Impact of COVID-19 Pandemic on Education of Plastic Surgery Trainees in the United States.

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Abstract

The current coronavirus 2019 (COVID-19) pandemic has vastly impacted the healthcare in the United States and is continuing to dictate its unprecedented influence on the education systems, especially the residency and fellowship training programs. The impact of COVID-19 on the residency and fellowship trainings has not been equal across the board; and amongst them, plastic surgery residency and fellowship programs are one of the hardest hit specialties. With social distancing regulations implemented, departmental educational activities including pre-operative, morbidity and mortality (M&M) conferences and journal clubs, as well as education in the operating room (OR) have all been impacted as is the overall training of plastic surgery trainees in the United States. Almost all elective and semi-elective surgeries across the United States were suspended for a period of a few months (this constitutes a significant portion of plastic surgery cases). Considering the current staged reopening policies, it may be a long time, if ever, before restrictions are completely lifted. In the current paper, the authors review the multidimensional impact of the current COVID-19 pandemic on the training of the plastic surgical residents/fellows in the United States and worldwide, along with some potential solutions on how to tackle these issues.

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Impact of COVID-19 Pandemic on Education of Plastic Surgery Trainees in the United States.

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Abstract: (200 words)

The current coronavirus 2019 (COVID-19) pandemic has vastly impacted the healthcare in the United States and is continuing to dictate its unprecedented influence on the education systems, especially the residency and fellowship training programs. The impact of COVID-19 on the residency and fellowship trainings has not been equal across the board; and amongst them, plastic surgery residency and fellowship programs are one of the hardest hit specialties. With social distancing regulations implemented, departmental educational activities including pre-operative, morbidity and mortality (M&M) conferences and journal clubs, as well as education in the operating room (OR) have all been impacted as is the overall training of plastic surgery trainees in the United States. Almost all elective and semi-elective surgeries across the United States were suspended for a period of a few months (this constitutes a significant portion of plastic surgery cases). Considering the current staged reopening policies, it may be a long time, if ever, before restrictions are completely lifted. In the current paper, the authors review the multidimensional impact of the current COVID-19 pandemic on the training of the plastic surgical residents/fellows in the United States and worldwide, along with some potential solutions on how to confront these issues.

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“*Education is the passport to the future, for tomorrow belongs to those who prepare for it today*”.

- Malcolm X

EDITORIAL

The current coronavirus 2019 (COVID-19) pandemic has vastly impacted healthcare in the United States and globally and is continuing to dictate its unprecedented influence on education systems, especially the health system and medical education (i.e. residency training programs). The impact of COVID-19 on residency and fellowship trainings has not been equal across the board and amongst them, plastic surgery residency and fellowship programs are one of the hardest hit specialties. Almost all elective and semi-elective surgeries across the United States were suspended for a period of a few months. Considering the current staged reopening policies, it may be a long time, if ever, before restrictions are completely lifted. The suspensions have greatly affected teaching opportunities for plastic surgery residents during this time as many plastic surgery cases are elective and semi-elective. Learning operative skills is a vital core element of education in the surgical specialties, which makes the surgical specialties more vulnerable than their medical counterparts in this COVID-19 era. In many instances, surgical residents have been removed from operating rooms altogether and, in some instances, have been dispatched to screening facilities, critical care facilities, and emergency rooms, where physicians and residents are currently most needed to staff undermanned hospitals and clinics [1]. Although this may feel as a bit of a nuisance to surgical residents at the time, it is absolutely necessary and can help them enhance their experiences and training in future health crises if they do occur, allowing them to diversify their level of expertise and confidence in working in these environments during times of uncertainty or future health catastrophes.

Overall, the impact of the COVID-19 related deficient operative/surgical exposure is dependent on the level of the trainee (highest in the senior and impending to graduate residents/fellows) and the general length of training (highest in shorter training length i.e. one-year

fellowships) [1]. For example, the lost training opportunities and the curtailed clinical activity between March and June 2020 for a trainee in a one-year fellowship (Gender affirmation Surgery, Aesthetic Surgery, or Reconstructive Microvascular Surgery) is one-third of their entire fellowship training period and difficult to recover from [1].

Furthermore, due to social distancing guidelines, many in-person opportunities for plastic surgery residents to interact with attendings, a vital component of residency education, have been discontinued. These impacts have been very drastic and may even be augmented if more waves of COVID-19 with subsequent restrictions and surgery suspensions arrive in the future. It is therefore necessary and important to analyze the educational impact of COVID-19 on plastic surgery residency and fellowship and to propose ways to address this challenge.

Certification in plastic surgery requires an integrated pathway plastic surgery residency, which is six years, or an independent pathway which includes satisfactory completion of a formal training and board eligibility in general surgery, otolaryngology (ENT), neurosurgery, orthopedic surgery, urology, or oral maxillofacial surgery (OMFS) residency (five to seven years) followed by a plastic surgery fellowship (three years). The OMFS graduate candidates are required to complete two extra years of general surgery training in addition to an MD/DDS. For program accreditation, Accreditation Council for Graduate Medica Education (ACGME) requirements, the annual review process of the residents and fellows, and their minimum case logs requirement must all be met. However, many will not be able to complete the required number of operative, clinical rotations, and patient care encounters due to COVID-19. This is why the ACGME has given program directors the right to assess the competence of residents and fellows during COVID-19 to determine if that specific individual has met competency to graduate and practice their specialty unsupervised [1,2]. Although allowing program directors the opportunity to determine if a resident/fellow has met the minimum competency in light of reduced semi-elective and elective cases due to COVID-19 is

necessary under the current circumstances, this obviously comes with a few issues. First of all, certain parts of the United States have been disproportionately affected by COVID-19. Some residents/fellows may still be dispatched to screening facilities, critical care facilities, and emergency rooms, while other trainees may currently be able to perform semi-elective and elective cases, depending on local and state laws. If both of these residents are assigned a status of competence in surgery/plastic surgery, they will have differing surgical experiences to no fault of their own. This change also adds in a subjective component to judging trainees, rather than an objective requirement of minimum case logs to designate competence. With subjective evaluations, there is always a gray area for interpretation. Overall, the real impact of this decision on residents/fellows remains unknown currently and it is unsure if it will have an impact on their eventual practice until the distant future.

In the United States, plastic surgery residency and fellowship training consists of three types of educational activities for residents to achieve certification and graduate level knowledge and skills: didactics, including textbook and journal reading assignments, departmental educational activities, including pre-operative and morbidity and mortality (M&M) conferences and journal clubs, and education in the operating room (OR). Each of these three categories of educational activities has been affected by COVID-19 through multiple facets. The aforementioned activities are set to equip the candidates with the six core ACGME set competencies: 1) Practice-Based Learning and Improvement, 2) Patient Care and Procedural Skills, 3) Systems-Based Practice, 4) Medical Knowledge, 5) Interpersonal and Communication Skills and 6) Professionalism. While there are currently solutions for each type of educational activity going forward, there must be more insight into this escalating issue. Through the didactic educational method (activity), program directors and attendings distribute reading and teaching materials, such as journal articles, operative case/technique video clips, posters, and textbook chapters, to trainees, allowing them to learn

individually in an unstructured manner. Then, residents/fellows and attendings convene in-person to discuss these materials in one-on-one or group discussion sessions. Due to social distancing, many of these in-person meetings have been cancelled, negatively impacting didactic learning opportunities for plastic surgery residents/fellows. However, this can be easily addressed, for the most part, with online technologies, such as Zoom, Skype, or WebEx. Through these virtual and/or video meetings, trainees and faculty physicians can gather through an online platform and discuss didactic materials. Not only does this abide by social distancing guidelines, but allows for greater flexibility in scheduling, avoids travel cost, hazard, and wasted time, increasing convenience for everyone involved as they no longer have to convene in one room. Thus, in a post-COVID era, this may become the preferred method for didactic residency activities.

Still, as many programs have not previously utilized remote conferencing in the past for didactic education, the quality of instruction and education will likely be affected during the learning curve [1]. The local connection logistics, software download, system compatibility assessment with individuals' personal computers, laptops, and smart phone terminals along with security and privacy measures to avoid potential Health Insurance Portability and Accountability Act (HIPAA) violation are essential preparation steps. With the aforementioned virtual platforms (Zoom, Skype, and WebEx), there are potential security risks as well, especially with HIPAA-sensitive information. Participants should be required to enter a password upon joining, which is provided by the host in order to prevent hackers from joining the call or giving malware and viruses to participants. Additionally, Zoom has also made end-to-end encryption available for all consumers, but this takes away the opportunity for participants to dial-in by phone (they must be on their computers), compromising user convenience [3]. Some virtual platforms (WebEx and Skype) also allow for the recording of the sessions, which could be problematic if they fall into the wrong hands. There are obviously security concerns associated with these virtual platforms, but users have no

choice other than using them while complying with social distancing guidelines. Still, secure conferencing must be of utmost importance, especially if sensitive information is being shared in regards to patient information.

From an educational standpoint, if participants turn off their video and microphone during these virtual calls, this allows for complete withdrawal from virtual learning [4]. However, as Morawo, Sun, and Lowden [4] demonstrated, a virtual learning environment in their neurology residency program by utilizing retrieval practice questions through Poll-Everywhere and a group-based quiz competition during virtual platform meetings was successful in stimulation of viewer engagement. Additionally, Zingaretti et al. [5] found that, while many residents have been using webinars during the pandemic, technologies are beneficial, but are not sufficient to analyze the complexity of plastic surgery topics. Still, using online technologies for virtual learning does allow for an opportunity for residents and fellows to share information with other trainees around the world. For example, online educational conferences/lectures by attendings could be opened up to participants in other countries or programs. Rare cases or surgeries could also be shared online to educate other trainees that may not have access to these cases in other areas of the world. Overall, live discussions and interactions, including point/counterpoint arguments, cannot be fully replaced with online technologies especially in complex topics like plastic surgery, but these online alternatives can currently supplement training.

The departmental educational activity component of the resident education consists of in-person faculty lectures, journal clubs, grand rounds, M&M, and preoperative conferences. The same aforementioned didactic methods can be employed for department-specific residency and fellowship meetings. Other approaches to educational activities can also be utilized, such as texting-based educational material, but the costs and benefits of this technique must be considered. Clavier et al. [6] investigated the distribution of teaching documents via WhatsApp, an instant messaging

app, versus traditional online learning platforms for anesthesia residency education. Younger generations are likely familiar with WhatsApp and open to using it as an educational technique. Yet, residents in the traditional learning group had higher medical reasoning than the WhatsApp group although there was no difference in medical knowledge between the two groups [6].

Similarly, Savoy et al. [7] investigated the use of texting-based educational material in a general surgery residency program. Texts were sent to medical students on surgery rotations and general surgery residents about observed cases or patients during rounds. Although this study was done at a single institution, it concluded that students from both study groups favor text messaging for educational purposes [7]. This form of education serves as “academic epinephrine” because an educational stimulus is prompted when the student is not anticipating it [7], indicating this could be a valuable tool going forward for departmental educational activities. Still, using mobile telephones for educational purposes may lead to distractions during dedicated educational periods, clinical duties, or operative time, which also should be taken into consideration.

The third and final component of plastic surgery residency and fellowship is the operating room education, which includes the preoperative evaluation of patients (marking and planning for surgery), postoperative rounds, performing or assisting in the operative procedure, live examination of patients and their wounds, and review of radiological and laboratory studies in person with respective subspecialists. Plastic surgery operative cases can be divided into three categories: emergency, semi-elective, and elective, all of which include a required case log minimum for all residents and fellows. Emergency cases, across all operative specialties, have and will continue to occur regardless of COVID-19 as emergency cases have not been impacted or are less impacted by COVID-19. However, emergency cases may be reduced or more staggered due to hospital bed capacity during the COVID-19 era, which is likely dependent on hospital location and local number of COVID-19 cases. Also, with the quarantine regulations, and lots of people either being

furloughed, losing their jobs, or working from home, some may argue that overall emergency/trauma-related plastic surgery operations have been reduced during the last few months since the start of the COVID-19 pandemic. In some cases, rotating shifts for residents have been put in place based on the current, and likely reduced, surgical schedule to minimize risk of virus contraction [1]. As long as trainees have the proper training and adequate personal protective equipment (PPE), they should be safe to continue to partake in emergent plastic surgery cases. In some hospitals during the COVID exponential phase, a restriction was imposed on the number of surgical apprentices who can scrub on a case. Going forward, it may be beneficial to video record emergent cases to play for other residents if they cannot scrub in during emergent cases so that their training is not completely compromised.

The second category of plastic surgery cases is semi-elective, which means the surgery must be done to save a patient's life eventually but is not emergent. In many hospitals, semi-elective surgeries have not been occurring for a period of time due to the American College of Surgeons *COVID-19: Elective Case Triage Guidelines for Surgical Care* [8] and the American Society of Plastic Surgeons [9] recommendations to cease elective and non-essential surgeries. Yet, the breadth of conditions that plastic surgery treats is so wide that, now more than ever, it is imperative that residents/fellows continue to nurture their surgical skills during COVID-19 despite lack of semi-elective and elective surgeries. Potential methods to do so can be to increase relevant readings for plastic surgery residents, watch surgical videos, and train on mannequins, laboratory live animals, cadaveric animal parts, or training platforms so that residents' skills are not negatively impacted as a result of COVID-19 [10].

Lastly, elective surgical cases are a vital component of plastic surgery residency and fellowship. In certain areas of the United States, semi-elective cases may be taking place or have been re-introduced, but elective surgeries were cancelled indefinitely all over the country. The same

methods as aforementioned for semi-elective procedures to preserve residents' surgical skills can be employed for elective surgeries (continuing relevant readings, watching surgical videos, and using mannequins or cadaveric animal parts for surgical techniques). Yet, training in elective cases will remain a challenge going forward for an unknown period of time, specifically in cities disproportionately affected by COVID-19, such as New York City, Boston, New Orleans, Philadelphia, Michigan, Chicago, and Washington D.C. Additionally, rhinoplasty, nasal reconstructive surgery, and other head and neck aesthetic surgeries (i.e. brow lift, blepharoplasties) are very common elective procedures for plastic surgeons and it is important to consider the potential aerosolization of the virus particles during these operations [11]. As a result, if COVID-19 is still prevalent, special precautions, such as limiting number of OR personnel, utilizing proper PPE, using powered air-purifying respirators (PAPR), and requiring at least two or three consecutive COVID-19 negative tests on patients to decrease the possibility of false negative results, must be taken to minimize transmission of the virus [11].

With the special precautions necessary for specific preoperative evaluations of patients undergoing elective surgeries during this time, there is also a number of challenges that arise with the re-introduction of elective surgeries and the required protocols for them to occur. Prior to surgery, patients must have at least one and preferentially two negative COVID-19 tests with the most recent negative test 24-48 hours prior to surgery, but this requires patients to come in for their surgery early to be tested [12]. Unfortunately, having to devote time for two tests requires travel time and possibly work time lost, but it is necessary as there is up to a 30% false negative rate for the RT-PCR test [13]. The RT-PCR test requires a nasopharyngeal or oropharyngeal sample, which are both uncomfortable for the patients and may be difficult to actually acquire a viable sample, contributing to the high false negative rates. Furthermore, some testing centers may not test asymptomatic walk-in patients, which would require a pre-operative testing request and

coordination from the referring physician as well. Patients who receive at least two negative COVID-19 tests should self-quarantine in their homes 24-48 hours prior to surgery away from the family who could be carrying the virus, which may be difficult for the patient to do and challenging for plastic surgeons to enforce [12].

Physicians, trainees, nurses and the hospital employees should also be regularly tested because they could be asymptomatic carriers too. As elective procedures are a large part of plastic surgery (and physician's incomes), healthcare professionals may be less likely to report their symptoms or viral status in fear of having to cancel these elective procedures. Even with testing protocol in place, there is still room for unpredictability and risk for viral transmission due to the high false negative rate [12]. Although the false positivity of the COVID-19 tests is not well discussed, a false positive test could bear some implications on financial burden to the patient and the health care system, and add to the complexity of the situation.

Surgical facilities also must have designated employees who screen patients on the phone beforehand and assess patients' potential risk of carrying the virus or having COVID-19 (by asking questions about symptoms, recent travel, close contacts, temperature, respiratory symptoms, etc.), which requires time that the employee could potentially be doing other work [12]. Other factors to consider are the cost of proper PPE for all OR employees and hospital staff and having a functioning PAPR device for each OR (which would require extra purchases if the hospital does not already have them, an issue for hospitals already strained on resources during this time). Patient surgical risk stratification is also important when deciding if an elective case should occur. Patient age, comorbidities (diabetes, hypertension, obesity, lung diseases, etc.), and type/complexity of surgery must be taken into account [12]. Lastly, the virus will not simply disappear forever after this pandemic and although elective procedures are a large part of plastic surgery training and should eventually be re-introduced, it is vital that these challenges be acknowledged and addressed going

forward.

The lack of elective surgical cases for residents and fellows may be further exacerbated in the future if there is a second wave resurgence of COVID-19 in the fall during flu season, or further ahead into 2021 and beyond. Thus, COVID-19 undoubtedly has had a negative impact on plastic surgery training and the COVID-19 pandemic grip in America remains ever-evolving. The European Academy of Facial Plastic Surgery Task Force [11] currently suggests using technology, such as surgical videos and webinars, as a teaching tool for residents and fellows during this time to protect residents from contracting the virus, conserve PPE, and maintain their surgical skills. Other virtual tools that could be used for plastic surgery education include the Anatomage Table and Touch Surgery. The Anatomage Table allows for three-dimensional virtual dissection of a life-sized human cadaver, contributing to a more precise visual perception of the human body, which may not be otherwise available during COVID-19 [5]. Touch Surgery is a surgical application software that has forty-two plastic surgery procedures available for residents/fellows to watch [5]. While these electronic tools cannot replace hands-on surgical experience, they can aid in surgical preparation and confidence for trainees during the pandemic.

Although the case log minima for residency and fellowship graduates during this time period will likely be interpreted in the context of COVID-19's effects on that specific program [1,2], more suggestions, creative ideas, and solutions are necessary to address the lack of surgical training in elective cases for plastic surgery residents. This pandemic will also lead to a backlog of facial and elective plastic surgery [10], which is another important consideration that will have to be addressed in the post-COVID-19 era. In other words, patients and their plastic surgery pathologies will wait for the appropriate time to be addressed, but they will by no means disappear.

Currently, there has been little research on how COVID-19 has affected medical residencies, and even less information on plastic surgery residencies/fellowships more specifically. The time

when a resident/fellow matures and their training culminates into the completion of their education, producing a capable and confident well-trained specialist, has been compromised. While the safety of patients, residents, fellows, and attendings is of utmost importance, the educational impact of COVID-19 on plastic surgery residency and fellowship is potentially devastating for future generations of the specialty and cannot be ignored. Additionally, the future of COVID-19 and its duration is unknown, which is why it may have a lasting impact on healthcare provision in the United States for many months and years to come. Therefore, more alternatives must be utilized in plastic residency and fellowship programs in terms of didactics, departmental educational activities, and operating room education so residents and fellows receive adequate training and are confident in their surgical skills upon graduation.

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Supplementary Files