

Impact of a global pandemic on surgical education and training- review, response, and reflection

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Abstract

The catastrophic effects of the coronavirus disease-2019 global pandemic have revolutionised human society. The unprecedented impact on surgical training needs to be analysed in detail to achieve an understanding of how to deal with similar situations arising in the foreseeable future. The challenges faced by the surgical community initiated with the suspension of clinical activities and elective practice, and included the lack of appropriate personal protective equipment, and the self-isolation of trainees and reassignment to coronavirus patient-care regions. Together, all these elements had deleterious effects on the psychological health of the professionals. Surgical training irrespective of specialty is equally affected globally by the pandemic. However, the global crisis inadvertently has led to a few constructive adaptations in healthcare systems, including the development of tele-clinics, virtual academic sessions and conferences, and increased usage of simulation. The current review article was planned to highlight the impact of corona virus disease on surgical training and institutions' response to the situation in order to continue surgical training, and lessons learnt from the pandemic.

Keywords: Surgical education, Training, COVID 19, Pandemic, Trainees.

Introduction

Global pandemic, which started from the Chinese city of Wuhan in December 2019, has changed almost every aspect of life.¹ From thinking to living and from behaviour to attitudes nothing is what it was like previously. The coronavirus disease-2019 (COVID-19) has not only claimed millions of lives, but has also had challenged significantly the entire global healthcare system. The healthcare system, which was once thought to be promising and flourishing, particularly in the developed world, now looks very feeble, insubstantial and wobbling

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in face of the viral surge, spread and now its recurrent waves. Although every walk of life has been affected by the pandemic, it is the healthcare system that has been hit the most.

In recent years, surgery has gained recognition as a major public health issue and access to surgical care has been deemed an essential component of human rights. The impact of COVID-19 on surgical practice is widespread and priorities in various surgical institutions stand changed² (Figure-1). The current pandemic has not only challenged the provision of good surgical care, but has significantly affected surgical training and education programmes in various countries. The extent of this impact on surgical training is yet to be estimated and might be revealed in the years to come, but several changes have been witnessed in various surgical training programmes.

Surgical trainees have been uniquely impacted by these changes. The drastic changes triggered by COVID-19 necessitate a re-evaluation of surgical education and training. Institutions have had to adapt to different ways in which their surgical trainees learn, practice and reproduce surgical tasks safely and effectively. The pandemic has also presented a huge opportunity to reconstruct the method by which surgical trainees learn and adapt to their curricular activities, and revisit contemporary methods of learning and gaining surgical expertise.

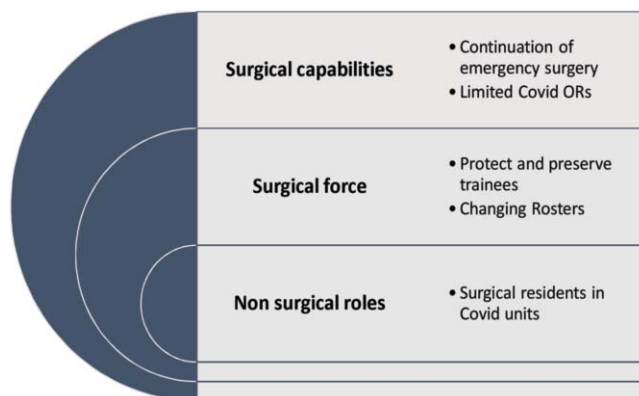


Figure-1: Priorities of the department of surgery during a pandemic.

The current review article was planned to highlight the current evidence and to offer recommendations for changes to surgical training after the COVID-19 surge in the light of global trends in this regard.

Methods

The review article comprised search on MEDLINE, PubMed, Google Scholar and Cochran databases using the keywords 'coronavirus' OR 'SARS-CoV-2' OR 'COVID-19', 'surgical education' OR 'surgical training' OR 'surgical residency' OR 'resident' OR 'virtual surgical training' OR 'surgical skills'. The reference lists of the identified papers were also searched for relevant articles. The search was further amplified by a manual search of most relevant and accessible journals.

Results

The review of the identified literature provided an insight into the impact of COVID-19 on surgical education and training in terms of challenges, responses and opportunities.

A. Challenges for surgical training

The sudden spread of COVID-19 pandemic led to abrupt changes in the field of surgical training, leading to major challenges stemming from the impact on surgical

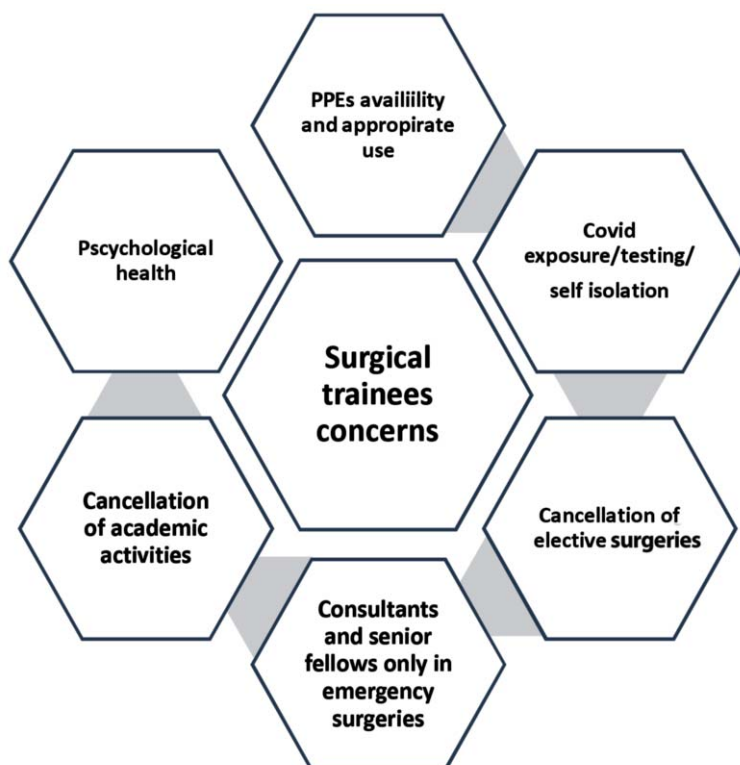


Figure-2: Concerns of surgical residents during a pandemic.

practice and extending to involve trainees' wellbeing (Figure-2).

I) Suspension of clinical activities

All aspects of surgical education have been severely impacted by the pandemic. As both surgical training and academic sessions are deemed unsafe due to social distancing measures, academic activities, including morbidity and mortality meetings, case discussions, journal clubs and tumour boards, were initially cancelled before they were restored with less interactive forms.³

II) Shortage of personal protective equipment and surgical exposure

The shortage of personal protective equipment (PPE) resulted in a major hindrance in clinical work. Italy faced high rates of cross-infection due to such a shortage.⁴ The preservation of the available PPE limited the residents' exposure in an operation room (OR) setting.⁵ The available PPE provided by the institutions was also a matter of concern. In a survey by Caruana et al., 22.54% trainees were concerned regarding the PPE provided at their respective institutions.⁶

III) COVID-19 exposure/ testing/ self-isolation of trainees

The resident workforce was recruited in multiple centres to provide medical coverage in COVID-19 units, meaning further exclusion from the surgical domain.⁷ Trainees working in the areas were subject to exposures and were later either quarantined or tested. In a study, 33% trainees reported having to take time off from work due to pandemic-related health issues.⁶

IV) Cancellation of elective surgeries

Surgical departments were made to reschedule all elective surgeries to limit the spread of COVID-19, reducing hospital admissions.^{8,9} This substantially compromised the education of trainees. Amparo et al. reported reduction in training for final year residents in urology from 84% to 44% ($p < 0.001$) of minimally invasive surgery (MIS) and from 82% to 46% ($p = 0.002$) of open surgery.¹⁰ Ellison et al. reported¹¹ an 87% reduction in exposure in elective surgeries among trainees. In a survey by Caruana et al.,⁶ trainees reported a 78% reduction in OR

exposure.

V) Senior surgeons only performing emergency surgeries

Training opportunities were further reduced when consultants, to limit the exposure, preserve PPE and decrease operative time, performed procedures by themselves.^{3,12} Bernardi et al.¹³ reported decreased inclusion in operative procedures of senior residents.

VI) Psychological health of trainees

At the peak of the surge, trainees went through fatigue and burnout,¹⁴ with one study reporting 33.1% trainee burnout.¹⁵ Ellison et al.¹¹ found a severe impact on trainees' emotional wellbeing up to 27%. Caruana et al.⁶ said 32% trainees relayed concerns regarding their mental wellbeing.

Moreover, the psychosocial stress of the risk of infecting a family member was profound, with one study reporting 72.7% prevalence of such stress.¹⁴

B. Specialty-based impact

All surgical specialties globally suffered drastic setbacks after COVID-19 reached the pandemic status. Some specialties were more affected in comparison to others. The impact of few of these specialties provides insight into the ground reality in different countries.

I) Oral and maxillofacial training

Maxillofacial training was adversely affected by the pandemic.¹⁶ In a study, 14% residents had to be reassigned to alternative clinical areas, treating COVID-19 patients. This reassignment was indicative of time lost in training. Residents expecting to complete training in 2022 had genuine concerns regarding their completion of training and their decreased operative exposure.¹⁶

II) Cardiothoracic training

Cardiac surgery training also suffered major changes. Shafi et al.¹⁷ extensively described the state of cardiac surgery training during this period in the United Kingdom. The intensive care unit (ICU) is an integral component of cardiac surgery, but the unprecedented ICU need for COVID-19 patients led to cardiac surgery practice being confined to two out of seven centres, with trainees in five centres getting deprived of surgical training. The vast majority of cardiac surgery patients were carrying high risk, meaning that the procedures were performed by a consultant rather than trainees. After the lockdown was enforced, the

outpatient services were limited, thereby affecting cardiac training elective exposure. Moreover, the study postulated that the resumption of cardiac surgery after lockdown will see a backlog of postponed surgical cases and that will have a deleterious effect on surgical training.¹⁷

III) Otorhinolaryngology training

The impact of COVID-19 on otolaryngology training has been well described by Guo et al.¹⁸ in the United States and Canada. Almost all residents (98%) reported a decrease in clinical activities and 94% reported decreased operative exposure; both of these being surrogate markers of surgical training. Almost 64% residents reported that they were not involved in clinic visitations. However, programmes utilising technology meant that majority of the residents did not report a reduction in educational training.

IV) General surgery training

Italy was one of the countries worst affected by the COVID-19 pandemic. Bernardi et al. described the effect of general surgery training in Italy. The unprecedented impact of the pandemic led to a significant decrease in operative exposure due to cessation of surgery for the benign general surgical condition, and the operative exposure was limited to emergency surgeries on patients with delayed presentations usually forcing the involvement of the consultants due to the difficulty of the procedure, limited PPE and risk of exposure. Elective surgeries were limited to non-deferrable oncologic procedures that were often done by consultants due to the difficulty of the case, to decrease operative time, and to decrease the risk of complications. However, there was an increase in non-clinical educational activities that were conducted from home.¹³

V) Surgical oncology training

Surgical oncology was one of the specialties relatively less affected by the global pandemic. Pawlik et al.¹⁹ described these effects in the United States. Complex general surgical oncologic training requires intensive training. Integral aspects of training include rotating in a variety of distinct patient populations, developing management strategies, and exposure to operative procedures. Reassignment of trainees to provide care to COVID-19 units led to the disruption of training. The surgical volumes decreased due to surgical candidates being limited to non-deferrable oncologic cases. And these urgent cases were more often dealt with via open technique as opposed to the laparoscopic approach due

to the risk of aerosol generation. The use of prolongation of aggressive neoadjuvant regimens also decreased the number of patients undergoing surgery, adversely affecting training.

C. Adaptations of surgical training programmes

Surgical training programmes globally were forced to adapt in accordance with the need of the hour. Few of these alterations were innovative and will possibly serve to strengthen surgical training in future.

I) Evidence-based use of PPE

Healthcare workers (HCWs) are at significant risk of COVID-19 infection,²⁰ but the correct use of PPE mitigates this risk. Direct exposure to bio-hazardous waste put surgical staff, particularly trainee residents, at a significant risk of contracting infection during surgery. A study of 205 COVID-19 patients by Wang et al.²¹ investigated the bio-distribution of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) ribonucleic acid (RNA) using real-time reverse transcription-polymerase chain reaction (RT-PCR). Results showed the highest rate in bronchoalveolar fluid, followed by sputum and nasal swabs. Few other studies demonstrated high viral load in stool, urine and blood. Evidence-based teaching was done along with



Figure-3: The use of level III personal protective equipment (PPE) during emergency trauma surgery. A limited surgical team comprising a consultant surgeon, trauma fellow, and a technician.

training of surgical staff on donning and doffing PPE to minimise the spread of COVID-19.^{21,22} PPEs are now worn as per World Health Organisation (WHO) and Centers for Disease Control and Prevention (CDC) guidelines.²³ Double-gowning and gloving is the preferred option with proper use of fit test-approved N95 mask or respirator (Figure-3).

II) Surgical e-learning

The current unprecedented crisis has created the opportunity to innovate, accelerate and enhance e-learning solutions for surgical education. Epidemiological forecasts, even if they are often imprecise, demonstrate that intermittent social distancing measures may be necessary until 2022. WebSurg and the French Institute for Research into Cancer of the Digestive System (IRCAD) surgical videos offer free-of-charge operative videos which help in remote surgical training.²⁴ Garcia et al. reported that during the emergency phase of the COVID-19 pandemic from April to May, 2020, the average number of surgical videos viewed on the WebSurg platform was 1161 views per month versus 161 views per month in the same period in 2019 (+621%).²⁴ Image-guided simulation trainers and virtual simulators used frequently in the COVID-19 era not only provide the opportunity of safe learning, but also a very promising paradigm shift from contemporary expert-based apprentice model to competency-based training.

III) Tele-clinics

A survey done in 84 residency programmes in the US reported implementation of tele-clinics in 90.5% of the programmes (76/84). Another 22(26.2%) reported that inpatient consults were being seen remotely via different electronic modes of communication.²⁵ This adaptation greatly reduces the risk of exposure of surgical residents with asymptomatic carriers. Vreeland et al.¹⁸ mentioned that their institution moved towards increased dependence on tele-health clinics with the aid of online video conference software. Although their tele-clinic model is in evolution, trainees make the initial contact with patients through video links, take all information on illness, and formulate a management plan as they normally used to do in the pre-COVID-19 era. The trainee then discusses the case with the attending surgeon over the phone. The attending and the trainee then conduct a multiuser video conference with the patient so that the resident can participate in the counselling of the patient and formulation of the final plan. Finally, the attending and the trainee discuss after the patient has signed off to finalise the encounter. Even though such patients'

interviews have lots of interruptions and there is no opportunity for clinical examination, this is an important and worthwhile initial effort.

III) Simulation platforms

As we work to define the new normal in surgical education and professional development, digital surgery will be critical for continued growth and progress. During the COVID-19 era, OR simulators and virtual simulation labs have widely been accepted as an effective media to continue surgical training. Currently, over 20 computer-based platforms, covering 9 surgical specialties, are available on the internet and are accessible from home to enhance the surgical skills of trainees and provide them real-time environment very close to that of an OR. There are 15 computer-based platforms freely accessible, 1 platform, Incision Academy, is offering a 4-week free trial during the pandemic, and 7 platforms require paid accounts.

IV) Virtual conferences and webinars

As an adaptive measure, surgical training programmes had to take their in-person academic sessions and meeting to virtual meetings for the continuation of didactic training. Virtual conferences and webinars are being held all over the world. Webinars are interactive online mini-conferences that allow surgeons an opportunity to select the content that best matches their interests and learning needs. Some hashtags about COVID-19 and surgery, like #COVID19surgery, #COVID19ESCP and #COVIDSurg, are being widely used by young surgeons all over the world.

D. Learning reflections after Pandemic

The effects of the pandemic are huge and devastating, disrupting nearly every sphere of life, including surgical education and training. However, as they say, 'every cloud has a silver lining', this pandemic has served as the missing catalyst to change the current exhausted framework and to reconsider a novel approach for optimising medical and surgical education.

I) Time for innovations

While the hospitals were busy fighting against the pandemic, institutions identified several ways and means to ensure continuity of education and training using virtual platforms for remote learning. These ranged from podcasts and vodcasts to synchronous lectures, seminars and conferences.²⁶ Learners participated in virtual rounds, journal clubs and tele-clinics that were taken very positively by the learners globally because of the flexibility of time and place.^{24,27} Simulations and artificial

intelligence (AI) allowed the trainees to observe procedures, experience ORs and participate in triage while being at home.²⁸⁻³⁰ Social media, otherwise considered a waste of time, was effectively utilised as a discussion board for official and academic meetings as well as for virtual classes.³¹ Reading courses in the form of books, atlases and scientific journals was made freely accessible, augmenting the phenomenon of knowledge-sharing. Educationists and faculty learned to create and use virtual rooms for teaching and learning while applying concepts of ethical principles in virtual settings. Even assessments for knowledge and clinical and technical skills were conducted virtually without compromising on their validity. COVID-19 changed the common perceptions of the 'on-the-job training' for the postgraduates and allowed them time for their formal education.³²

Inter-professional education was another area that was explored for continuing professional development (CPD) during the pandemic, mainly to adjust to feasible timings and to cut down cost while ensuring diversity. Also, diversity in the form of inter-professional education enriched learning experiences.

All these measures were especially important for low-resource countries. The pandemic equipped us with knowledge, experience, resources and infrastructure that can be used to continue our academic activities for both undergraduate and postgraduate programmes³³ even after the situation returns to normal, allowing time for self and family as well as promoting self-directed learning.^{9,28}

II) Wellbeing of surgical trainees

What came as an unexpected benefit was the time to reflect and ponder on issues that were earlier discussed in meetings and published in journals but were never really applied and addressed to in their core either due to service load or because it was never a priority. One such area was mental health and wellbeing of surgical trainees. Different programmes started weekly online counselling and stress management sessions / workshops and peer support teams for trainees and programme directors to combat the effect of pandemic-related stress and to ensure psychological health. Clinical services ran with fewer healthcare professionals, allowing adequate work-life balance.^{34,27} These initiatives can be turned into regular activity even in the post-pandemic time without compromising service and patient-care.

III) 'Me time'

While people were locked down and practicing social distancing, many felt bored as lockdowns got extended, and started thinking out of the box to fill their time with something. The world witnessed the largest number of researches conducted and papers published during this time across all disciplines. Many of these turned out to be great innovations suggesting the value of time for reflection and critical thinking.

Conclusion

The COVID-19 global pandemic has adversely affected surgical specialties, resulting in major lapses in training, but has also thrown up a few unexpected useful adaptations. The pandemic, like many other disasters, has taught us lessons for survival and has also served as an impetus for pedagogical novelties and reshaped training for improving the quality of education and life.

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