

Reflecting on Plastic Surgery Training During Early COVID-19 Pandemic: Resident Exposure and Telemedicine

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Purpose: Coronavirus disease 2019 (COVID-19) pandemic has been an unprecedented public health crisis. As hospitals took measures to increase their capacity to manage COVID-19 patients, plastic surgeons have also had to modify their routine to continue serving their vital role within the hospital environment. In an effort to reduce exposure to COVID-19 and conserve hospital resources, many plastic surgery programs drastically modified call schedules, restructured inpatient teams, triaged operative cases, and expanded telemedicine encounters. Plastic surgery programs focused on craniofacial procedures were impacted by precautionary preventative protocol and shifts in case load made to protect both the healthcare teams and the patients. At academic centers, plastic surgery trainees of all domains felt the impact of these changes. Recognizing the implications on future craniofacial surgical practice, the pandemic has made, the goal of the authors' study is to measure initial impacts of COVID-19 on plastic surgery trainees using a nationwide survey. The authors' results present the first quantitative analysis of plastic surgery trainees' exposure to COVID-19, deployment to other medical specialties, usage of personal protective equipment, and implementation of telemedicine during the pandemic. While healthcare systems have greatly adapted to pandemic complications and can anticipate vaccination, resurgence of COVID-19 cases linked to the delta variant heightens the authors' urgency in understanding the early pandemic, and its lasting impacts on healthcare. In the months following pandemic onset, telemedicine has become a mainstay in healthcare, trainees have adapted and become integrated in patient care in novel ways, and visits unable to transition to telemedical settings received substantial attention to ensure patient and provider safety.

Methods: An institutional review board-approved anonymous, multiple-choice and short-answer, Qualtrics survey regarding plastic surgery resident experiences with COVID-19 exposure. It was sent to all US plastic surgery program directors and program coordinators on April 23, 2020 with the request to distribute the survey to their residents. Residents were given the option to participate in a raffle for a \$50 gift card. Outcomes measured included demographics, exposure to COVID-19, availability of resources, and adjustments to residency training practices.

Results: Sixty-nine plastic surgery residents throughout all years of training from 18 states responded. Gender, year of training, and location did not significantly impact these reports.

Sixteen percent of residents reported covering a COVID-19 team. Twelve percent reported covering a shift not within their scope of practice. From these reports, residents mostly worked in the intensive care unit (50%) and the emergency department (29%).

Half of the residents believe they were exposed to high-risk patients. This was reported in a variety of settings: the emergency department for plastic surgery consults (34%), caring for plastic surgery inpatients (16%), performing trauma reconstruction surgery (16%), cancer reconstruction surgery (12%), elective surgery (6%), and intraoperative consults (6%).

Seventy-two percent of residents reported adequate access to personal protective equipment. Equipment type varied by patient exposure. When attending to a non-COVID-19 inpatient, most residents used a standard mask (62%) rather than an N95 mask (21%). N95 masks were generally used in patients with unknown COVID-19 status. Residents reported using eye and face shields when attending to non-COVID-19 ICU patients (17%), patients with unknown COVID-19 status (27%), and in the operating room (34%).

Forty percent of residents implemented telemedicine to see patients for new consults, follow-up visits, postop checks, and wound checks. Eighty-five percent of residents report that they would continue to incorporate telemedicine in the future. Most significant reported barrier to using telemedicine is the limited ability to perform a physical examination (33%) followed by limited patient access to telemedicine (21%). Other challenges included poor ease of use for patients or providers, billing questions, and lack of interpersonal connection with patients.

Conclusion: This study, to the best of the authors' knowledge, is the first to quantitatively investigate how plastic surgery residents have been affected by the widespread impacts of the COVID-19 pandemic. It reports resident exposure to COVID-19 and their associated concerns, resident access to and perceived adequacy of personal protective equipment, as well as changes to clinical practice.

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Coronavirus disease 2019 (COVID-19) pandemic placed unprecedented strain and complex implications on global healthcare systems. As hospitals and health systems prepared for influxes of highly contagious patients, attention and resources were acutely focused on supporting COVID-19 patients, reducing virus transmission to patients and hospital staff, and decreasing the burden on the healthcare system.¹ This, in turn, significantly restructured standard hospital functioning. Not only was plastic surgery training affected, but studies indicate facial plastic and reconstructive training was uniquely impacted due to the operative experience-based training. Cross-sectional survey of facial plastic and reconstructive surgery fellowship directors indicated a direct negative impact on craniofacial surgery volume and 50% reported less patient willingness to undergo congenital/craniofacial surgery.² Many plastic surgery residency programs had to drastically modify call schedules, restructure inpatient teams, triage operative cases, and ramp up telemedicine to adjust to these changing demands.

Redefining medical resident and fellow roles was first seen at the University of Washington Medicine. Specifically, for plastic surgery trainees, University of Washington hospitals promptly limited clinical services, reporting declines in surgical volume from 75% up to 100%.³ With the March 2020 formal advisory to cancel elective and non-essential medical procedures, plastic surgery residents were further limited in their scope of practice and operative experience.⁴ This abrupt shift in hospital functioning and reduced operative load surfaced question of how plastic surgery trainees would remain integrated within hospitals. Although operative load initially reduced, the pandemic elevated patient demand for cosmetic/aesthetic procedures.³ This elevated demand places increased urgency on developing safety protocol for craniofacial surgery procedures and among alternatives to reduce viral risk.

To reduce viral risk, healthcare systems around the country were encouraged to explore alternatives to face-to-face visits with patients.¹ These included utilizing televisit systems between healthcare providers and inpatients and for patient consultations to minimize exposure.⁵ This was particularly important for maintaining patient contact while preventing further COVID-19 spread. Some authors suggest the shift to televisit systems may have reduced patient bias and the impact of traditional marketing-related elements of when selecting craniofacial surgeons particularly for cosmetic/aesthetic operations.⁶

Visits that could not be oriented to telehealth were subject to new procedures and protective measures to reduce transmission. Craniofacial surgery has a notable risk as COVID-19 is heavily concentrated in areas of craniofacial surgical specialty. Recommendations across healthcare providers limited craniofacial procedures to urgent and emergency cases to reduce the associated viral burden.⁷ When determining urgency, the time-sensitive nature of craniofacial procedures and the risks of postponing such procedures had to be considered and weighed against the exposure risks largely without specific state guidelines.⁸

Proper personal protective equipment (PPE) for craniofacial surgery was an additional concern. While all specialties faced PPE scarcity, N95 masks alone were found insufficient at controlling the virus during operations in craniomaxillofacial regions. For procedures involving prolonged exposure to the oral cavity, nasopharynx, oropharynx, larynx, and trachea, especially those involving aerosol and plume generating tools such as suction, electrocautery, and laser, use of PAPR (Powered,

Air Purifying Respirators) were reported to successfully control healthcare-related transmission.⁷ This PPE guideline was not consistent, in guidelines set in Zimmermann et al. FFP3/N99 respirators, gown, cap, eye protection, and gloves were recommended for aerosol-generating craniofacial surgeries due to the limited evidence for PAPR.⁸ As postponed craniofacial procedures become more urgent, procedure modifying measures should be considered to limit potential aerosolization or prolonged exposure. For example, self-drilling maxillomandibular fixation screws should be used over traditional maxillomandibular fixation and operating room (OR) staff, excluding the anesthesia team, should be outside the OR during high-risk intubation and extubating time. Healthcare professionals can further be protected by protective measures such as the use of barrier enclosure during intubation.³

With reduced surgical volume, limited access to PPE, and implementation of alternative strategies for patient care, it is of great interest how plastic surgery residents adapted to the COVID-19 pandemic. This study surveyed plastic surgery residents around the United States to measure initial impact of these COVID-19-related changes on training. Our results present the first (to our knowledge) quantitative analysis of plastic surgery trainees' exposure to COVID-19, deployment to other medical specialties, usage of personal protective equipment, and implementation of telemedicine during the pandemic. As the global community braces for the impact of new strains such as the highly transmissible delta variant, understanding our initial response gives us critical insight on how to best improve our current procedures.

METHODS

Survey Design

The institutional review-board-approved anonymous study was designed in March to April, 2020 at the University of Miami Miller School of Medicine in response to COVID-19 pandemic spreading through the United States. Study was created on Qualtrics survey software and included a consent script to introduce the purpose of the study prior to resident agreement for participation. Failure to complete the consent script terminated the survey.

Original investigation consisted of 2 separate surveys for plastic surgery trainees amidst COVID-19: the first was on Resident Exposure and Telemedicine. It was followed by the second on Resident Wellness and Education. Both took a combined total of approximately 9 minutes to complete. It was kept brief to maximize resident response rate. This paper reviewed only the survey on Resident Exposure and Telemedicine.

Resident Exposure and Telemedicine survey consisted of 16 multiple choice and yes/no questions, as shown in Supplementary Digital Content, Table 1, <http://links.lww.com/SCS/D734>. It was divided into 2 sections. First section was general demographic information. Second section consisted of questions to investigate trainee deployment to other medical specialties, perceived COVID-19 exposure, personal protective equipment used, and incorporation of telemedicine into practice.

Survey Distribution

Survey was sent to all US integrated and independent plastic surgery program directors (n = 63 programs) on April 23, 2020 with the request to distribute to their residents. A follow-up email was sent to US plastic surgery program coordinators. A second request was to distribute the questionnaire to the plastic surgery residents. It remained active for completion for 2 weeks following distribution. Upon completion of the survey, residents had the

option to participate in a raffle for a \$50 Amazon gift card by submitting their email address to a separate Google Form.

Analysis of Responses

Out of the 103 total surveys submitted, 69 of the surveys were complete and used for data analysis. The remaining 35 surveys were largely incomplete beyond demographic information. They were excluded from analysis.

RESULTS

Demographic Information

It was not possible to gauge response rate, due to inability to confirm that all program directors and program coordinators distributed the survey. However, 103 residents from 18 states accessed the survey. Of 103 initiated surveys, 69 templates were completed and included for data analysis. Twenty-five percent of completed surveys were done by Florida residents. Residents from all stages in training completed the survey (Integrated post-graduate year [PGY]-1 through PGY 7 and Independent PGY-4 through PGY-6). Fifty-one percent of respondents were female.

Deployment to Other Specialties

Twelve percent of residents reported covering a shift not within scope of practice. Of these, 50% were in intensive care unit, 29% were in emergency room, and 7% each were in emergency room triage, nonmedical duties (ie, handing out PPE, transporting patients), or calling discharged COVID patients.

Telemedicine Use

Forty percent of residents reported using telemedicine. These included follow-up visits for patients (96%), postoperative (89%) wound checks (59%), new patient (56%), and preoperative consults (4%). Most significant reported barriers to telemedicine included limited ability to perform physical examinations (89%), patient access to telemedicine (55%), and poor ease of use for patients (44%). Other challenges included inadequate interpersonal connection with patients (30%), familiarity with equipment for providers (22%), obstacles with billing (19%), and technical issues (7%).

Eighty-five percent of residents using telemedicine at the time of the survey reported they would maintain for future practice. Residents indicated that they would specifically employ telemedicine for follow-up (74%), postoperative visits (48%), screening new patients (48%), wound checks (33%), and new patient consults (15%). Seven percent of residents reported they will conduct all clinic visits with telemedicine.

Gender Differences

There were no significant differences in responses between male and female residents. Breakdown was similar for males and females in covering COVID-19 teams or working outside the scope of practice. Most notable difference ($P = 0.43$): 92% of male residents continue using telemedicine in their future practice, while 80% of female residents.

Geographic Differences

Trainee location did not impact most reports. However, residents in New York reported more perceived COVID-19 exposure and deployment to other specialties. Residents in Florida reported significantly less perceived exposure and deployment to other specialties. Based on nationwide resident data, 12% of trainees reported covering shifts outside scope of practice, 16% reported joining COVID-19 teams, and 50% re-

ported perceived exposure to high-risk patients. Of the 3 participating New York residents, all (100%) covered shifts outside scope of practice and COVID-19 teams and had perceived exposure to high-risk patients. Of 17 participating residents from Florida, none (0%) reported covering shifts outside scope of practice or covering COVID-19 teams, and 35% reported perceived exposure to high-risk patients.

DISCUSSION

These results offer the first quantitative analysis of US plastic surgery trainee experiences navigating changes in the COVID-19 era. At large, resident experiences did not vary by gender or year in training. However, there were geographical differences.

Location Matters

At the start of COVID-19 pandemic in the US, residents and fellows were excluded from caring for COVID-19 patients. Simultaneously, elective caseloads decreased to divert scant resources to COVID-19 effort.³ As caseloads rose, trainees became essential in patient care.⁹ Results suggest early regional severity of COVID-19 impacted how plastic surgery residents were affected by COVID-19 (Supplementary Digital Content, Table 2, <http://links.lww.com/SCS/D735>). As of May 23, 2020 (1 month postsurvey distribution), New York had 1832 cases per 100,000 while Florida had just 227 cases per 100,000.¹⁰ In New York, all residents ($n = 3$; 100%) reported covering shifts outside of their scope of practice, working on a COVID-19 team, and perceived exposure to high-risk patients. Conversely, of the Florida residents ($n = 17$), none covered a shift outside scope of practice or joined COVID-19 teams, and only 35% perceived exposure to high-risk patients. This trend supports the notion that states with initially higher caseloads resulted in greater involvement and impact on plastic surgery residents. It parallels sentiment of facial plastic and reconstructive fellowship directors which, despite no adverse training impact at large, report the few (5) incidences of “worsened fellow training” from the Northeast. Hospitals with fewer COVID-19 cases could manage with less surgical resident support.

Sixteen percent of residents reported covering a COVID-19 team. Fifty-six percent were in intensive care unit, 22% were in emergency room, 11% were in nonintensive care inpatient unit, 6% were in COVID-19 rule-out unit, and 6% were calling discharged COVID patients.

Half of residents reported feeling exposed to high-risk patients. Of these, 18% were asked to cover a shift outside their scope of practice. Twenty-four percent were asked to cover a COVID-19 team. Other half of residents whom did not report perceived exposure to high-risk patients, 6% were asked to cover a shift outside their scope of practice and 9% were asked to cover a COVID-19 team.

Perceived COVID-19 Exposure

Seventy-two percent of residents reported feeling adequate access to personal protective equipment. Equipment type varied by patient exposure (Supplemental Table 3, <http://links.lww.com/SCS/D736>). Residents reported using regular masks more frequently than N95 masks, except when attending to patients with unknown COVID-19 status. It was more common to use N95 masks. As mentioned previously, half of residents felt they were exposed to high-risk patients. Most common perceived exposure occurred during inpatient or emergency plastic surgery consults (34%). Others included situations caring for plastic surgery inpatients (16%), performing trauma (16%), cancer reconstruction surgery (12%), elective surgery (6%), taking in-

traoperative consults (6%), or other nonspecified scenarios (10%).

Role of Plastic Surgeons in Other Fields

A number of plastic surgery residents reported covering shifts outside scope of practice (12%) and joined COVID-19 teams (16%) in addition to training in their field. Despite the high-risk burden of craniofacial procedures, facial plastic and reconstructive surgery residents were able to continue training thanks to the addition of safety precautions such as preoperative COVID-19 testing.² This reflects diverse role that plastic surgeons undertook without compromising the integrity of specialized training. With the influx of COVID-19 patients, plastic surgeons shared burdens of increasing cases. While plastic surgery residents are predominantly trained in elective procedures, they have skillsets to care for critically ill patients. Plastic surgery residents could incorporate general surgery training with diverse experiences and perspectives to expand their role at this time.¹¹ To further support plastic surgery residents through COVID-19 pandemic, American Society of Plastic Surgeons teamed with Society of Critical Care Medicine to offer free, online critical care training to plastic surgeons.¹² These online modules were essential tools to reinforce key skills in plastic surgery residents to support COVID-19 efforts. Resident deployment to other specialties and contributions to COVID-19 teams held value in hospitals. This supports the assertion made by most fellowship directors that despite the unique challenges, facial plastic surgery resident training was not adversely affected.²

Learning About PPE Distribution and Use

Plastic surgery residents reported inconsistent patterns in the types of personal protective equipment used with patients during this time (Supplementary Digital Content, Table 1, <http://links.lww.com/SCS/D734>). As per suggestions for managing facial trauma, physicians should treat patients of unknown COVID-19 status as COVID-19 positive.¹³ However, only 60% of residents reported using N95 masks. Inconsistency in types of PPE reflects variation in methods of preventing further transmission of COVID-19. Centers for Disease Control and Prevention (CDC) recommendations included N95 masks or higher respirator, face shield or goggles, and an isolation gown. Facemasks are considered an alternative method of respiratory protection to N95 masks.¹⁴ All (100%) residents from New York reported N95 use in all patient encounters. N95 use was far lower when accounting for the nationwide report (Supplementary Digital Content, Table 1, <http://links.lww.com/SCS/D734>), further suggesting regional severity impacted how plastic surgery residents utilized PPE. This is concerning particularly as it applies to craniofacial surgical residents whose procedures put them at increased risk of viral load. The noted use discrepancy may be in part due to early pandemic scarcity but inconsistency between guidelines may have contributed as well. As we recognize necessity for long-term protocol to mitigate COVID-19 risk, craniofacial surgery guidelines should be assessed and standardized across healthcare systems. Areas of interest include investigation of the use of N99 or PAPR during craniofacial plastic procedures while increasing N95 utilization by plastic surgery residents generally.

Implications of Telemedicine—A Growing Addition in Medicine

With sudden onset of COVID-19, necessity to limit spread warranted rapid response. Forty percent of residents were already using telemedicine at the time of questionnaire distribution, and 85% reported expectations to continue use. While

telemedicine use arose out of rapid necessity to maintain patient communication, it offers possible advantages moving forward.

Telemedicine enables physicians and patients to connect virtually, is convenient for patients and physicians, spares travel costs for patients, and allows residents to care for patients from distance. Plastic surgery patients appreciate continuity of care without necessity of risking health. While not meant to replace in-person medical care, it is a valuable tool in minimizing spread risks, preserving hospital resources, and decreasing patient stay post-operatively.¹⁵ The early experience in and embracing of telemedicine of plastic surgery residents was mirrored in physicians who practice with craniofacial specialties. Surveys show over 75% of facial plastic and reconstructive surgeons confidently reported plans to continue to incorporate telemedicine into patient medical care and 71% reported positive effects on patient encounters.¹⁶

Majority of plastic surgery residents using telemedicine were challenged by the inability to perform physical examinations, technical difficulties with patient access, and barriers of connecting with patients in-person. There were concerns about new billing protocols and ease of physician use. There were strict Health Insurance Portability and Accountability Act (HIPAA) rules surrounding telemedicine due to concerns of patient privacy and safety with new technologies.¹⁷ Other challenges included equipment costs, provider training, methods of payment and regulation, and licensing of new telemedicine platforms.¹⁵ It is proposed that these services will continue to evolve to be better integrated into healthcare moving forward. Although these concerns mirror the telemedicine concerns and beliefs of practicing craniofacial surgeons, only the limitations of the physical examination, not concerns with patient connection or patient access to technology, were cited by over 50% of physicians.¹⁶

Moving forward, telehealth can be utilized in ambulatory care settings. Patients can be given tablets if positive for COVID-19 and remain isolated in an examination room to minimize unnecessary exposure.⁵ Virtual medical decision-making is possible in many scenarios. Telemedicine establishes better access to subspecialists not immediately available. In the months following survey distribution, telemedicine became a mainstay of healthcare. Physicians report seeing 50 to 175 times more patients via telehealth, and 46% of patients are now using telehealth compared with 11% of patients who used it in 2019.¹⁸

CONCLUSION

A probable predictor of initial resident deployment to other specialties and COVID-19 exposure was the degree of severity in their geographical region of training. Plastic surgery residents continued to focus on training and education in their field until the need for help grew more dire, and they were deployed to support COVID-related efforts without prominent depreciation in specialty training. This resulted in the rapid transition to telemedicine, which presented with a significant new set of challenges, as well as new opportunities for patient interaction. While primarily trained in elective procedures, plastic surgeons are doctors, first. As severity intensified, plastic surgery residents became a greater asset to patient care, enhanced by access to critical care trainings and transitioning to telemedicine. As demonstrated by this study of plastic surgery residents, the core principle of caring for patients remained at the forefront. Plastic surgery residents were called upon to support the COVID-19 pandemic effort and adjust their practices. Supporting the indication that despite the training adjustments, facial plastic surgery residents and plastic surgery residents broadly did not receive “worsened training.” This study, to the best of our knowledge, is the first to quantitatively investigate how plastic

