

ORIGINAL ARTICLE **TRAINING**

# The impact of COVID-19 on Australian plastic and reconstructive surgery trainees: a survey study

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### Abstract

**Introduction:** The COVID-19 pandemic had a significant impact on the training of plastic and reconstructive surgeons and the wellbeing of surgical trainees internationally. The aim of this study was to evaluate the impact of the COVID-19 pandemic on Australian plastic and reconstructive surgery trainees.

**Method:** A web-based self-administered survey was distributed by the Australian Society of Plastic Surgeons to all Australian plastic and reconstructive surgery registrars in October 2021. A questionnaire developed to assess the impact of the COVID-19 pandemic on plastic and reconstructive surgery trainees in the United States of America was adapted for the Australian context. Subgroup analysis evaluated differences in responses between early and late Surgical Education and Training trainees and between Australian states.

**Results:** Of 103 Australian plastic and reconstructive surgery trainees invited to participate, 24 responded (23%). Of these, 52 per cent were in their first two years of training. Total working hours were reduced for 61 per cent of respondents, 54 per cent reported less direct operative supervision, and 75 per cent reported missing out on critical operative learning experiences due to elective operating changes. Overall impact on trainee education was reported to be negative by 71 per cent of respondents. Self-assessed overall wellbeing was negatively impacted in 92 per cent of respondents: all reported feeling isolated from colleagues and 67 per cent reported burnout due to changes during the pandemic. Positive innovation in plastic and reconstructive surgery unit management was reported by 29 per cent of respondents. There were no statistically significant differences in responses between early and late Surgical Education and Training trainees. There were some differences identified in senior supervision and frequency of organised teaching between states.

**Conclusion:** Australian plastic and reconstructive surgery trainees in our cohort reported that the COVID-19 pandemic had a negative impact on their clinical training opportunities, formal education and wellbeing. These findings should be considered in planning for future periods of significant disruption to try to mitigate the negative impacts on trainees.

## Introduction

The COVID-19 pandemic had a significant impact on all aspects of global health systems. The impact on the quality of surgical training during the pandemic has been of particular concern given significant reductions in elective surgical case volumes and, in many cases, redeployment of surgical staff to areas of need.<sup>1,2</sup> The experience of plastic and reconstructive surgery (PRS) trainees in the first wave of the pandemic in the United States of America (USA) from March to May 2020 has been studied by several authors, who have documented reductions in outpatient and operative volumes, perceived negative impact on education, increased levels of stress, and concerns about the health and safety of trainees and their families.<sup>3–6</sup> The impact on PRS trainees in the United Kingdom, Europe and India has also been studied and mirrors that of trainees in the USA.<sup>7–9</sup>

The Australian experience of the pandemic was different to that of the USA and Europe in that protracted lockdowns and closure of international and interstate borders successfully mitigated the number of cases, hospitalisations and deaths from the Alpha and Delta waves of COVID-19 in 2020 and through most of 2021. Australia's large spike in cases was instead felt from December 2021 onwards as part of the Omicron wave, at a time of high rates of vaccination in the community. Hospital systems throughout the country moved through different states of modified activity from the beginning of the pandemic through 2021 and into 2022. During this time, elective operating and outpatient clinic volumes were reduced to increase emergency and critical care capacities, affecting the activity of Australian PRS units and the trainee workforce. All states returned to business-as-usual elective activities by the end of 2022.

The aim of this study was to evaluate the impact of the COVID-19 pandemic on PRS trainees in Australia.

## Method

All registrars training in PRS in Australia provide their contact details to the Australian Society of Plastic Surgeons and receive regular correspondence by email. For this study the same correspondence pathway was used to invite participation in a web-based, self-administered survey in October 2021. Participation was voluntary and anonymous. The survey was adapted from a questionnaire that was used for a similar purpose for PRS residents in the USA.<sup>3</sup> Changes were made to adapt the survey questions

to the Australian setting; the questions of the adapted survey are presented in **Supplementary material 1**. Responses were collected until August 2022. The survey was hosted by SurveyMonkey (SurveyMonkey Inc, San Mateo, California, USA), who stored the data until closure of the survey and export of the data in August 2022 to a password-protected computer. Participants were assigned a unique study identifier and responses were anonymised. Statistical analysis was limited due to the small number of respondents. Data were described using frequencies and percentages. The sample was separated into groups for analysis based on state and Surgical Education and Training (SET) level (SET 1.1 through 2.2 compared with SET 3.1 through 5.2). Due to small group sizes, Fisher's exact test was used for binary categorical outcome variables, Wilcoxon rank-sum test was used for ordinal categorical outcome variables with a binary independent variable (early versus late SET), and Kruskal–Wallis rank test was used for ordinal categorical outcome variables with categorical independent variables containing greater than two levels (state). Statistical significance was set at  $p < 0.05$ . All analysis was conducted using Stata 15.1 (StataCorp, College Station, Texas, USA). This study was considered and granted exemption from HREC review by the Far North Queensland Human Research Ethics Committee (reference 1742 AB).

## Results

### Demographic data

The survey was distributed to 103 Australian PRS trainees, of whom 24 responded (23%). Of respondents, 67 per cent were male and 52 per cent were SET 1 or 2 trainees. New South Wales trainees composed 43 per cent of the cohort, Victorian and Queensland trainees each composed 22 per cent of the cohort, and the remaining 13 per cent were South Australian trainees. Respondent demographic data is presented in **Table 1**.

### Clinical activity and supervision changes

Modifications to PRS team structures and/or schedules to reduce the impact of potential COVID-19 exposures were reported by 79 per cent of respondents. Reductions in the number of patients seen through the outpatient department were reported by 88 per cent of respondents. Total working hours were reduced for 61 per cent and increased for 17 per cent of respondents. Regarding supervision by senior PRS staff, 54 per

**Table 1. Respondent demographic data**

| Factor                                          | Number (%) |
|-------------------------------------------------|------------|
| <b>Gender (n = 24)</b>                          |            |
| Male                                            | 16 (67%)   |
| Female                                          | 8 (33%)    |
| Other                                           | 0          |
| <b>Current year of training (n = 23)</b>        |            |
| SET 1.1 or 1.2                                  | 4 (17%)    |
| SET 2.1 or 2.2                                  | 8 (35%)    |
| SET 3.1 or 3.2                                  | 5 (22%)    |
| SET 4.1 or 4.2                                  | 5 (22%)    |
| SET 5.1 or 5.2                                  | 1 (4%)     |
| <b>State of training (n = 23)</b>               |            |
| New South Wales                                 | 10 (43%)   |
| Victoria                                        | 5 (22%)    |
| Queensland                                      | 5 (22%)    |
| South Australia                                 | 3 (13%)    |
| Western Australia                               | 0          |
| <b>Living situation (n = 24)<sup>†</sup></b>    |            |
| Lives alone                                     | 5 (21%)    |
| Lives with an adult in the healthcare field     | 7 (29%)    |
| Lives with an adult not in the healthcare field | 10 (42%)   |
| Live with your child/children                   | 4 (17%)    |
| Live with someone older than 65 years old       | 2 (8%)     |

<sup>†</sup> Living situation options were not mutually exclusive

cent of respondents reported less direct operative supervision, 50 per cent reported less direct supervision in the outpatient clinic, and 65 per cent reported that senior staff were reluctant to be present in the outpatient clinic or operating theatre due to the risk of COVID-19 exposure. Overall, 29 per cent of respondents reported positive innovations in their unit's management during the COVID-19 pandemic. These results are presented in **Table 2**.

### Education and training impacts

Changes to operative experience, including cancellations, were reported as maximally impactful on training by 25 per cent of respondents, moderately impactful by 50 per cent, and minimally impactful by 25 per cent; and 75 per cent reported missing out on critical operative learning experiences due to elective operating changes. The effect of the COVID-19 pandemic on trainee education was reported as somewhat or very negative by 71 per cent of respondents. Reading and virtual teaching sessions were perceived to

**Table 2. Clinical activity restructuring and changes to supervision during the COVID-19 pandemic**

| Response                                                                                                                                        | Number (%) |
|-------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| <b>Alternate scheduling and/or reduced PRS workforce to reduce exposures (n = 24)</b>                                                           |            |
| Yes                                                                                                                                             | 19 (79%)   |
| No                                                                                                                                              | 5 (21%)    |
| <b>Less direct senior operative supervision (n = 24)</b>                                                                                        |            |
| Yes                                                                                                                                             | 13 (54%)   |
| No                                                                                                                                              | 11 (46%)   |
| <b>Reduced outpatient clinic patient numbers (n = 24)</b>                                                                                       |            |
| Yes                                                                                                                                             | 21 (87.5%) |
| No                                                                                                                                              | 3 (12.5%)  |
| <b>Less direct senior supervision in the outpatient clinic (n = 24)</b>                                                                         |            |
| Yes                                                                                                                                             | 12 (50%)   |
| No                                                                                                                                              | 12 (50%)   |
| <b>Perceived reluctance for senior staff to be present in the outpatient clinic or operative theatre due to COVID-19 exposure risk (n = 23)</b> |            |
| Yes                                                                                                                                             | 15 (65%)   |
| No                                                                                                                                              | 8 (35%)    |
| <b>Unit requires or offers working from home during isolation/quarantine (n = 24)</b>                                                           |            |
| Yes                                                                                                                                             | 9 (38%)    |
| No                                                                                                                                              | 15 (63%)   |
| <b>Total working hours during the COVID-19 pandemic (n = 23)</b>                                                                                |            |
| Increased work hours                                                                                                                            | 4 (17%)    |
| No change                                                                                                                                       | 5 (22%)    |
| Reduced work hours                                                                                                                              | 14 (61%)   |
| <b>Has the pandemic driven positive innovation in your unit? (n = 24)</b>                                                                       |            |
| Yes                                                                                                                                             | 7 (29%)    |
| No                                                                                                                                              | 17 (71%)   |

be more useful educational activities than clinical work, practising surgical skills in a simulated environment or conducting research during the pandemic. The frequency of virtual education or meetings increased from a mean of 0.65 (SD 0.91) per week before the pandemic to 1.42 (SD 0.95) per week during the pandemic, but 46 per cent of respondents reported a decreased frequency of organised teaching overall during the pandemic. Short notice cancellation or rescheduling of courses, conferences or exams affected 79 per cent of respondents. These results are presented in **Table 3**.

**Table 3. Education and training impacts during the COVID-19 pandemic**

| Response                                                                                                                          | Number (%) |
|-----------------------------------------------------------------------------------------------------------------------------------|------------|
| <b>Perceived impact of elective operating cancellations and other operating room changes on operative experience (n = 24)</b>     |            |
| Maximally                                                                                                                         | 6 (25%)    |
| Moderately                                                                                                                        | 12 (50%)   |
| Minimally                                                                                                                         | 6 (25%)    |
| <b>As a result of elective operating changes, do you feel that you have missed out on critical learning experiences? (n = 24)</b> |            |
| Yes                                                                                                                               | 18 (75%)   |
| No                                                                                                                                | 6 (25%)    |
| <b>Effect of COVID-19 pandemic on your education (n = 24)</b>                                                                     |            |
| Very positive                                                                                                                     | 0          |
| Somewhat positive                                                                                                                 | 2 (8%)     |
| No effect                                                                                                                         | 5 (21%)    |
| Somewhat negative                                                                                                                 | 12 (50%)   |
| Very negative                                                                                                                     | 5 (21%)    |
| <b>Importance of educational mediums during the COVID-19 pandemic† (n = 24)</b>                                                   |            |
| Virtual education/teaching                                                                                                        | 2.5        |
| Reading                                                                                                                           | 2.4        |
| Doing research                                                                                                                    | 4.0        |
| Practising surgical skills                                                                                                        | 3.3        |
| Continued clinical work                                                                                                           | 2.8        |
| <b>Frequency of virtual educational conferences or meetings prior to the COVID-19 pandemic (n = 24)</b>                           |            |
| None                                                                                                                              | 12 (50%)   |
| Fortnightly                                                                                                                       | 4 (17%)    |
| Weekly                                                                                                                            | 4 (17%)    |
| Twice weekly                                                                                                                      | 3 (13%)    |
| Three or more per week                                                                                                            | 1 (4%)     |
| <b>Frequency of virtual educational conferences or meetings during the COVID-19 pandemic (n = 24)</b>                             |            |
| None                                                                                                                              | 2 (8%)     |
| Fortnightly                                                                                                                       | 6 (25%)    |
| Weekly                                                                                                                            | 8 (33%)    |
| Twice weekly                                                                                                                      | 6 (25%)    |
| Three or more per week                                                                                                            | 2 (8%)     |
| <b>Decreased frequency of organised teaching during the COVID-19 pandemic (n = 24)</b>                                            |            |
| Yes                                                                                                                               | 11 (46%)   |
| No                                                                                                                                | 13 (54%)   |
| <b>Cancellation or rescheduling of course, conference, or exam with short notice (n = 24)</b>                                     |            |
| Yes                                                                                                                               | 19 (79%)   |
| No                                                                                                                                | 5 (21%)    |

† Respondents ranked each activity from 1 to 5, with 1 being the best educational resource. Mean scores for each medium are reported

**Table 4. Health and wellbeing during the COVID-19 pandemic**

| Response                                                                                                                    | Number (%) |
|-----------------------------------------------------------------------------------------------------------------------------|------------|
| <b>Effect of the COVID-19 pandemic on overall wellbeing† (n = 24)</b>                                                       |            |
| My home life has been disrupted by efforts to protect family members/roommates and reduce the risk of COVID-19 transmission | 14 (58%)   |
| My COVID-19 care duties have become a source of financial burden/stress on my family                                        | 4 (17%)    |
| My COVID-19 clinical care duties have become a source of anxiety and psychological stress                                   | 16 (67%)   |
| My COVID-19 clinical care duties have become a strain on my physical health                                                 | 6 (25%)    |
| Other negative impacts                                                                                                      | 3 (13%)    |
| <b>Exposure event at work requiring isolation/quarantine (n = 24)</b>                                                       |            |
| Yes                                                                                                                         | 5 (21%)    |
| No                                                                                                                          | 19 (79%)   |
| <b>Frequency of feeling isolated from colleagues due to social distancing (n = 24)</b>                                      |            |
| Always                                                                                                                      | 2 (8%)     |
| Most of the time                                                                                                            | 5 (21%)    |
| Sometimes                                                                                                                   | 13 (54%)   |
| Rarely                                                                                                                      | 4 (17%)    |
| Not at all                                                                                                                  | 0          |
| <b>Methods of maintaining contact with colleagues† (n = 24)</b>                                                             |            |
| In person with social distancing                                                                                            | 19 (79%)   |
| In person without social distancing                                                                                         | 8 (33%)    |
| Video conferencing                                                                                                          | 13 (54%)   |
| Telephone                                                                                                                   | 16 (67%)   |
| Email                                                                                                                       | 3 (13%)    |
| Other                                                                                                                       | 0          |
| <b>Perceived level of unit support of trainee psychosocial wellbeing during the COVID-19 pandemic (n = 24)</b>              |            |
| Maximal                                                                                                                     | 3 (13%)    |
| Moderate                                                                                                                    | 10 (42%)   |
| Minimal                                                                                                                     | 11 (46%)   |
| <b>Unit supports of trainee psychosocial wellbeing during the COVID-19 pandemic† (n = 24)</b>                               |            |
| Financial support                                                                                                           | 0          |
| Child care support                                                                                                          | 0          |
| Physical wellness (eg virtual group exercise)                                                                               | 2 (8%)     |
| Psychosocial wellness (eg virtual group activities)                                                                         | 2 (8%)     |
| Reduced clinical working hours                                                                                              | 7 (29%)    |
| Alterations to clinical duties to reduce potential COVID-19 exposures                                                       | 7 (29%)    |
| Other                                                                                                                       | 3 (13%)    |
| Not applicable                                                                                                              | 14 (58%)   |
| <b>Impact of the pandemic on socialising outside of work (n = 24)</b>                                                       |            |
| Yes                                                                                                                         | 24 (100%)  |
| No                                                                                                                          | 0          |
| <b>Trainee experience of burnout as a result of changes brought about by the COVID-19 pandemic (n = 24)</b>                 |            |
| Yes                                                                                                                         | 16 (67%)   |
| No                                                                                                                          | 8 (33%)    |

† Responses were not mutually exclusive

## Health and wellbeing

The changes brought about by the COVID-19 pandemic negatively impacted perceived overall wellbeing of 92 per cent of respondents. All respondents reported feeling isolated from colleagues due to social distancing to some extent, with 29 per cent feeling isolated most or all of the time. Regarding PRS unit support of trainee psychosocial wellbeing, 46 per cent of respondents felt minimally supported, 42 per cent felt moderately supported and only 13 per cent felt maximally supported. All respondents reported that the pandemic had negatively impacted their social life outside of work and 67 per cent reported burnout resulting from changes during the pandemic. These results are presented in **Table 4**.

## Subgroup analysis

Differences in responses between early and late SET trainees across outcome variables regarding supervision, effect on operating experience and training, education and burnout were explored, and no statistically significant differences were identified.

Trainees in different states had statistically significantly different responses to three questions pertaining to senior supervision, organised teaching, and working from home during periods of self-isolation:

- One hundred per cent of Victorian respondents and 70 per cent of New South Wales respondents reported reluctance from senior staff to be present for supervision during theatre or clinic sessions compared to 50 per cent of Queensland respondents and none of the South Australian respondents ( $p=0.033$ ).
- The frequency of organised teaching was reported as decreased by 100 per cent of Queensland respondents and 67 per cent of South Australian respondents compared with 30 per cent of New South Wales respondents and 20 per cent of Victorian respondents ( $p=0.023$ ).
- One hundred per cent of Victorian respondents were required or offered to work from home during periods of personal social isolation or quarantine compared with only 20 per cent of New South Wales and Queensland respondents and none of the South Australian respondents ( $p=0.005$ ).

## Discussion

The COVID-19 pandemic brought significant changes to the clinical workload, team structures and processes in PRS units in Australia, as it did

across the whole health system. We have captured some of the material changes to the work of Australian PRS units through the lens of PRS trainees and the impact on trainees of these changes in the domains of perceived training quality, formal education and psychosocial wellbeing.

Most respondents perceived that the quantity and quality of their training and education during the pandemic was reduced. Most respondents reported reduced overall working hours, reduced operative and clinical supervision by seniors, and reduced operative experience and learning opportunities during the pandemic. A higher proportion of respondents from Victoria and New South Wales reported reluctance from senior staff to supervise theatre and clinic sessions in person than those from Queensland and South Australia. This highlights an area for potential improvement, where policy could clarify expected and appropriate supervision in both normal and extenuating circumstances (such as a future pandemic) at the level of the Australian Society of Plastic Surgeons, individual health services and individual units. Our results were consistent with the self-reported experience of PRS trainees in the USA, a majority of whom reported a negative impact on their education, and 52.4 per cent of whom reported a maximal or moderate effect on their operative experience. Notably, this effect was more significant in final year USA trainees, while a difference was not found between the experiences of early and late SET Australian trainees in this study.<sup>3</sup> Similar negative impacts on surgical case volumes and perceived negative impact on training were reported in PRS trainees from Europe, India, Canada and the UK.<sup>7-9</sup>

Though the frequency of virtual education was increased during the pandemic, the overall frequency of formal trainee education was reduced for nearly half of respondents, and most had disruption to courses, conferences or exams. More respondents from Queensland and South Australia reported fewer organised teaching sessions than those from New South Wales and Victoria, which is likely reflective both of the pre-COVID education format (face-to-face versus virtual) and the adaptations to the education schedule and format during the pandemic made by each state. The frequency of education sessions reported by Australian trainees in our cohort was much lower than that reported by USA trainees (mean 1.4 virtual education sessions per week compared with 4.2 sessions per week).<sup>3</sup> Respondents to our survey reported similar

frequency of teaching sessions to the Australian PRS trainees who responded to a survey reported by Budden and colleagues (2021), and despite the lower frequency of education sessions when compared with USA trainees, 91 per cent of Australian trainees reported being satisfied with the frequency of formal education.<sup>7</sup> Experiences with virtual education for PRS training programs and other surgical training programs have been reported on extensively, with a majority of respondents supporting their usefulness.<sup>3,8,10</sup> As with the increased use of telehealth services, the ongoing use of virtual education may be one of the positive changes caused by the COVID-19 pandemic.

Two-thirds of respondents reported experiencing burnout as a result of the changes brought about by the COVID-19 pandemic, and almost all respondents felt their overall wellbeing had been negatively impacted. Feeling socially isolated from colleagues and friends was reported by all respondents. Negative psychosocial impacts of the pandemic were consistently reported by international cohorts of PRS and other surgical trainees.<sup>2,3,5,9,11</sup>

The survey achieved a response rate of 23 per cent of all Australian PRS trainees. While not as high as the 56.1 per cent response rate of the similar survey of USA trainees conducted by Crowe and colleagues,<sup>3</sup> our response rate is high enough that our sample can be considered representative of the PRS trainee population given there is no clear reason to suspect a systematic bias in those who responded.<sup>12</sup> No Western Australian trainees responded to the survey and given the difference in COVID-19 case numbers and public health measures between Western Australia and the other states, their experience may have been different such that the results of our survey may not be generalisable to Western Australian PRS trainees. A higher response rate would have improved the usefulness of subgroup analysis, which was limited due to low subject numbers. A further limitation of this study is the cross-sectional design (single time point), though the impact of this may be mitigated by having distributed our survey in October 2021, approximately 18 months after the declaration of the pandemic in March 2020, allowing trainees

to reflect on their overall experience of the pandemic. The survey tool itself was adapted from a survey for USA trainees developed with multi-institutional expert panel input and pilot testing, and has not been reliability tested—we consider that reliability testing of a survey for this purpose is impracticable, and we have made reasonable adaptations to the most relevant and well-constructed survey tool available.

## Conclusion

Australian PRS trainees in our cohort reported significant disruption and negative impacts on their clinical training, formal education and psychosocial wellbeing during the COVID-19 pandemic. Policy makers at the surgical society and health service level have an opportunity to use what we have learned from the pandemic to set expectations during future crises about senior supervision of trainees, organised trainee education and contributors to trainee wellbeing, so that the overall quality and experience of training during crises can be improved and made more consistent across Australia.

## Conflict of interest

The authors have no conflicts of interest to disclose.

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## References

- 1 Munro C, Burke J, Allum W, Mortensen N. Covid-19 leaves surgical training in crisis. *BMJ*. 2021;372:n659. <https://doi.org/10.1136/bmj.n659> PMID:33712499
- 2 Wise CE, Berekenyi Merrell S, Sasnal M, Forrester JD, Hawn MT, Lau JN, Lin DT, Schmiederer IS, Spain DA, Nassar AK, Knowlton LM. COVID-19 impact on surgical resident education and coping. *J Surg Res*. 2021;264:534–43. <https://doi.org/10.1016/j.jss.2021.01.017> PMID:33862581 PMCID:PMC7877215



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- 3 Crowe CS, Lopez J, Morrison SD, Drolet BC, Janis JE. The effects of the COVID-19 pandemic on resident education and wellness: a national survey of plastic surgery residents. *Plast Reconstr Surg*. 2021;148(3):462e–74e. <https://doi.org/10.1097/PRS.00000000000008281> PMID:34432706
- 4 Epstein A, Jabori SK, Wo LM, Huberman M, Samaha G, Ovadia S, Thaller SR. Reflecting on plastic surgery training during early COVID-19 pandemic: resident exposure and telemedicine. *J Craniofac Surg*. 2022;33(6):1820–824. <https://doi.org/10.1097/SCS.00000000000008471> PMID:35762598 PMCID:PMC9432419
- 5 Jabori SK, Epstein A, Wo LM, Samaha GJ, Bayati MA, Ovadia S, Thaller SR. Plastic surgery training during coronavirus disease 2019 pandemic: a quantitative study on trainees' wellness and education. *J Craniofac Surg*. 2022;33(6):1679–683. <https://doi.org/10.1097/SCS.00000000000008419> PMID:35968981 PMCID:PMC9432422
- 6 Shah J, Zhao R, Yi J, Otterburn D, Patel A, Szpalski C, Tanna N, Taub PJ, Weichman KE, Ricci JA. Frontline reporting from the epicenter of a global pandemic: a survey of the impact of COVID-19 on plastic surgery training in New York and New Jersey. *Plast Reconstr Surg*. 2022;149(1):130e–38e. <https://doi.org/10.1097/PRS.00000000000008649> PMID:34936636 PMCID:PMC8691163
- 7 Budden CR, Rannard F, Mennie J, Bulstrode N. The impact of COVID-19 on plastic surgery training in the United Kingdom, Canada and Australia—a cross-sectional study. *Indian J Plast Surg*. 2021;54(3):327–33. <https://doi.org/10.1055/s-0041-1734569> PMID:34667519 PMCID:PMC8515307
- 8 Tripathy S, Mohapatra DP, Sahu RK, Mohsina S, Sharma RK, Khan S, Renu S, Singh CK, Nair SR, Koliath S, Pathan I. The impact of 'COVID-19' and 'Webinar Pandemic' on plastic surgery practice in teaching institutes and resident training—a multicentric perspective. *Indian J Plast Surg*. 2022;55(1):45–53. <https://doi.org/10.1055/s-0041-1735425> PMID:35444741 PMCID:PMC9015845
- 9 Paskal AM, Jaremków P, Małyszczak P, Paskal W, Wójcik K, Opyrchal J, Paul MA. Impact of COVID-19 pandemic on plastic surgery training in Europe. *J Plast Reconstr Aes*. 2022;75(5):1696–703. <https://doi.org/10.1016/j.bjps.2021.11.090> PMID:34973932 PMCID:PMC8632853
- 10 Cho MJ, Hong JP. The emergence of virtual education during the COVID-19 pandemic: the past, present, and future of the plastic surgery education. *J Plast Reconstr Aes*. 2021;74(6):1413–421. <https://doi.org/10.1016/j.bjps.2020.12.099> PMID:33541826 PMCID:PMC7797168
- 11 Rana T, Hackett C, Quezada T, Chaturvedi A, Bakalov V, Leonardo J, Rana S. Medicine and surgery residents' perspectives on the impact of COVID-19 on graduate medical education. *Med Educ Online*. 2020;25(1):1818439. <https://doi.org/10.1080/10872981.2020.1818439> PMID:32924869 PMCID:PMC7534325
- 12 Mealing NM, Banks E, Jorm LR, Steel DG, Clements MS, Rogers KD. Investigation of relative risk estimates from studies of the same population with contrasting response rates and designs. *BMC Med Res Methodol*. 2010;10:26. <https://doi.org/10.1186/1471-2288-10-26> PMID:20356408 PMCID:PMC2868856