, 37% (19 of 51) were not doing any consultations, 16% (8 of 51) were undertaking only telephone consultations, 18% (9 of 51) were doing only consultations in person, and 29% (15 of 51) were doing a combination of both.

This was 61% (31 of 51) and 88% (45 of 51), respectively, for their international peers.

When Belgian residents were asked on how the COVID-19 pandemic has impacted on training; 11% (4 of 35) felt it led to no change, 63% (22 of 35) were of the opinion that their surgical training had suffered; however, they had been able to use this time to perform research and increase their theoretical knowledge about the specialty. Twenty-three percent (8 of 35) felt that their training had

suffered in general. One respondent felt that his training had benefited. Among the international network, 16% (8 of 51) felt there was no change, 49% (25 of 51) felt surgical training alone had suffered, and 35% (18 of 51) felt all of the training suffered. None responded that the training had benefited (Fig. 3).

Yet, the majority of Belgian trainees (54%; 19 of 35) did not feel training ought to be prolonged, with the youngest residents most against the idea of training prolongation (Table 1). Twenty-nine percent (10 of 35) opined that prolongation would only be appropriate if measures lasted 6 months, and 6% (2 of 35) if measures lasted 3 months. Nonetheless, 11% (4 of 35) felt that training should already be prolonged in the current situation. Internationally, the answers were more evenly spread; 39% (20 of 51) were against training prolongation, 18% (9 of 51) for if measures lasted 6 months, and 27% (14 of 51) if measures lasted for 3 months; 16% (8 of 51) felt that training should already be prolonged (Fig. 4).

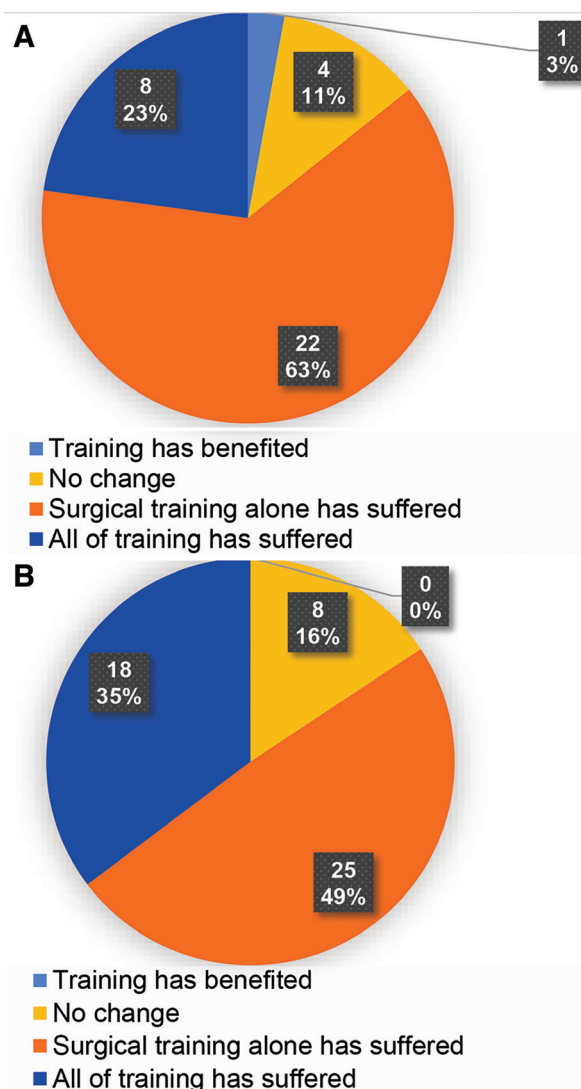
Finally, 54% (19 of 35) of Belgian residents showed some level of anxiety for the health of loved ones, their own health, and the future of their surgical training; 46% (16 of 35) did not report any anxiety. Concurrently, 69% (35 of 51) of international peers reported a degree of anxiety regarding the impact of the COVID-19 situation on themselves and their training, and also on the well-being of their friends and family.

## DISCUSSION

With a 92% response rate (35 of 38), our study gives a representative opinion from plastic surgery residents in Belgium. A snapshot comparison with our residents' international network was also performed to gain an insight into how training is impacted beyond our borders. There is a significant reduction in surgical activity. With regard to type of surgery, we note that across the board in Belgium and internationally, there is a steep reduction in skin cancer surgery and breast cancer reconstruction: 43% and 56% in Belgium and 65% and 82% internationally.

This has clearly had an impact on training; about 85% of Belgian residents and their international network of peers feel that their surgical training has suffered, with on average 30% feeling that their training in general has been hit. This decrease in surgical training carries significant implications for plastic surgery residents to reach adequate proficiency. Most would agree that the key to acquiring surgical skills is continued practice. The literature has evidenced this by studies showing that improvement in a surgeon's or in a center's outcome is correlated with increased volume.<sup>18–20</sup> If the current measures carry on, it is clear that operative caseloads and surgical learning opportunities would markedly decline.

Nonetheless, mere repetition of the same procedures tends to improve performance up to a plateau that is less than the maximal level.<sup>21</sup> An important concept is that of deliberate practice and the time spent doing this—for example, the number of anastomoses performed in a microsurgery laboratory, as opposed to the quantity of time spent in surgery—to achieve the maximum level of



**Fig. 3.** Impact on resident training. A, The graph shows the Belgian residents' opinion on the impact of COVID-19 on resident training: 11% (4 of 35) felt it led to no change, 63% (22 of 35) were of the opinion that their surgical training had suffered; however, they had been able to use this time to perform research and increase their theoretical knowledge about the specialty; 23% (8 of 35) felt that their training had suffered in general; and 1 respondent felt that his training had benefited. B, The graph shows the results from the international network: 16% (8 of 51) felt there was no change, 49% (25 of 51) felt surgical training alone had suffered, and 35% (18 of 51) felt all of training suffered. None responded that the training had benefited.

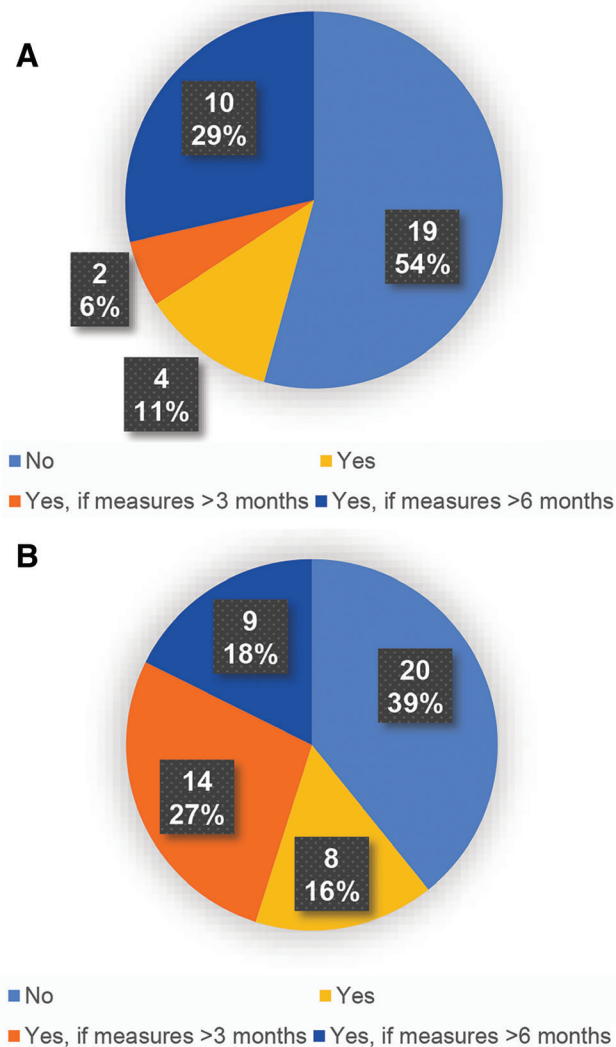
expertise and outcomes.<sup>22,23</sup> Deliberate practice is used to improve performance by actively setting new goals and higher performance standards and by seeking out training situations to achieve one's objectives. This period may be considered an ideal time to improve one's deliberate practice: the occasion to reconnect with colleagues, to build a new network, to improve particular skills, and to team up with a research group.

And it is this positivity we must aim to carry forward. Our survey showed that a high number of trainees were

**Table 1. Perspectives of Belgium Residents (by Year) on Whether Training Should Be Prolonged**

| Total = 35     | No.       | Yes, If Measures Last for 6 mo | Yes, If Measures Last for 3 mo | Yes, Already Prolonged |
|----------------|-----------|--------------------------------|--------------------------------|------------------------|
| Year 3 (n = 9) | 8 (89%)   | 1 (11%)                        | 0                              | 0                      |
| Year 4 (n = 8) | 2 (25%)   | 6 (75%)                        | 0                              | 0                      |
| Year 5 (n = 9) | 4 (44.5%) | 0                              | 1 (11%)                        | 4 (44.5%)              |
| Year 6 (n = 9) | 5 (56%)   | 3 (33%)                        | 1 (11%)                        | 0                      |

Year 1 and 2 are not included in these results, as Belgian residents rotate through General Surgery departments in their first 2 years. We note that in year 3, the majority is against the idea of prolongation, likely related to the idea that they have sufficient years to catch up on training. In later years, the responses tend to vary more.



**Fig. 4.** Should training be prolonged? A, The graph shows that the majority of Belgian trainees (54%; 19 of 35) did not feel training ought to be prolonged: 29% (10 of 35) opined that prolongation would only be appropriate if measures lasted 6 months, and 6% (2 of 35) opined that prolongation would only be appropriate if measures lasted 3 months. Nonetheless, 11% (4 of 35) felt that training should already be prolonged in the current situation. B, The graph shows that internationally, 39% (20 of 51) were against training prolongation, 18% (9 of 51) for prolongation if measures lasted 6 months, and 27% (14 of 51) if measures lasted for 3 months; 16% (8 of 51) felt that training should already be prolonged.

provided with continuous training opportunities by their trainers on a virtual platform. A remarkable surge was seen in webinars, online training modules, and virtual journal clubs promoting the continued transfer of knowledge from trainer to trainee. About 9 in 10 of all our respondents felt they were able to deepen their theoretical knowledge of the specialty, focus on improving gaps in surgical skill, and achieve aims that a lack of time may have not allowed before. A strong example is that 74% of Belgian trainees and 61% of their international peers managed to do an increased amount of research activity.

At the same time, we must take into account a potential second wave and the likelihood that it will be a long time before life returns to how we used to know it. This would mean we would have to get used to a new normal, which may consist of alternative options for surgical training.<sup>15,24,25</sup> Options such as web-based seminars and video-based surgical skills training, have already existed for a while<sup>26,27</sup>; however, these are often not incorporated into formal learning, and uptake has been limited.<sup>28</sup> As such, we must provide structure to future plastic surgery training following simple principles (Table 2). First of all, systemic organization of webinars and online meetings is essential. Currently, we are seeing a plethora of different webinars. Trainers can use this opportunity to evaluate their national curriculum and advise trainees on online learning opportunities that match these by sending a schedule of web-based learning opportunities. Second, we must truly embrace the power of virtual learning; attempts should be made to record and stream videos of surgeries so that residents at home can follow and learn essential surgical steps. Preexisting surgical videos must be organized and made available by departments, training boards, or national associations. Third, presentation of challenging cases and scientific discussions can be promoted on a wide, multicenter, and international basis by web-based case meetings and journal clubs, allowing interactivity and knowledge sharing. Although virtual case meetings and journal clubs were not done extensively before the lockdown measures, many departments and universities, including ours, are organizing these to promote continued investigative thoughts and critical analyses. Fourth, we must incorporate skills-based learning in the curriculum to address specific surgical educational aims such as microsurgery training, cadaveric dissection, and deliberate practice on specific surgical steps. The same accounts for medical students.<sup>29</sup>

The COVID-19 pandemic could truly be the paradigm shift in surgical training. Each one of us will have to

**Table 2. Suggestions for Continued Surgical Training in a Changing Environment as a Result of the COVID-19 Pandemic**

| Facets of Surgical Training Ensuring Continued Education by: |  |
|--|--|
| Surgical skills  | Masterclasses with videos of cases (both live transmission and recorded)<br>Creation of a surgical video library either locally or nationally  |
| Surgical knowledge   | Skills-based learning: microsurgery laboratories, surgical simulation, laser/ultrasonography/dermoscope training<br>Acquisition of theoretical surgical knowledge as per curriculum<br>Structured overview of webinars<br>Virtual case presentations |
| Academics  | Virtual journal clubs<br>Ongoing support by seniors at distance for research at home<br>Open access to journals and novel research at home   |

It is essential to strategize continued training on 3 fronts; first of all, in terms of surgical skills by access to live videos of complex cases and by access to a video library of basic cases to view and understand surgical steps. Further, specific skills-based learning and deliberate practice can help perfect certain surgical skills of residents; for example, by performing microsurgery in laboratories and surgical simulation models. Second, maintaining and improving surgical knowledge is essential by continued self-learning as per the curriculum and also by virtual learning opportunities, such as virtual case presentations allowing problem-based learning, and webinars. Third, continued support for academic progress and critical analysis is important by virtual journal clubs, continued support by seniors for research at home, and open access to research and scientific literature at home provided by the training board or university.

adopt new ways of education if we want our residents to have a well-founded formation. With regard to training, we cannot ignore that there will be a trade-off between acquisition of pure surgical skill and theoretical know-how. As such, we must find a way to continue promoting surgical excellence during these times. Whether providing a modified curriculum encompassing virtual learning and deliberate practice alone will suffice remains a point to reflect and decide on. It is likely that serious consideration will need to be given by different educational boards on whether training should be prolonged in the case of continued reduced experience due to prolonged measures or a possible second wave. In our study, only 11% of Belgian residents already felt training should be prolonged, and 54% was against it. This remains a point of further reflection; nonetheless, provisions to design a new curriculum using virtual learning opportunities, such as journal clubs and webinars, and use of surgical videos and simulation procedures can already be done as described above.<sup>30</sup>

Our study is the first report expressing the voice from a representative national group of plastic surgery residents in view of the COVID-19 pandemic. This was done in the form of a quantitative questionnaire (see **appendix, Supplemental Digital Content 1**, which displays the questionnaire used in this study, <http://links.lww.com/PRSGO/B453>). We feel it is crucial to have a representative perspective of trainees to help trainers in deciding the future course of action. To add an extra dimension to the study, we wanted to have an insight into a comparable number of responses internationally to view how Belgian residents stand among their peers. We recognize that different countries have different policies for COVID-19, and also have different training systems, as such we did not want to undertake statistical comparisons between Belgium and other countries. We feel that country-specific surveys are needed to truly understand the opinions of plastic surgery residents, so that national boards can act accordingly as per their training curriculum.

Besides all of this, one must not forget that plastic surgery residents remain as susceptible to the impact of the virus as the rest of the population. We have seen some of our colleagues being infected by the virus, and some requiring intensive care. We also noticed that a large

proportion of our resident colleagues reported anxiety regarding the ongoing crisis (54% in Belgium and 69% among international peers), either for themselves and their training or for their loved ones. This underlines that residents can be impacted by the current situation and may not only need continued training and education, but may also look at their trainers for support, guidance, and direction.

## CONCLUSIONS

The COVID-19 pandemic has had a significant impact on the functioning of hospitals and on training. In our study, we found that there was a significant decrease in surgical activity among plastic surgery trainees, coupled with genuine concern regarding their training progression. At the same time, we noted that there were possibilities of continued education with virtual education and skills-based learning. As such, we underline the importance of ongoing education by alternative means and encourage trainers and trainees to come together and discuss how the acquisition of surgical skills can be ensured. This will safeguard that the coming generation of plastic surgeons will be well trained, well prepared, and able to face the future with confidence.

**Moustapha Hamdi, MD, PhD**

Department of Plastic and Reconstructive Surgery  
University Hospital (UZ) Brussels  
101 Laarbeeklaan  
1090 Brussels  
Belgium

E-mail: [moustapha.hamdi@uzbrussel.be](mailto:moustapha.hamdi@uzbrussel.be)

## ACKNOWLEDGMENTS

*We acknowledge all Belgian Residents in Plastic Surgery and, in particular, the board of the BRPS (Belgian Residents of Plastic Surgery) for their support in this project. We also thank all trainers for their efforts in providing continued education during this time.*

## REFERENCES

1. Rohrich RJ, Hamilton KL, Avashia Y, et al. The COVID-19 pandemic—changing lives and lessons learned. *Plast Reconstr Surg Glob Open*. 2020;8:e2854.

2. Brindle M, Gawande A. Managing COVID-19 in surgical systems. *Ann Surg*. 2020;272:e1–e2.
3. Sarac BA, Schoenbrunner AR, Wilson SC, et al. Coronavirus disease 2019 state guidelines on elective surgery: considerations for plastic and reconstructive surgeons. *Plast Reconstr Surg Glob Open*. 2020:e2904.
4. Farid Y, Kapila AK, Schettino M, et al. Assessing the skillset of surgeons facing the COVID-19 pandemic. *Br J Surg*. 2020; [E-pub ahead of print].
5. Porpiglia F, Checucci E, Amparore D, et al. Slowdown of urology residents' learning curve during the COVID-19 emergency. *BJU Int*. 2020;125:E15–E17.
6. Nassar AH, Zern NK, McIntyre LK, et al. Emergency restructuring of a general surgery residency program during the coronavirus disease 2019 pandemic: the University of Washington experience. *JAMA Surg*. 2020 [E-pub ahead of print].
7. Kogan M, Klein SE, Hannon CP, et al. Orthopaedic education during the COVID-19 pandemic. *J Am Acad Orthop Surg*. 2020;28:e456–e464.
8. Kapila AK, Farid Y, Kapila V, et al. The perspective of surgical residents on current and future training in light of the COVID-19 pandemic. *Br J Surg*. 2020 [E-pub ahead of print].
9. Kotsis SV, Chung KC. Application of the “see one, do one, teach one” concept in surgical training. *Plast Reconstr Surg*. 2013;131:1194–1201.
10. Lisi G, Campanelli M, Spoleitini D, et al. The possible impact of COVID-19 on colorectal surgery in Italy. *Colorectal Dis*. 2020;22:641–642.
11. Ng JJ, Ho P, Dharmaraj RB, et al. The global impact of COVID-19 on vascular surgical services. *J Vasc Surg*. 2020;71:2182–2183.e1.
12. Kowalski LP, Sanabria A, Ridge JA, et al. COVID-19 pandemic: effects and evidence-based recommendations for otolaryngology and head and neck surgery practice. *Head Neck*. 2020;42:1259–1267.
13. Farid Y, Schettino M, Kapila AK, et al. The decrease of surgical activity in the COVID-19 pandemic: an economic crisis. *Br J Surg*. 2020 [E-pub ahead of print].
14. Baccarani A, Pappalardo M, Starmoni M, et al. Plastic surgeons in the middle of the Covid-19 pandemic storm in Italy: changing perspectives on our role. *Plast Reconstr Surg Global Open*. 2020;8:e2889.
15. Cho DY, Jenny LY, Um GT, et al. The early effects of COVID-19 on plastic surgery residency training: the University of Washington experience. *Plast Reconstr Surg*. 2020 [E-pub ahead of print].
16. Facchin F, Scarpa C, Vindigni V, et al. Effectiveness of preventive measures against coronavirus disease of 2019 in a plastic surgery unit at the epicenter of the pandemic in Italy. *Plast Reconstr Surg*. 2020;146:112e–113e.
17. BRPS. Belgian Residents in Plastic Surgery. 2020. Available at <https://brps.be>. Accessed April 29, 2020.
18. Albornoz CR, Cordeiro PG, Hishon L, et al. A nationwide analysis of the relationship between hospital volume and outcome for autologous breast reconstruction. *Plast Reconstr Surg*. 2013;132:192e–200e.
19. Birkmeyer JD, Stukel TA, Siewers AE, et al. Surgeon volume and operative mortality in the United States. *N Engl J Med*. 2003;349:2117–2127.
20. Sosa JA, Bowman HM, Gordon TA, et al. Importance of hospital volume in the overall management of pancreatic cancer. *Ann Surg*. 1998;228:429–438.
21. Ericsson KA. Deliberate practice and acquisition of expert performance: a general overview. *Acad Emerg Med*. 2008;15:988–994.
22. Ericsson KA, ed. The road to excellence: the acquisition of expert performance in the arts and sciences, sports, and games. Hove, United Kingdom: Psychology Press;2014.
23. Halm EA, Lee C, Chassin MR. Is volume related to outcome in health care? A systematic review and methodologic critique of the literature. *Ann Intern Med*. 2002;137:511–520.
24. Yuen JC, Gonzalez SR. Addressing the surgical training gaps caused by the COVID-19 pandemic: an opportunity for implementing standards for remote surgical training. *Plast Reconstr Surg*. 2020 [E-pub ahead of print].
25. Cho MJ, Hong JP. Plastic surgery education during the COVID-19 outbreak: leveling the playing field. *Plast Reconstr Surg Glob Open*. 2020;8:e2925.
26. Martin-Smith JD, McArdle A, Carroll SM, et al. Webinar: a useful tool in plastic surgery specialty trainee education. *J Plast Reconstr Aesthet Surg*. 2015;68:1323–1324.
27. Khansa I, Janis JE. Maximizing technological resources in plastic surgery resident education. *J Craniofac Surg*. 2015;26:2264–2269.
28. Nahai F. Distance learning in plastic surgery: are live meetings destined for the scrapheap? *Aesthet Surg J*. 2012;32:659–660.
29. Kapila V, Corthals S, Langhendries L, et al. The importance of medical student perspectives on the impact of COVID-19. *Br J Surg*. 2020 [E-pub ahead of print].
30. Chick RC, Clifton GT, Peace KM, et al. Using technology to maintain the education of residents during the COVID-19 pandemic. *J Surg Educ*. 2020;77:729–732.