

Academics in the Pandemic: Early Impact of COVID-19 on Plastic Surgery Training Programs

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Background: The COVID-19 global pandemic has impacted plastic surgery training in the United States, requiring unprecedented measures to prepare for potential surges in critically ill patients. This study investigates how plastic surgery programs responded to this crisis, as well as how successful these changes were, through a survey of program directors and of residents at academic training programs in the United States.

Methods: Two separate anonymous online surveys were conducted via REDCap between April 16 and June 4, 2020. The first survey was distributed to program directors, and the second was distributed to plastic surgery residents. Resident responses were then subdivided for an analysis between geographic regions.

Results: Of the 59 program director responses (43.7%), the majority of programs implemented a platoon approach for resident coverage. A minority did the same for attending coverage. In total, 92% transitioned to virtual didactics only. Plastic surgery residents covered alternative services at 25% of responding institutions, and an additional 68% had a plan in place for responding to personnel shortages. Overall, residents were satisfied with their program's response in a variety of categories. When subdivided based on geographic region, respondents in the Northeast and Northwest were less satisfied with resident wellness, personal and loved ones' safety, and program communication.

Conclusions: With the possibility of a "second wave," successful methods of academic programs adapting to the pandemic should be communicated to reduce the future impact. Increased frequency of communications between program directors and residents can improve mental health and wellness of the resident population. (*Plast Reconstr Surg Glob Open* 2020;8:e3320; doi: [10.1097/GOX.0000000000003320](https://doi.org/10.1097/GOX.0000000000003320); Published online 25 November 2020.)

INTRODUCTION

The COVID-19 global pandemic has had a devastating impact on all aspects of society.¹ Current US training programs have no precedent for this in modern history. Smaller outbreaks such as the Ebola virus in underdeveloped countries have helped us develop surge planning and management strategies for highly contagious diseases, but deployment of these strategies has not been necessary until now.^{2,3} Bracing for surges in the numbers of patients

requiring critical care, hospitals across the United States halted routine daily operations, and resource management became a primary concern.⁴ The mandated social distancing, cancellation of elective surgical procedures, and shelter-in-place orders resulted in severe disruptions of surgical residents' daily hospital lives and schedules.⁵⁻⁸ Program administrators have had to implement drastic measures to conform to an ever-changing set of guidelines and regulations from local, state, and federal levels.⁹

This study was designed to explore how plastic surgery programs responded to the COVID-19 crisis, and also quantify resident attitudes to these changes. While understanding what actions program directors have taken to adapt to the pandemic is important, understanding the impressions of the group most affected—plastic surgery residents—is critical.

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MATERIALS AND METHODS

Study Design

A cross-sectional, IRB-approved study was designed and consisted of 2 separate anonymous online surveys. Study data were collected and managed using Research Electronic Data Capture.¹⁰ The Research Electronic Data Capture is a secure, web-based application designed to support data capture for research studies.

Both surveys were distributed in compliance with the American Council of Academic Plastic Surgeons guidelines. The first survey was sent to all 135 plastic and reconstructive surgery training programs in the United States to determine what changes were made to the residents' schedules, educational curricula, patient care responsibilities, and faculty coverage of day-to-day tasks. This was sent on April 16, 2020, and the responses were collected over 6 weeks before the survey was closed on June 3, 2020.

The second survey was intended for residents in plastic and reconstructive surgery training programs. It was designed to determine their sentiments toward changes in the clinical and educational environments made by their programs in response to the pandemic. After getting approval from American Council of Academic Plastic Surgeons, the survey was first distributed via email communication on April 16, 2020, and was closed on June 4, 2020. The resident survey was conducted utilizing a 5-point Likert scale, with 1 = Strongly Disagree, 2 = Somewhat Disagree, 3 = Neutral, 4 = Somewhat Agree, and 5 = Strongly Agree. Data from the ACGME RRC for plastic surgery were collected to determine the impact of the changes on case volume and program surveys.

Survey questions for both the program director and resident surveys are included as supplemental digital contents. (See survey, Supplemental Digital Content 1, which displays the response to COVID-19 crisis director survey. <http://links.lww.com/PRSGO/B528>; See survey, Supplemental Digital Content 2, which displays the response to COVID-19 crisis resident survey. <http://links.lww.com/PRSGO/B529>.) An optional free-text box was included for respondents to identify their affiliated institution. Geographic location of institution was collected (Northeast, Southeast, Midwest, Northwest, and Southwest).

Statistical Analysis

Likert scores from the resident survey were summarized using mean \pm SD. Each question's mean score was compared by geographic region using the Kruskal-Wallis test. All statistical analyses were performed using R Statistical Software (version 1.1.447; R Foundation for Statistical Computing, Vienna, Austria) and $P < 0.05$ was considered statistically significant. Descriptive statistics were calculated for the Program Director survey, given the non-standardized responses. For selected free-text responses, a Word Cloud generator was used to give a visual representation of the most commonly encountered words.

RESULTS

Program Director Survey

Fifty-nine program directors responded to the survey (response rate: 43.7%). In total, 96% of respondents modified coverage of the inpatient plastic surgery services at their institutions. The majority (56%) instituted a platoon approach that was rotated on a regular basis. Operative case coverage was also modified, with 42% of respondents having only essential personnel operating, and 30% instituting the platoon approach. In programs where residents had increased unstructured time (eg, tiered platoon system with week on/week off approach), nearly all respondents reported increased expectations for either didactics, research production, conference attendance, or a combination of these. Regarding faculty/attending coverage of essential services, the majority of respondents (65%) did not implement any change, while 20% implemented attending platoon systems.

In total, 92% of programs transitioned to virtual didactics only, and 93% reported either no change (31%) or an increase (62%) in the frequency of didactics. Regarding exposure to confirmed COVID-positive patients or Persons Under Investigation (PUI), 63% tested/quarantined residents with symptoms, and 29% of programs tested and/or quarantined anyone with suspected exposure. Similar results were reported for faculty/attending exposure to suspected/confirmed COVID patients (56% tested/quarantined at onset of symptoms, 32% tested/quarantined suspected exposure). Regarding testing for surgical patients, the majority (66%) of respondents were testing all surgical patients before surgery, whereas 24% were testing only symptomatic patients at the time of survey completion.

Plastic surgery residents/fellows were asked to cover alternative services at 25% of responding institutions due to personnel shortages. An estimated 68% of institutions did not have plastic surgery residents covering, but had a plan in place if institutions began experiencing increased personnel shortages. Regarding elective rotations, 56% of programs had postponed/cancelled all elective rotations indefinitely. While 22% evaluated electives on an individual rotation basis, 20% had not changed the participation in elective rotations. In total, 66% of programs postponed/cancelled away or visiting rotations indefinitely. Conversely, 58% of programs did not alter vacation schedules. An estimated 71% of programs implemented special precautions for high-risk residents/fellows, including not allowing contact with confirmed or suspected COVID patients, or self-quarantine for high-risk residents.

Finally, respondents were asked to list 1–2 implementations to address resident wellness. Many responses highlighted a system-based program, including available mental health counseling, weekly huddles, increased “check-ins” between residents and Program Director, or scheduled weekly social hour/happy hour virtual calls. There was also recognition that implementation of the platoon system allowed increased time off, which was a welcome break from the daily rigors of residency, with

some respondents encouraging residents to focus on family life, learning new hobbies, etc.

Resident Survey

In total, 116 survey responses were recorded. Responses were distributed across 18 states in 5 geographic regions: 27% Southeast, 26% Northeast, 23% Midwest, 13% Southwest, and 11% Northwest (Fig. 1). Program affiliation was reported in 70% of respondents, while 30% chose to remain anonymous. Residents had a strong positive view of their program’s response to the crisis regarding clinical activities, educational curriculum, resident safety, and resident wellness: 80% or more of respondents were somewhat or strongly satisfied with their program’s response to these areas.

Regarding residents’ ability to receive adequate medical education, responses were mixed. Of the respondents, 45% felt somewhat or strongly concerned about their ability to receive an adequate medical education, while 42% of residents felt that their medical education remained adequate. Within the last 2 months, the majority of residents felt comfortable fulfilling clinical duties, and did not feel overwhelmed (72% and 66% respectively). An estimated 73% of respondents did not feel concerned about career choice over the last 2 months.

Regarding personal safety while performing clinical duties, 44% reported that they were fearful to some degree, while 37% did not feel fearful. Likewise, the majority of residents (63%) were fearful for family/close friend’s safety due to potential exposure risks that the respondent may pose. Interestingly, the majority of residents agree that surgical training was negatively impacted to some degree (45% agree, 29% disagree).

Similar to respondent’s satisfaction with the program, residents were also very satisfied with the communication from both their program and their institution (85% and 80%, respectively). An estimated 75% of respondents felt that their institution was prepared to handle the crisis.

Given the regional distribution of the COVID-19 outbreak, the responses were sub-divided into geographic regions. Four survey questions demonstrated a significant difference between geographic regions ($P < 0.05$): 1) response by program relating to resident wellness; 2) feeling fearful for personal safety while participating in clinical duties; 3) feeling fearful for family/close friends’ safety due to potential exposure risks; 4) satisfaction with program communication. (See table, Supplemental Digital Content 3, which displays the resident survey subdivided into response averages by geographic region. <http://links.lww.com/PRSGO/B527>.)

Program director response to resident wellness was noted to be statistically significant in the Kruskal-Wallis analysis, with the lowest score in the Northeast (3.63) and the highest score in the Southeast (4.77) (Fig. 2). Residents were generally not fearful of their own personal safety while performing clinical duties, but there were statistically significant differences between geographic regions, with the Northwest being the most concerned (3.54) and the Southwest being the least (2.13) (Fig. 3). Regarding fear for family or personal friends

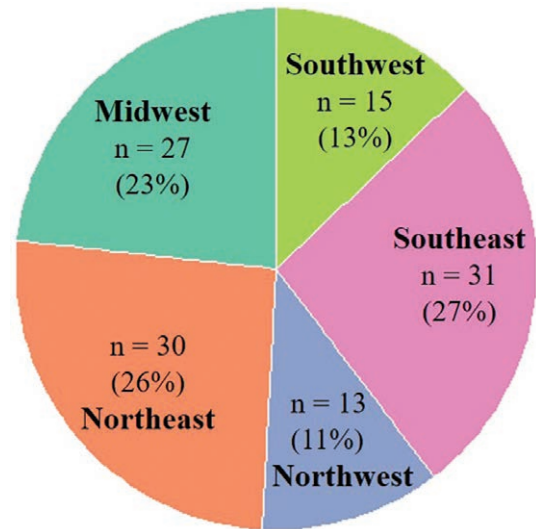


Fig. 1. Pie diagram showing resident responses by region.

Resident satisfaction: program wellness

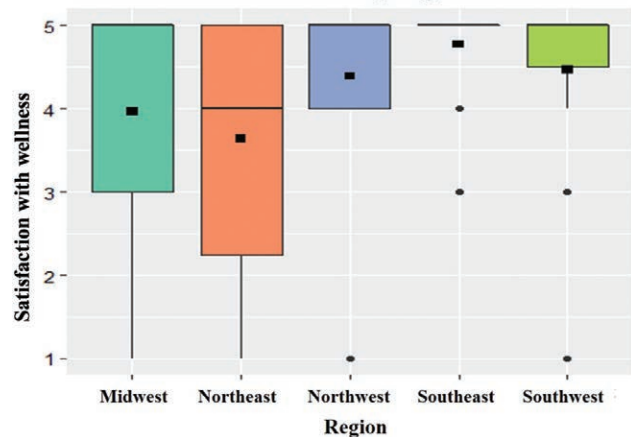


Fig. 2. Box-and-whisker plot demonstrating satisfaction of residents with program response regarding resident wellness (5 = Strongly Agree, 1 = Strongly Disagree).

due to respondent’s personal exposure risks, the same difference was seen, with the Northwest demonstrating the most concern (4.00) and Southwest demonstrating the least (2.67) (Fig. 4). Finally, satisfaction with communication from the program was also significantly different between regions, with the Midwest and Northeast being the least satisfied (3.96 each), and Northwest and Southwest the most satisfied (4.84 and 4.87, respectively) (Fig. 5).

Moreover, data from the ACGME RRC were reviewed for the authors’ training institutions to investigate the impact of the pandemic on operative case volume. At both institutions, the total case volume for graduating residents from the 2018–2019 and 2019–2020 academic years was reviewed. The total case volume was not impacted, and in some instances the 2019–2020 graduating residents had higher case volumes than the previous year’s graduating class. (See survey, Supplemental Digital Content 1,

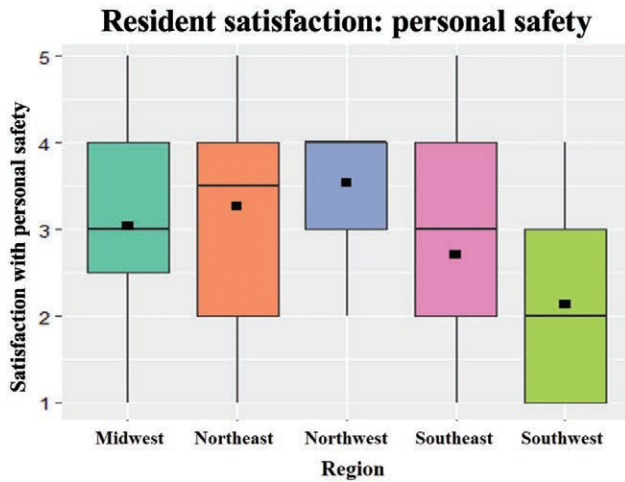


Fig. 3. Box-and-whisker plot demonstrating resident attitudes regarding fear for personal safety while conducting clinical duties (5 = Strongly Agree, 1 = Strongly Disagree).



Fig. 4. Box-and-whisker plot demonstrating resident attitudes regarding fear for family and close friends' safety due to potential exposure while conducting clinical duties (5 = Strongly Agree, 1 = Strongly Disagree).

which displays the response to COVID-19 crisis director survey. <http://links.lww.com/PRSGO/B528>; See survey, Supplemental Digital Content 2, which displays the response to COVID-19 crisis resident survey. <http://links.lww.com/PRSGO/B529>.)

DISCUSSION

The impact that COVID-19 has had cannot be overstated. Countries have closed borders, societal norms have been radically changed, tens of millions of Americans have lost their jobs, and hundreds of thousands have lost their lives.¹¹ In hospitals on the frontline of this global battle, training programs have not been spared from the chaos.¹² Some programs have documented an 80% reduction in case volume in the first month of the virus outbreak.^{13,14}

Unfortunately, there was a paucity of state and national guidelines, specifically with regard to elective

surgical procedures.⁹ This has placed the burden of developing regulations on hospitals and their various departments.¹⁵ This study is a snapshot of how academic plastic and reconstructive surgery training programs adapted to the tumultuous first 3 months of the COVID-19 outbreak, from both a faculty and a resident perspective. With a 44% response rate by program directors, 116 resident responses, and a diverse response pool representing 18 different states and all 5 geographic regions, this is likely a representative view of plastic surgery training programs in the United States.

The majority of institutions modified resident coverage of essential services by switching to a “platoon” system, with divided and isolated teams that would alternate on weekly or biweekly schedules. Roughly two-thirds of programs (65%) made no modification to attending coverage of essential services. Platoon systems have multiple benefits: first, it decreases the exposure of residents/faculty to the hospital; second, if one team contracted the virus, the other would be able to ensure continuity of care.¹⁶ The University of Washington Department of General Surgery recently published the restructuring that occurred in response to the outbreak, which involved 3 “ platoons” to cover the 3 main phases of care: inpatient, clinic, and operative.¹⁷

Testing for residents and faculty was similar, with the majority of programs testing and quarantining only symptomatic individuals. A minority of programs tested/quarantined anyone with suspected exposure. Unsurprisingly, conferences and didactics previously held in-person were transitioned to virtual platforms nearly across the board (92%), and the frequency of didactics increased at 62% of programs. Anecdotally, this may be a natural result of decreased resident operating room exposure, with programs increasing didactics to compensate for this deficiency.

Fifteen programs (25%) had plastic surgery residents covering non-surgical services, and over two-thirds of programs had a tentative plan for off-service coverage in the event of critical personnel shortage. Off-service coverage included Emergency Department, ICU, Trauma, Burn, and General Surgery services. Of note, 8 of the 15 programs (53%) requiring residents to cover non-surgical services were located in the Northeast. A recent survey of 63 surgeons and residents in the UK revealed more than half of respondents answered negatively when evaluating their own ICU skills.¹⁸ If plastic surgery residents are required to cover medical intensive care units, one might expect a similar lack of confidence.

From a different perspective, residents had a generally positive view of their program's response to the crisis in a variety of areas (resident education, safety, wellness, and clinical duties). There was mixed sentiment on resident's ability to maintain an adequate education. Most residents (63%) agreed that they felt fearful for family or close friends due to the risk of exposure that they themselves may provide.

After stratifying the responses by geographic region, interesting trends were noted. (See table, Supplemental Digital Content 3, which displays the resident survey

Resident satisfaction: program communication

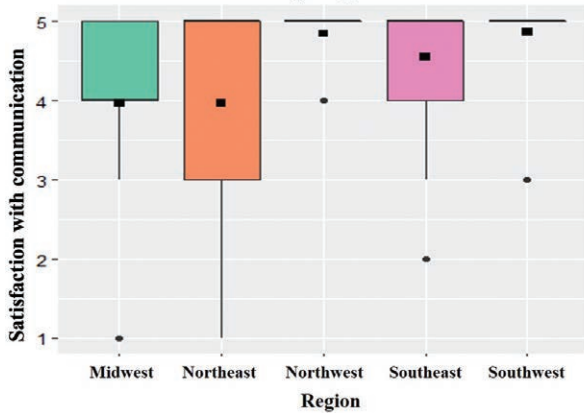


Fig. 5. Box-and-whisker plot demonstrating resident satisfaction with program communication (5 = Strongly Agree, 1 = Strongly Disagree).

subdivided into response averages by geographic region. <http://links.lww.com/PRSGO/B527>.) Residents in the Northeast were significantly less satisfied with response to resident wellness (Fig. 2). The Northwest respondents were

more fearful both for personal safety and for the threat posed to family and close friends (Figs. 3, 4). Residents in the Northeast and Midwest were significantly less satisfied with communication from programs, compared to residents in the Southwest and Northwest (Fig. 5). The causes for these discrepancies are likely multifactorial, and future investigations should attempt to clarify these trends. However, recognizing that the Northwest and Northeast were 2 of the hardest hit geographic regions in the early months of the outbreak may provide some context to these data.¹⁹

Before the start of the pandemic, mental health and wellness of resident physicians was a robust area of research.^{20,21} With the added stressors of the pandemic, a greater degree of attention to the resident mindset is warranted.^{22,23} In both the program director's and resident's surveys, an optional free-text response box at the end allowed respondents to communicate methods implemented to focus on resident wellness. Word clouds were generated from these free text responses (Figs. 6, 7). The most common theme was increased communication between residents and program directors, with multiple Program Directors noting weekly, biweekly, or more frequent "check-ins" with all residents. Creative



Fig. 6. Program Director free-text responses to prioritization of resident wellness and health.



Fig. 7. Resident free-text responses regarding overall mental health during the pandemic (April–June 2020).

solutions included exercise classes, “game nights,” weekly virtual “happy hour,” cooking demonstrations, and meditation sessions that were led by residents or faculty members. Other comments referenced the presence of system-wide wellness programs and availability of counselors.

This study is not without limitations. One concern is the inability to obtain the denominator for the resident responses. After getting approval from American Council of Academic Plastic Surgeons, the survey was distributed via email. However, the distribution to residents is ultimately filtered by program coordinators. The authors have no way of accurately quantifying the residents who received the survey, and subsequently cannot state the response rate.

Another limitation includes the inability to quantify the impact of the outbreak on specific institutions. The survey responses were from April to June of this year. The outbreak has impacted different cities, states, and geographic regions at different timepoints. Unfortunately, there was no method to directly correlate the regional impact of the virus and resident/program director responses.

CONCLUSIONS

With the strong likelihood of a “second wave” in the fall,²⁴ successful methods of training program responses in the early phases should be communicated to all programs. What we have learned from the first surge in the spring is alternating platoon systems of residents, and faculty are a viable and widely-used tactic to decrease exposure and burnout. At the authors’ own high-volume training programs, the operating volumes of the graduating residents were not significantly impacted. This may be explained by residents being very busy and surgically active during the “on” times, as fewer residents would be available for coverage. It would likewise be expected that during these down-times, there will be an increase in academic productivity. When surges occur, residents may be required to cover alternative services that are outside the normal scope of practice. Programs should support residents by providing additional educational review to help them feel prepared as well as ensuring adequate supervision in these situations. Residents should be encouraged to increase productivity during their increased down-time, but program directors should prioritize resident health and wellness by establishing open and frequent communications with trainees.

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