



# We Asked the Experts: Virtual Learning in Surgical Education During the COVID-19 Pandemic—Shaping the Future of Surgical Education and Training

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## Introduction

The outbreak of COVID-19 continues to generate profound effects on surgical education and training. Currently, surgical training programs must decide between arresting their surgical education curriculums and devising adapted versions. By halting their educational programs, a disservice is done to their residents, medical students, and the surgical community. In contrast, programs designing virtual learning alternatives to maintain their curriculums forge the future of surgical teaching [1, 2]. These new designs create durable programs, which are able to acclimate to a multitude of situations while continuing surgical education and training [3].

Prior to COVID-19, virtual learning was slowly mixing into pedagogical methods, creating blended learning [3]. Blended learning utilizes online resources to enhance didactic and clinical knowledge and reasoning skills [3]. In the surgical field, online resources are continuously created to tailor to the needs of specific education levels, medical students, residents, fellows, and surgeons [4–6]. Due to the crisis, the incorporation of virtual learning in surgical education has exponentially increased.

Per the guidance of the Association of American Medical Colleges (AAMC), most medical schools have withdrawn their students from in-hospital clerkships [7]. The AAMC standard is for medical students to complete about 8 weeks of surgical clerkship to graduate [7]. Current challenges center on exposing students to the surgical discipline without exposing them to COVID-19. To mitigate the halt on in-hospital clerkships, medical schools are maximizing the use of virtual learning platforms [2, 4]. Virtual learning goes beyond delivering didactic materials online. Platforms exist that provide clinical skills with decision-making exercises. Such interactive platforms, like Aquifer-Wise MD, maintain the flow of robust information [4]. These interactive platforms provide surgical anatomy reviews, surgical procedure walkthroughs, practice test questions, and intricate patient cases [4]. Students practice developing differential diagnoses and improve clinical reasoning. Using this method of continuing education, students are exercising skills for their surgical clerkship. A study by Lindeman et al. demonstrated the use of virtual learning in a surgical clerkship resulted in noninferior academic outcomes with improved student satisfaction [4]. In another study by Chapman et al, medical students reported a lack of preparedness to be a significant factor contributing to unsatisfactory operating room (OR) learning experiences [8]. Through virtual learning, medical students will be more prepared when returning to their clerkships, capturing more positive learning experiences.

Though virtual learning is able to support certain aspects of surgical education, such as didactic materials, it cannot bridge certain gaps. It is difficult for the current virtual

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platforms to address the lack of intra-operative experiences. For third year medical students, the role of virtual learning should be to prepare them for the surgical clerkship by reviewing basic materials, procedures, and clinical skills. This approach relies on clerkship directors to appropriately adjust the third-year schedule to allow for students to complete the entirety of the surgical rotation. For third year students, the use of virtual learning can not only minimize the impact of the delay caused by this pandemic but can also better prepare students for the rigorous surgical clerkship and allowing for increased focus on intra-operative experiences [4, 8]. In regard to new fourth-year medical students pursuing a surgical residency, clerkship directors should adjust the fourth-year schedule to permit the completion of online electives, such as radiology, during this delay [9]. This allows students to reschedule surgical rotations, gathering more OR time. In addition to the previously mentioned resources, students can take advantage of online courses in suturing techniques with at-home practice kits. Though this does not fully replace hands-on experiences, continuing education through virtual means is the best approach to mitigate lost time in the operating room [3, 4].

With COVID-19, surgical residency programs are confronting massive declines in elective cases, concerns with COVID-19 exposures, and personal protective equipment (PPE) shortages [10]. While some programs have adjusted their infrastructure to temporarily address the aforementioned obstacles, their strategies should be to integrate the essential didactic materials, mitigate the resident schedule disruption, and address the rising instances of resident burnout [11]. In an effort to resolve these issues, our program reconstructed the residents into two teams. One team focused on clinical care while the other concentrates on didactic-centered materials. This strategy fits the clinical team with the appropriate numbers of residents required to deliver quality care and cover the reduced surgical volume. Since the teams alternate each week between the clinical and didactic, there is a reduction in exposures and in the use of PPE. A beneficial aspect of this design is the creation of a reserve workforce, which mitigates the effect of losing a resident to quarantine or isolation.

During the clinical week, teleconferencing is utilized for virtual hand offs and our multidisciplinary patient care meetings. For the didactic week, residents abide by the state's Stay-at-Home mandate and utilize virtual learning to continue their training [1, 5, 12]. This includes secure online academic lectures, academic conferences (e.g., Morbidity and Mortality Conferences), research, teleconferences and daily COVID-19 updates [12]. An additional resource provided by The Resident and Associates Society of the American College of Surgeons (RASACS), called Hangouts, provides supplemental didactic material for

residents [5]. Hangouts offers online lectures, curriculum modules, and educational videos for residents to follow along each week [5]. In addition to virtual surgical education, a major benefit of establishing a didactic rotation is addressing the issue of resident burnout. Burnout, a persistent plague for healthcare providers, worsens when there is limited self-care and increased emotional exhaustion [13]. Giving residents more time during the didactic week for self-care/mindfulness can reduce burnout and improve mental health [13].

With the decrease in case variety, residents are faced with less time to complete procedural quotas and less familiarity with other specialties [1, 14]. This generates more difficulty for residents when contemplating specialty selections. The disruption of the residents' schedule requires programs to reevaluate how best to deliver educational experiences. Simulations provide residents with a means to continue practicing their surgical skills with attending supervision [12, 14]. This provides residents with a means to prepare and review pertinent cases related to their procedural quotas. To acquaint residents with specialties, programs can continue to engage residents through the aforementioned virtual means with their current assigned specialty service. Though virtual learning can familiarize residents in procedural processes, it cannot directly fulfill procedural quotas or fully immerse the resident in a surgical specialty. Programs must still design amendments to the residents' schedule to allow for more specialty exposure. Using virtual platforms lessens the knowledge deficit created by COVID-19.

The greatest burdens for resident training are the decreased time spent in the OR refining and practicing surgical techniques [10]. To augment the effects of less OR time, the ACS offers a variety of online courses [6]. These courses include topics on core surgical knowledge and technical skills and procedures. Surgeons can review laparoscopic skills, ultrasound techniques and more through the interactive modules [6]. During this crisis, virtual learning is offering viable options to learn and refresh surgical skills.

The spread of COVID-19 will hopefully decline soon; the use of virtual learning in surgical education should continue to grow. The novel solutions created demonstrate the vast potential and benefits of virtual learning. Regarding surgical clerkships, the permanent employment of blended learning should be established. As a study by Hew and Lo demonstrated, students exhibited a significant improvement in academic performance when taught via a blended learning style versus a traditional teaching method (standard mean difference = 0.33, CI = 0.21–0.46,  $p < 0.001$ ) [3]. Utilizing interactive online modules creates students who are primed for their surgical clerkship, enhancing their surgical experiences. For surgical

residency programs, it is imperative to consider weaving in virtual didactic sessions into their schedules. This strategy is a viable approach to tackling resident burnout by allowing more time for mindfulness, improving overall mental health and morale [13]. Utilizing blended learning in residency promotes “dual coding” of both visual and verbal experiences, which is associated with enhanced residents’ recall and retention. Additionally, virtual learning provides avenues for surgeons to complete required continuing education courses. The time saved from traveling to distant sites can instead be allocated to self-care time, helping address physician burnout [15]. The recommendations to incorporate virtual learning at each level of surgical education creates a constant flow of technological exposure. Gaps in technological familiarity are diminished [16]. Across all levels of surgical education, virtual learning provides 24/7 accessible interactive platforms and online resources to continually enrich surgical training. At present, virtual learning serves as a means to improve surgical education by creating easily accessible platforms for distributing knowledge and practicing skills, not as a full replacement for hands-on clinical experiences. Given the current circumstances, we have the opportunity to begin mastering virtual learning. Thus, programs can begin to expand and improve their curriculums, maintaining pace with technological developments and innovations.

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