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REVIEW

Endoscopy training in COVID-19: Challenges and hope for a better age

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Abstract

The COVID-19 pandemic is a unique challenge that has disrupted endoscopy training. Initial infection control measures aimed at protecting patients and staff meant nonessential endoscopic activity was suspended in many countries. The decrease in elective caseload from the pandemic also reduced training numbers during this period. While hands-on training took a backseat, more efforts were directed to didactic training of cognitive competencies. We review the literature describing the impact of COVID-19 on endoscopy training and summarize key measures aimed at mitigating this effect. These include leveraging on web-based didactic material and video-conferences, increased use of simulation and models to hone technical competencies, and a shift in focus from numbers-based accreditation to competency-based accreditation. While COVID-19 was hoped to be short-lived, it is clear the impact is long-lasting. Hence, it is crucial for training programs to take stock of how endoscopy training is evolving and use this opportunity to implement new paradigms into their endoscopic training curricula. COVID-19 might just be the catalyst that transforms endoscopy training into a new digital era.

Introduction

The coronavirus disease 2019 (COVID-19) pandemic continues to rampage the world. Many countries responded quickly with institution of lockdowns to slow down the spread of the virus, prevent health-care services from being overwhelmed, and reduce mortality. This significantly impacted gastroenterology and endoscopy training globally, with European trainees reporting reductions of activities up to 90% and 66.4% reporting interruption of trainee involvement. An international survey involving 67 countries and 770 respondents reported high levels of anxiety (52.4%) and burnout (18.8%). Major societies and groups from the United States, Europe, the United Kingdom, Asia, and Japan issued various guidance and guidelines,[1] of which four had explicit limitations on trainee involvement in endoscopy.[2–5] Nonessential endoscopic activity was suspended, trainees were redeployed to support critical services of the hospital, and trainee participation in endoscopies that were still being performed was also limited.[6]

These initial measures were disruptive, but effective. New COVID-19 cases decreased, we appeared to have crested the peak, and plans for gradual resumption of endoscopy services were being rolled out.[7] However, easing of restrictions and reopening led to the arrival of second waves in Europe, the United States, and many other countries, triggering the reimplementation of restrictions and even full lockdowns in some areas.[8] Despite the herculean effort from researchers to develop vaccines, it is clear that we will have to continue living with COVID-19 for at least the near future. The effects of COVID-19 are projected to persist till at least 2022.[9]

What was initially a short-term fix has stretched into longer term measures, and these continued restrictions have created a significant gap in learning opportunities for gastroenterology trainees. Endoscopy is a key component of the syllabus, and trainees are expected to become proficient in a wide range of diagnostic and therapeutic modalities. However, there has been a uniform reduction in procedure numbers globally, and there is growing concern as to whether sufficient competency can be attained within the finite training period.[10,11] Even when services do resume, it appears unlikely that training will recommence in the same capacity as it did beforehand. It is imperative that we adapt to this "new normal," and come up with alternative strategies to ensure trainees still remain competent by the end of their tutelage.[12] We highlight key paradigm shifts in endoscopy training in Figure 1 and elaborate on them.

Current solutions

Didactic learning. The pandemic has accelerated the uptake of many innovations by both gastrointestinal societies and individual programs to aid in didactic training in the cognitive aspects of gastroenterology, for example, procedural indications, complications, and limitations. The traditional classroom model of teaching is now unfeasible due to the social restrictions that have to be imposed. An alternative method is the "flipped classroom" strategy, whereby trainees are provided with educational material that they can peruse at their own leisure prior to the teaching session. The aim of the session then shifts to synthesis and application of the provided material.[13] This has been shown to improve knowledge acquisition and is widely preferred by trainees.[14]

Gastrointestinal societies have been at the forefront in the curation and generation of endoscopy learning material. All major

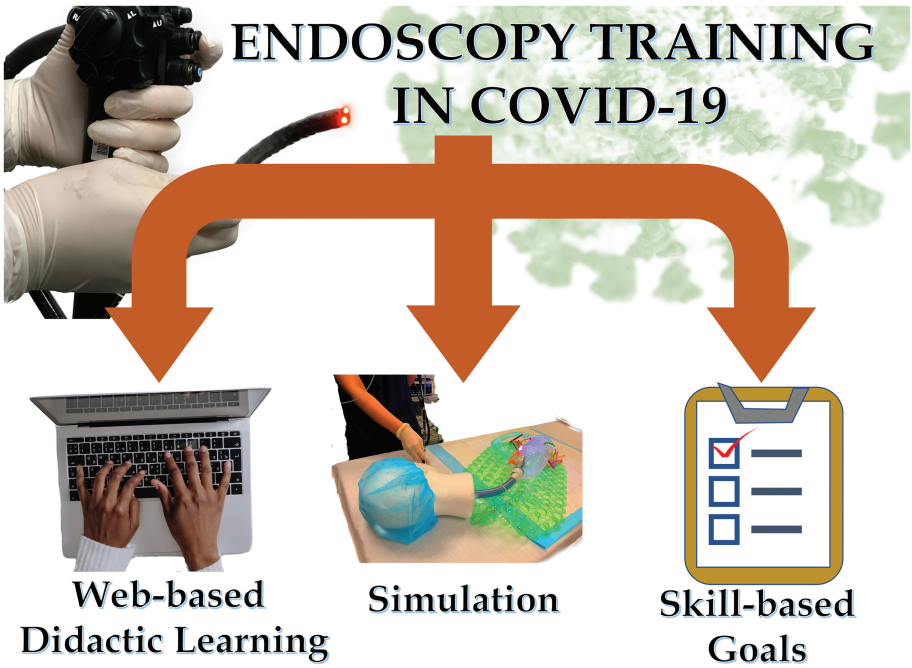

Figure 1 Key paradigm shifts in endoscopy training with COVID-19.

American gastrointestinal societies have online platforms such as the GI Leap portal from the American Society of Gastrointestinal Endoscopy (ASGE) and the American College of Gastroenterology (ACG) Education Universe that contain high-quality, expert-led endoscopy training videos.[15,16] There are also online educational programs such as the American Gastroenterological Association (AGA) GI Distance Learning portal and the ACG weekly Virtual Grand Rounds.[17,18] European societies such as the European Society of Gastrointestinal Endoscopy (ESGE) also offer similar programs such as the ESGE Webinar Series, which gives trainees the chance to view and participate in presentations made by world leaders in endoscopy.[19] Virtual conferences and live endoscopy sessions that are organized via international collaboration also allow trainees to access expert faculty while bypassing the usual limitations of cost, travel time, and jet lag, increasing exposure and educational opportunities in a nonstressful environment. The cost of many of these virtual conferences is often a fraction of the in-person meetings, although networking and social interaction is much attenuated.

Many training programs have also moved their traditional conferences and teaching sessions to a teleconference format. This can be performed via applications that transmit live video feeds, allowing trainees to participate by asking questions directly. Endoscopy video rounds can also be carried out in this virtual style as well. Fellows and their mentors can discuss key aspects of the endoscopic procedure, while taking advantage of the wide range of educational material available online for education on case-related topics. In addition, this format allows for other faculty members (e.g. surgery, pathology, and radiology) to contribute to teaching, broadening the trainees learning experiences.[20] Tele-endoscopy has also been used as an alternative training method in view of reduced endoscopy volumes. This involves trainees observing real-time endoscopic procedures being performed by experienced seniors, letting trainees continue to be involved in the decision-making process for procedures, as well as the live interpretation of endoscopic findings.[21] These recordings can be archived and viewed on-demand in the future.

Social media has also risen as an invaluable tool for augmenting individual learning. YouTube, Twitter, and LinkedIn have all been used as platforms to post educational infographics or clips of endoscopic procedures with commentary. These are unique methods for engaging a large number of participants in interactive discussions and are valued for both their flexibility, speed, and reach.[22] Real-time changes and new scientific knowledge can be shared and discussed even in this COVID-19 environment. Traditional criticisms have been towards the accuracy of the content provided. However, there has been a steady movement towards increasing rigor and authenticity, with experts leading regular structured conversations about difficult clinical cases and impactful journal articles.[23]

Simulation. Endoscopy has traditionally been taught using an apprenticeship model encapsulated by the dictum "see one, do one, teach one" method, where the trainee learns primarily through direct patient encounters under the guidance of an experienced teacher. However, this approach has several limitations. Trainees routinely learn the most basic endoscopic maneuvers for the first time on patients, which can be risky. Such a system usually leads to the trainee endoscopist focusing on gaining technical competence first before learning how to make appropriate diagnoses, which may lead to inappropriate interpretation of endoscopic findings.[24] Feedback directly tailored to the trainee is critical to learning, but this can be challenging to provide on-site in a hectic clinical setting. Furthermore, the level of training and advice that is

provided can vary widely—being an experienced endoscopist does not make one a good teacher.[25]

In general, the gastrointestinal community has limited adoption of simulation-based learning, compared with other disciplines such as surgery, critical care, and interventional radiology. However, the ongoing restrictions on endoscopy volume and trainee participation make this an ideal time for programs to evolve and incorporate simulation into their teaching syllabi. Simulation-based mastery learning (SBML) is a well-structured form of competency-based education that allows for the acquisition of procedural skills quickly and safely through repeated practice.[26] Task complexity is progressively increased to align with trainee competence, and a minimum level of knowledge and skill has to be demonstrated before being allowed to advance on to the next stage, ensuring all trainees learn uniformly. SBML helps with acquisition of endoscopy-related skills through a process of repetition and feedback. This allows trainees to build a basic framework of skills and techniques, and competency to be achieved at one's own pace.[27]

Simulators exist for all major domains of gastrointestinal endoscopy and can be used for novice and advanced endoscopists alike. Practice of basic endoscopy skills such as endoscopic handing, tip deflection, and torque steering can accelerate the time needed to achieve minimum competence. Becoming familiar with endoscopic techniques lets the trainees focus on image recognition and interpretation when performing endoscopies on real patients. It is also particularly useful for training in uncommonly encountered scenarios, such as low-frequency lesions like large polyps requiring endoscopic mucosal dissection or submucosal resection, esophageal nodules in Barrett's esophagus, or early gastric cancer. Modules that focus on lesion recognition, classification, and decision-making skills will help to facilitate skill acquisition, reinforce skill maintenance, and shorten the learning curve for training of new techniques.[28]

A growing body of evidence shows that clinical skills acquired in simulation settings transfer directly to improved patient care practices and better patient outcomes.[29,30] A meta-analysis of 14 studies comparing simulation based learning compared traditional clinical medical education showed superiority in achieving specific clinical skill acquisition goals.[29] SBML has been used to effectively teach upper endoscopy endoscopic skills to novices and also used to successfully train practicing endoscopists in the acquisition of the clipping over the scope technique.[31,32] The Accreditation Council for Graduate Medical Education in the United States and the ASGE reflect this by encouraging the use of simulators for endoscopy training.[33]

Augmented reality (AR) and virtual reality (VR) simulators have also made their way into medical training. AR involves the integration of reality with digital information through graphical overlay, whereas fully immersive VR transports the user into an artificial world created by the computer. AR and VR simulators have been used by surgical trainees and shown to bring about enhanced learning retention, trainee performance, and decreased patient complications.[34] AR and VR have also been used for clinical applications in the field of GI endoscopy. For example, they have been used in conjunction with artificial intelligence for recognition of pathology such as polyps and early neoplasia.[35] There is still significant untapped potential in the field of endoscopic training—the ability to create authentic, interactive scenarios with an accurate visual stereoscopic representation of reality and engaging haptic feedback can allow trainees to not only practice basic skills but also practice and plan for complex endoscopic procedures. Although nothing can replace clinical procedures, AR and VR simulators are superior to traditional mannequin-based simulators in their adaptability, greater degree of realism, and ability to improve both technical skills as well as cognitive competencies.[36]

However, simulators come with their own set of limitations. Models can be expensive and challenging to set up, especially in resource-limited countries. The use of live animal models is associated with both ethical and cultural controversies (such as use of pig models, which could be unsuitable for Muslim practitioners). Mechanical models provide suboptimal haptic feedback compared with actual endoscopies. It can also be challenging to accurately track and reproduce the mobile bowel on AR and VR simulators. In addition, while simulators are useful for training in higher-risk low-volume procedures such as interventional endoscopy, they do not replace the ability to recognize and treat procedural complications such as post ERCP pancreatitis or perforation which is best obtained from supervised training on real-life cases. Simulators are thus best used as an adjunct to *in vivo* training and do not obviate the need for *in vivo* training or proctored cases. Certain endoscopic training is also hard to replicate in simulation, such as interventional endoscopic ultrasound, gastrointestinal bleeding training, third space endoscopy and deep enteroscopy.

Transformation of endoscopic curricula. Competency in endoscopy has historically been assessed only after the trainee has met an arbitrary threshold for number of procedures completed. The ASGE currently recommends a minimum of 130 upper endoscopies and 275 colonoscopies before competency is formally evaluated.[37] However, trainees' progress at variable pace and the number of procedures needed to become competent can fluctuate widely between different individuals. The subjective assessment that is carried out can also lead to bias.

A goal-directed, performance-based system that provides objective evaluations to measure trainee progress can overcome some of these limitations with the existing approach, and is in line with the milestone-based "Next Accreditation System" recommended by the Accreditation Council for Graduate Medical Education.[38] The COVID-19 pandemic is an opportune time for programs to adopt and change their endoscopic curricula, as it mitigates the impact from reduced learning opportunities and endoscopy volumes. Trainees will only serve to benefit from a syllabus that shifts the emphasis away from assuming competence based on numbers alone, to teaching aimed at maximizing education by focusing on achievement of competencies.[39]

One key method is to use objective skill assessment tools in the clinical setting to monitor the learning curves of trainees. These provide a strong framework for training and help with early identification of deficiencies.[40] Numerous tools exist (e.g. the Direct Observation of Procedural Skills used by the Joint Advisory Group for Gastrointestinal Endoscopy in the United Kingdom, the Global Assessment of Gastrointestinal Endoscopic Skills used by the Society of American Gastrointestinal and Endoscopic Surgeons, and the Mayo Colonoscopy Skills Assessment Tool), but the Assessment of Competency in Endoscopy endorsed by

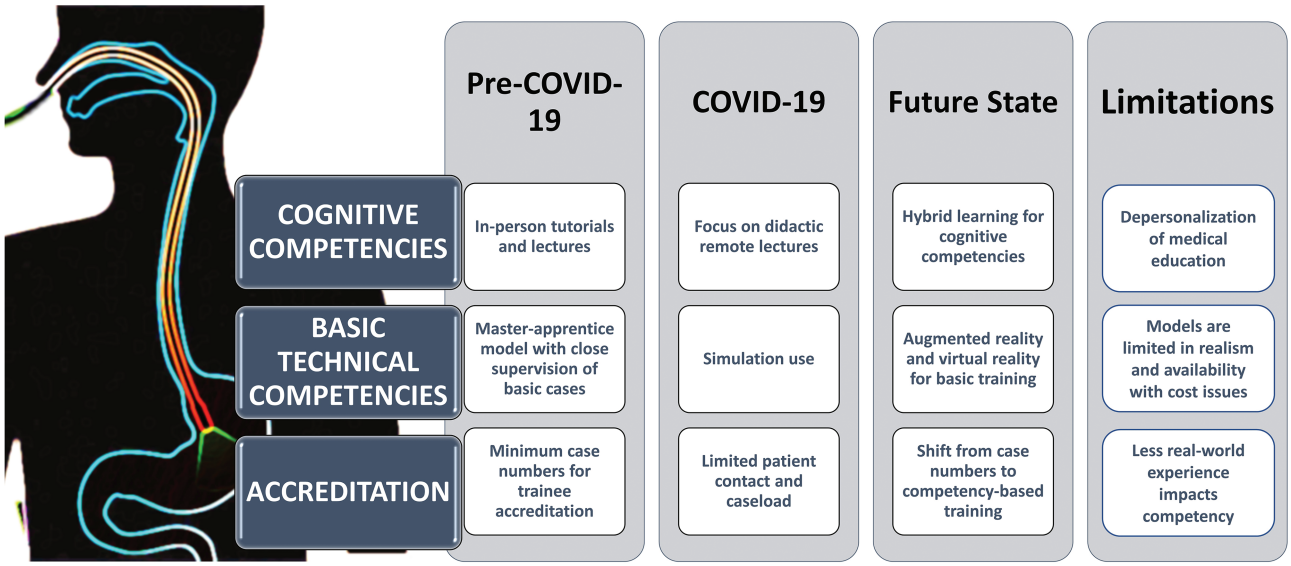

Figure 2 Analyzing the impact of COVID-19 on endoscopy training.

the ASGE has been validated to be predictive of performance on real patients.[41,42]

Moving forward, instructors should use preplanned training for each trainee and adapt their teaching based on trainee performance and self-reflection on outcomes.[43] Learning plans should also be centered around each trainee's needs, so that learning agendas are kept aligned,[44] and the application of web-based technology will help with the administrative burden and allow responsive tracking of training. Emphasis should be placed on the need for frequent constructive feedback in the context of routine clinical care, and focused assessment to highlight strengths and weaknesses that need improvement. These learning plans will also help program directors and faculty members with early recognition of trainees who are having difficulties, and address problems expediently.

Summary

The COVID-19 pandemic is a unique challenge that has arrested gastroenterology and endoscopy training but has also become a driving force spurring fundamental and structural changes in endoscopy training. Many techniques and pedagogies described in the literature were developed prior to the pandemic, and their efficacy in the pandemic setting has not been studied specifically. Furthermore, the heterogeneity of the outbreak means some of these factors are not universally applicable in all care settings. For example, in countries such as Singapore and Korea where the pandemic is under relative control, face-to-face training has already resumed with the addition of precautions such as masks and limited group sizes. We summarize the paradigm shifts and limitations in Figure 2.

These developments are not all positive. Although low-cost simulators in response to the COVID-19 situation have been described,[45] simulators in general are costly and not always available, and no amount of simulation can replicate the tactile response of live endoscopy. Remote learning methods are often impersonal, and overall reduced training numbers will certainly impact training adversely.

Ultimately, even though the pre-COVID-19 landscape offered a richer training experience, successful training programs will need to evolve and make the most of a difficult situation by incorporating new teaching paradigms into their endoscopic curricula.

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