PERSPECTIVES

Using Technology to Maintain the Education of Residents During the COVID-19 Pandemic

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BACKGROUND: The COVID-19 pandemic presents a unique challenge to surgical residency programs. Due to the restrictions recommended by the Centers for Disease Control and Prevention and other organizations, the educational landscape for surgical residents is rapidly changing. In addition, the time course of these changes is undefined.

METHODS: We attempt to define the scope of the problem of maintaining surgical resident education while maintaining the safety of residents, educators, and patients. Within the basic framework of limiting in-person gatherings, postponing or canceling elective operations in hospitals, and limiting rotations between sites, we propose innovative solutions to maintain rigorous education.

RESULTS: We propose several innovative solutions including the flipped classroom model, online practice questions, teleconferencing in place of in-person lectures, involving residents in telemedicine clinics, procedural simulation, and the facilitated use of surgical videos. Although there is no substitute for hands-on learning through operative experience and direct patient care, these may be ways to mitigate the loss of learning exposure during this time.

CONCLUSIONS: These innovative solutions utilizing technology may help to bridge the educational gap for surgical residents during this unprecedented circumstance. The support of national organizations may be beneficial in maintaining rigorous surgical education. (J Surg Ed 000:1−4. Published by Elsevier Inc. on behalf of Association of Program Directors in Surgery.)

KEY WORDS: COVID-19, distance learning, flipped classroom, surgical videos

COMPETENCIES: Medical Knowledge, Practice-Based Learning and Improvement

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INTRODUCTION

The COVID-19 pandemic will have a profound effect on surgical education for the foreseeable future. As educators, while we must focus on providing care to our patients, we must also focus on the safety of our trainees and colleagues. The Centers for Disease Control and Prevention recently recommended avoiding any gatherings with more than 10 people.[1] As a result, in-person academic activities, including teaching conferences, morbidity and mortality conferences, and simulation labs should be avoided. In addition, rotations between different sites, even while remaining within the same institution, should be limited or canceled, as rotating through multiple hospitals may significantly increase the risk to residents, patients, and other healthcare personnel. Finally, the American College of Surgeons (ACS), and even many government institutions, are recommending against the continuation of elective surgery,[2,3] and most facilities are minimizing participants in any operation to essential personnel only. These factors will undoubtedly decrease resident case volume.

Given all of these sudden changes, surgical trainees will see a dramatic drop in their in-person exposure to all aspects of their education, with no clear endpoint. This presents an extreme challenge for surgical educators and, given the rapidly evolving situation, there have not yet been nationwide or multi-institutional recommendations. We must take immediate action and adapt novel techniques to ensure we maintain high-quality surgical education in these trying times. This needs to be done while maintaining safety and wellness of the learner, educators, and our patients (Table 1).

TABLE 1. General Recommendations for Maintaining Safety of Educators, Learners, and Patients during the COVID-19 Pandemic

Maintaining Safety of Educators, Learners, and Patients
Avoid gatherings >10 people
Avoid rotations between different sites
Cancel or postpone elective operations in a hospital setting
Minimize nonessential personnel in the operating room
Maintain disaster management and mass casualty triage principles

TABLE 2. Summary of the Proposed Innovative Solutions for Mitigating the Loss of In-Person Academic and Operative Education for Surgical Residents

Innovative Solutions
Flipped Virtual Classroom model
Online practice questions
Academic conferences via teleconference
Telehealth clinics with resident involvement
Facilitated use of surgical videos

INNOVATIVE SOLUTIONS

At our institution, during normal operations, we have 3 hours of academic-focused time on Monday mornings, then hold a 30-minute resident-focused academic conference every weekday morning.[4] In the past academic year, we have instituted novel strategies to use technology to augment these current education strategies.

We have implemented a flipped classroom strategy for select conferences. In this well-studied teaching method, learners are provided with didactic material in the form of a prerecorded video lecture that they can watch during any free time prior to the conference. The aim of the conference session then shifts to synthesis, application, and case-based discussion.[5] At our institution, we have shown in a small pilot study that this technique improved knowledge acquisition with no increase in preparation time. In addition, this technique is widely preferred by trainees.[6] This technique also provides trainees with a repository of video lectures that can be watched remotely at any time. Since the topics and objective tend to differ between junior (postgraduate year [PGY] 1-2) vs senior (PGY 3-5) residents, it is wise to have 2 separate tracks. This will allow for minimizing the number of participants in the "classroom" and allow for more interaction by the participants at the appropriate level.

Additionally, we created a novel social-media-based platform, a closed Facebook group titled "ABSITE Daily," to provide daily practice questions to prepare residents for the American Board of Surgery In-Training Examination (ABSITE). This platform not only allows for daily exposure to practice questions but also allows for another avenue of discussion of surgical topics without a requirement for in-person meetings. From its inception in July 2019 to the ABSITE in January 2020, membership rose from 27 to 237, with a median of 122 daily views. In a recent survey of participants, 100% found the platform helpful and 95% were likely to utilize it in their future ABSITE preparation.[7]

Given our experience with the use of such technologies, we have adapted rapidly to the current restrictions on in-person education with continued use of flipped classroom model lectures, continuing our use of our social media group for daily questions and discussion, and with the following new strategies (Table 2).

First, we are implementing a teleconference format for our weekday academic conferences, held at the same time as usual. We are utilizing a commercial online software (GoToMeeting (LogMeIn Inc., Boston, MA)) for these teleconferences that is free to users with a single paid institutional account. This format allows for trainees and staff to have a live video feed, so the lecturer can see who is currently attending, see responses of the trainees, and ask questions of specific audience members, which gives the feel of an in-person meeting from a safe distance. For the most part users are logging in from computers, but this program is also accessible from smartphones and tablets, which allows learner engagement from any location. Similar capabilities can be accessed through a variety of platforms, including Zoom (Zoom Video Communications, San Jose, CA), WebX WebEx (Cisco Webex, Milpitas, CA), and Skype (Skype Technologies, Palo Alto, CA). In addition, this format allows us to record all conferences (except for those with protected information, such as morbidity and mortality conference). Once recorded, these conferences are stored on a cloud account accessible by all residents for later review.

The first of these sessions, held on March 18, had a total attendance of 30, with a mix of faculty and residents in attendance. Due to self-quarantining and mandated staffing changes, more than half of participants were at home during the conference meeting time, and those in the hospital called in from computers in their separate offices. The session consisted of a preprepared lecture-based discussion with PowerPoint slides. With the teleconference platform, an interactive format was maintained with resident participation at multiple PGY levels. A straw poll after the 30-minute session showed that residents and faculty were happy with the format and were interested in continuing to attend remotely. From our early experience, we recommend using a

platform in which users can submit questions through a live chat function. This decreases participant talk-over and allows for a more fluid presentation.

There are a number of limitations to this platform, such as some faculty struggling with novel technology, participants with poor bandwidth connections, and some difficulty reviewing imaging. These challenges can be overcome, however, through an investment of time and effort by staff providers with familiarity with these techniques. Specifically, for imaging, we have had success with recording short video while scrolling through cross-sectional imaging (making sure to avoid any patient identifiers in the recording), then playing this video on a shared display. One approach to mitigating the limitations on technology-savvy staff is to conduct such conferences at a multi-institutional or even regional level with rotating faculty among more than 1 program. This will have the added benefit of increasing the pool of faculty who will invest in these platforms, and adding the unique advantage of learning what other programs are doing. We are actively pursuing this type of experience with nearby institutions.

Next, as most of our elective clinics have been canceled for the time being, we are moving towards increased dependence on telehealth clinics using the same online video conference software. To date, most staff providers have conducted these encounters alone. As it has become clear this format will be needed for some time, we are redirecting our efforts to keep residents involved with clinic and maintain this educational experience for them. Our clinic model is still in evolution, but currently involves trainees making the initial contact with patients who are sent to us for initial consult encounters, gathering a comprehensive history, then formulating a plan as they normally would. The trainee then discusses the case with the attending surgeon over the phone. The attending and trainee then conduct a multiuser video conference with the patient, so that the resident can partake in the final counseling of the patient and formulation of the final plan. Finally, the attending and trainee have a discussion after the patient has signed off to finalize the encounter. There are certainly potential issues with this approach such as patients with limited internet access and technologic capabilities, establishing rapport with patients without in-person encounters, the lack of a physical exam, and ambiguity about information security.[8] While these limitations are very real and we are actively working to improve this process, we believe this is an important and worthwhile initial effort.

While virtual academic conferences and telehealth can be used as a temporary replacement for learning done during didactic and clinic time, this will not make up for the significant decrease in the amount of time in the operating room. Depending on the setting, some programs may be able to augment resident learning with simulation in various forms. While simulation does not inherently involve meeting in large groups, simulation equipment is often located within the hospital, as it is for our program. Although we are looking for ways to get residents access to simulation equipment outside the hospital, we have discouraged residents from coming to the hospital unless they are on call and directly involved in patient care; therefore, their access to simulation is currently limited. For residents with access to a non-hospital-based simulation laboratory, these activities may be very beneficial to maintain technical skills through deliberate practice amidst the lack of operative cases.

Whether simulation is available or not, we also recommend viewing of high-quality surgical videos to help make up for the significant loss of time in the operating room.[9-11] While self-review of videos is encouraged, higher points of learning can be achieved when done in a group study format, ideally led by faculty. One limitation is the number of video libraries that vary widely in content and quality, with particular concern over the quality of freely available videos on platforms such as YouTube.[12,13] This can be improved by ensuring staff oversight and discussion when viewing videos of questionable quality. Additionally, there are video libraries from surgical societies such as the ACS and Society of Gastrointestinal and Endoscopic Surgeons,[14] which do offer an alternative, but are incomplete and, in some cases, expensive. Perhaps this time will serve as a reminder of the importance of wide access to such resources.

RECOMMENDATIONS AND CONCLUSION

During this rapidly evolving crisis, a great deal of flexibility will be required from both learners and educators, and learning methods that are not well-studied may be necessary. The authors call on surgical organizations such as the Association for Academic Surgery (ASE), the Association of Program Directors in Surgery, Society of Gastrointestinal and Endoscopic Surgeons, and the ACS to assist residency programs with this transition by offering alternative approaches, allowing free access to surgical video libraries, and encouraging surgical educators to share their resources with programs across the country. For these strategies to be widely successful, we encourage cooperation between institutions, particularly in the form of regionalization of educational teleconferences and allowing access to nearby institutions to ensure all trainees have access to high quality education during these difficult times. We welcome any collaboration from programs around the country.

A retrospective study of the changes being made by surgical residency programs during this time may generate hypotheses about the most efficient methods for surgical education and may be used in the future to drive innovations in surgical education. We emphasize that

the physical and mental safety of learners should be a priority and that all programs should take appropriate measures to preserve it, including the implementation of distance learning tools as described here.

In conclusion, this unprecedented circumstance will change the way we educate our residents for at least the coming months, if not longer. This will require innovation and cooperation on the part of surgical residency programs, and leadership on the part of our national societies to maintain rigorous standards of education and training for surgical residents.

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