

Original Contribution



The Technological Impact of COVID-19 on the Future of Education and Health Care Delivery

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Background: The unexpected COVID-19 crisis has disrupted medical education and patient care in unprecedented ways. Despite the challenges, the health-care system and patients have been both creative and resilient in finding robust “temporary” solutions to these challenges. It is not clear if some of these COVID-era transitional steps will be preserved in the future of medical education and telemedicine.

Objectives: The goal of this commentary is to address the sometimes substantial changes in medical education, continuing medical education (CME) activities, residency and fellowship programs, specialty society meetings, and telemedicine, and to consider the value of some of these profound shifts to “business as usual” in the health-care sector.

Methods: This is a commentary is based on the limited available literature, online information, and the front-line experiences of the authors.

Results: COVID-19 has clearly changed residency and fellowship programs by limiting the amount of hands-on time physicians could spend with patients. Accreditation Council for Graduate Medicine Education has endorsed certain policy changes to promote greater flexibility in programs but still rigorously upholds specific standards. Technological interventions such as telemedicine visits with patients, virtual meetings with colleagues, and online interviews have been introduced, and many trainees are “techno-omnivores” who are comfortable using a variety of technology platforms and techniques. Webinars and e-learning are gaining traction now, and their use, practicality, and cost-effectiveness may make them important in the post-COVID era. CME activities have migrated increasingly to virtual events and online programs, a trend that may also continue due to its practicality and cost-effectiveness. While many medical meetings of specialty societies have been postponed or cancelled altogether, technology allows for virtual meetings that may offer versatility and time-saving opportunities for busy clinicians. It may be that future medical meetings embrace a hybrid approach of blending digital with face-to-face experience. Telemedicine was already in place prior to the COVID-19 crisis but barriers are rapidly coming down to its widespread use and patients seem to embrace this, even as health-care systems navigate the complicated issues of cybersecurity and patient privacy. Regulatory guidance may be needed to develop safe, secure, and patient-friendly telehealth applications. Telemedicine has affected the prescribing of controlled substances in which online counseling, informed consent, and follow-up must be done in a virtual setting. For example, pill counts can be done in a video call and patients can still get questions answered about their pain therapy, although it is likely that after the crisis, prescribing controlled substances may revert to face-to-face visits.

Limitations: The health-care system finds itself in a very fluid situation at the time this was written and changes are still occurring and being assessed.

Conclusions: Many of the technological changes imposed so abruptly on the health-care system by the COVID-19 pandemic may be positive and it may be beneficial that some of these transitions be preserved or modified as we move forward. Clinicians must be objective in assessing these changes and retaining those changes that clearly improve health-care education and patient care as we enter the COVID era.

Key words: Continuing medical education, COVID-19, fellowship program, medical education, medical meetings, residency program, telehealth, telemedicine

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Among the many changes imposed on us by the COVID-19 pandemic are shifts in how educational content is delivered, with a migration away from the traditional in-classroom experience to more technology-based virtual learning experiences. Likewise, this affects the training of residents and fellows who must forego much of the traditional hands-on experiences of clinical training in favor of more virtual didactic experiences. In addition, the pandemic has abruptly shifted health-care delivery and patient encounters, which have been sorely felt by physicians caring for vulnerable pain patients. How long such changes will endure is not known, nor can we foresee all of the ramifications of this transition.

These changes raise many important and intriguing questions. Can pain fellowship didactics make up for a lack of direct patient and collegial contact? As numerous specialty societies cancel their medical meetings, conventions, and symposia, can continuing education content be done as well with webinars and virtual experiences? While costs in terms of both time and money for patient and physician education have decreased thanks to technology, is this new technology really viable over the long term? What must be sacrificed in order to reap these gains?

The aim of this commentary is to evaluate how technology in the time of COVID-19 has changed pain practice, pain education, and patient care and to determine how these transitions might benefit pain care.

METHODS

COVID-19 has had acute and challenging effects on fellowship education, continuing medical education (CME), and other forms of postgraduate medical education. The impact of technology on the delivery of health-care, explosion of telemedicine services, and the potential impact on opioid and regulatory reform will also be evaluated.

FELLOWSHIP EDUCATION

The COVID-19 pandemic has imposed significant challenges to pain management and other fellowship programs by altering delivery of care to patients, drastically reducing procedural and surgical volume, and altering didactic programs. This public health crisis has exposed disparities in pain fellowship education, particularly with concern over impact of telemedicine on education, use of e-learning platforms and technical proficiency. There is, however, an opportunity to establish practices that will mitigate inequities now

and prevent future disruption in pain fellowship education.

The Accreditation Council for Graduate Medical Education (ACGME) is actively providing updated guidance to post-graduate programs to navigate these challenges (1). Policy changes include endorsing flexibility in some program requirements, while rigorously upholding others, including duty hours, provision of adequate supplies and resources, and adequate supervision (2). The pandemic has resulted in a differential impact on fellows' clinical experiences with some programs in areas severely impacted by COVID-19 having to redeploy trainees to help care for patients infected with the virus. Nationally, 32% of residency and fellowship programs were under the ACGME COVID-19 pandemic Emergency Status as of April 27, 2020 (2). The redeployment of fellows and reductions in case volumes may result in the inability of pain fellows to gain sufficient hands-on experience with certain types of interventions or achieve the minimum case requirements as set forth by the ACGME specialty program requirements. Furthermore, as pain management centers reopen and procedural volumes increase, the need to preserve personal protective equipment (PPE) may limit fellows' ability to participate in procedural care because some local graduate medical education programs restrict the performance of procedures to the most experienced clinician. In response, the ACGME has allowed for flexibility in these situations, permitting the program director and clinical competency committee to evaluate a fellow's readiness for autonomous practice regardless of completed case load (3).

The use of technology in pain fellowship programs may mitigate proficiency concerns. For example, telemedicine visits enable fellows to continue to participate in the care of patients. The ACGME allows for direct supervision of fellows either by simultaneous use of a telemedicine platform (i.e., the attending and fellow are physically in the same place) or via the concurrent monitoring of a telemedicine encounter (4). Using these approaches, an attending physician can still assess and supervise a fellow's clinical performance. While telemedicine is a useful tool for fellows to engage in patient care, limitations exist. The performance of a physical examination may be limited, especially in regard to subtleties, such as might be observed during a neurological examination (5). One must consider the educational impact that these limitations impose on the trainee. Will the absence of a comprehensive physical examination be associated with delay in treatments as

seen in previous studies (6)? Will fellows increase their dependence on radiographic imaging to determine diagnosis (7)? These are questions that do not have clear answers at this time. We must also consider that while a quick physical examination often yields expected findings, a thorough physical examination may result in unexpected findings (7). Telemedicine may limit the ability to perform a thorough examination and, in that way, it might reduce the chances of detecting the unexpected. These limitations in the physical examination may pose other challenges as well, such as appropriate patient selection and judicious scheduling of procedures. Thus, the benefits of technology must be tempered with ways to overcome these potential shortfalls.

Traditionally, postgraduate training programs utilize a person-to-person model for delivery of educational didactics, journal clubs, and workshops. This is an "old school" model, in which our health-care system has both confidence and long experience. Even before the first case of COVID-19 was diagnosed, technological innovation had already begun to change education, health-care, and even social relationships. The COVID-19 crisis has simply accelerated the drive and interest in these new tools. But while the technological tools and platforms to a large extent existed years before COVID-19, they have never been used as purposefully, as rapidly, or with such intentionality as they are being used now.

Trainees today may be considered "techno-omnivores" and are comfortable using a variety of devices and electronic resources, such as WhatsApp and Twitter (8). Trainees approach their education with a desire for user-friendly, technology-driven, convenient opportunities. Clearly, technology-based platforms have a real and growing place in medical education, but other methods may be needed to add depth and organization to a virtual educational curriculum (8). In the current time of social distancing, computer-assisted learning, online learning, and web-based programs can all be used to effectively provide medical education. There is tremendous versatility in this new e-learning technological toolkit: Educational activities can be used synchronously or asynchronously, allowing online systems to mimic live classroom interactions or provide for self-paced learning. E-learning opens up greater access to education, higher efficacy of educational effort, cost-effectiveness, learner flexibility, and interactivity (9). Comparisons between e-learning and traditional teaching methods are difficult because comparison groups are heterogeneous, lack uniformity, and have numerous confounders that defy adjustment (10).

The efficacy of e-learning methodology appears promising. Pape-Koehler et al (11) demonstrated improved surgical performance of a laparoscopic cholecystectomy when used in isolation or when combined with a practical training session compared to practical training alone. Additionally, Smeekens et al (12) reported improvement in nurses' ability to detect child abuse in an emergency department after a 2-hour e-learning session. The demonstrated improvements in that study included higher quality history taking (12). In some cases, a hybrid approach may be helpful as in palliative care where a study found medical students benefited from e-learning on palliation but that their education had to be supplemented with experience-based training and face-to-face encounters with patients at the end of life (13). The combination of traditional in-person learning combined with asynchronous or synchronous e-learning has grown in use (14,15) and could be an effective method in this new era (16).

Surgical virtual education studies can be extrapolated towards the development of e-learning platforms geared toward teaching technical proficiency to pain medicine fellows. One may theorize that webinars will probably have practical components that may resemble a video game or another virtual simulation. Studies have supported the use of online video skills curricula to aid in learning surgical techniques such as 2-layered hand-sewn small bowel anastomoses (17). In another study combining audio-video materials with a hands-on simulation, surgical residents reported that they enjoyed and learned from the step-by-step, in-house, audiovisual curriculum and both appreciated and thrived on the hands-on simulation sessions mimicking operations that they have seen in real operating rooms. The cost of these programs was found not to be prohibitive and the programs offer simulated repetitions for duty-hour-regulated trainees (18).

Video-based coaching is another modality that may assist in the development of procedural skills. In the COVID era, interventional procedures may be coached by a preceptor remotely. A recent study found that despite equivalent exposure to practical laparoscopic skills training, video-based coaching enhanced the quality of laparoscopic surgical performance on both virtual reality and porcine laparoscopic cholecystectomy models, but this was at the expense of increased time (19). The authors concluded that video-based coaching is a feasible method of maximizing performance enhancement from every clinical exposure (19).

The COVID-19 crisis will end, but pain education specialists should continue to re-think postgraduate medical education in light of different teaching techniques that may complement conventional face-to-face education. Moreover, e-learning techniques and technology also greatly enhance the ability for cross-departmental or multidisciplinary collaborative educational sessions. Pain programs have already utilized these cross-institutional educational platforms, enabling fellows to gain educational expertise from clinicians outside their own institutions. Virtual platforms can be used by faculty to help mentor fellows with the advantage that they may make faculty more accessible to fellows than in the older fellowship model (20).

Webinars were gaining popularity even before the pandemic, and there are numerous webinars currently offered by national specialty societies and industry. (Table 1.) The impact of such webinars on fellows' education is not known. Unlike traditional classroom didactic programs, webinars can be offered either as live events or on-demand, that is, recorded for replay at the convenience of the consumer. But these webinars may actually expand beyond conventional in-classroom experiences by giving fellows more exposure to experts in their field than they may have had with traditional learning.

The Severe Acute Respiratory Syndrome (SARS) epidemic in 2003 posed substantial challenges to fellows and resident education in Canada that may serve as guidance for education in the COVID-19 era. Residents treated many of the SARS patients in one Toronto

hospital but new clinical rotations were postponed or cancelled to reduce the risk that clinicians might infect new areas of the city (22). Out-of-town electives were not permitted in order to restrict mobility. Conventional teaching approaches, such as grand rounds, workshops, and other seminars were either cut back, reduced in scope, or cancelled. For about 4 months, the hospital maintained an abbreviated schedule of training events. During this time, the faculty at this teaching hospital directed their time and efforts to the SARS epidemic and were unable to devote the usual amounts of time to educating fellows and residents. In addition to disrupting the normal course of medical education, many fellows and residents in this period were disappointed with their altered job descriptions and unprepared for some of the demands placed on them (22). Following the SARS crisis, the older approaches were reinstated.

An important challenge in this COVID-19 era has been an initial shortage of PPE needed for clinicians who had direct patient contact. As a result, the Association of American Medical College issued guidance on April 14, 2020, restricting medical students' ability to have direct patient contact in an effort to spare the very limited PPE available for physicians and nurses (23). While this is understandable, it prevented or at least limited trainees from contact with patients. The COVID-19 pandemic has also caused a sharp drop in elective procedures, further reducing the sort of clinical activities in which students, residents, or fellows may participate (24).

Table 1. Webinar data from the ClickMeeting.com company (21). Note that this information was gathered and presented prior to the COVID-19 crisis and is not limited to health-care-related webinars.

Criterion		Comment
Average amount of time a person spends at a webinar	53 minutes	This is somewhat less than the time of the average webinar, that is, the average user may sign off before the webinar is fully completed.
Best day and time for a webinar in terms of getting attendance	Tuesday between 2 and 4 p.m.	Asynchronous webinars only. Despite the rigidity of scheduling, live webinars drive high attendance as well.
Number of webinars held using the service ClickMeeting.com	627,033 in 2019 604,488 in 2018 Increase predicted for 2020	8.5 million unique attendees in 2019. It is likely that the service Zoom has a very high volume as well, but data were unavailable.
Main purpose of webinar	Online training: 35.6% Product demos: 27.8% Business meetings: 11.0%	Online training includes classes, certification, courses, and so on.
Device used by consumer of webinar content	Desktop: 68% Phone: 32%	Participants may have a strong preference for a particular device.

Initiation of any new virtual tool can result in technical issues until the learners become more familiar with the interface. Even young and technically savvy health-care professionals may experience initial difficulties with new applications or devices. Evidence from cardiology programs suggest that there may be ways to offer guidance to promote their successful use, such as orientation sessions, informing participants to mute their microphones, encouraging users to enable video to create a more personal feel to the meeting, assigning a moderator to large group sessions, and having a designated technology trouble-shooter available during live events (20).

While these technological tools are not new, the COVID-19 pandemic has sped their entry into everyday clinical use, changing the educational environment of this year's pain fellows. Future endeavors will need to assess fellows' satisfaction, attendance, and clinical performance with these technological tools to better understand their overall impact on the future careers of current pain fellows.

CONTINUING EDUCATION

The increased number of on-demand activities not only offers clinicians the ability to consume medical and scientific content at an unprecedented rate, but also allows for more nuanced presentations while accommodating a variety of personal learning styles. The conflicts between multiple competing entities to provide an educational experience may, on one hand, lead to heterogeneity of the CME processes, but, on the other hand, this heterogeneity may lead to a new platform in which educational providers are able to distribute their content to practitioners as a whole, thus creating a more homogeneous common curriculum.

Of course, heterogeneity in the practice of medicine and medical education was the norm prior to modern times. In fact, heterogeneity has always existed on multiple levels among medical societies, institutions, and individual preceptors, and efforts have always been made to find common ground and adjust for these differences. The factors that have contributed to the standardization of medical practices have traditionally been medical board examinations, evidence-based guidelines, consensus statements, and the textbook. While academic institutions and medical societies have traditionally been the champions of shaping current practices, the internet offers anyone and everyone a platform for their teachings, providing they can gather an audience. Content—even if anecdotal, erroneous,

or scientifically unsound—can be released to the broad reach of the internet in seconds. The typical YouTube celebrity or Instagram “influencer” is often an outspoken person who is more adept at gaining a large number of followers than having a depth of knowledge, experience, or expertise in their field. In medicine, science, and academic fields, such internet stars most likely did not climb the ladder in their field or go through the traditional academic rites of passage. Indeed, those who follow traditional professional or academic pathways and present their findings in balanced, scientifically sound ways may find themselves overlooked online, while the more flamboyant internet presenters dominate. This trend may be harmless when it comes to fashion blogs, home repair instruction, or cooking tutorials, but the day may arrive when “the Napsters of medicine” disrupt the CME world with large volumes of “influenced,” biased and yet free content. Specialty societies, academic institutions, and key opinion leaders may face fierce and sudden competition coming from individuals who have almost nothing to lose by releasing unvetted content, anecdotal opinion under the guise of evidence that are yet commercially biased content, false information, or plagiarized materials.

Independent digital educators and academic institutions may either compete aggressively with each other for the attention of clinicians or they can forge a symbiotic and mutually beneficial cooperative agreement that leverages each of their unique assets. Flexibility and adjustment to new norms is necessary, as is the ability to rapidly produce high-quality, scientifically sound, vetted content. The peer review process is one of the pillars of traditional medical publication, but vigorous and thorough reviews take more time than the digital era generally permits. Expedited reviews may solve the temporal problem only to introduce new ones: Inaccurate content, misconceptions, bias, plagiarism, and other flawed content may result. As institutions develop online platforms for medical education, they must be able to match the speed of the independent digital educator in terms of delivering visually appealing content and keeping online information updated.

A wealth of free online CME activities is already available online. During the disruption imposed by COVID-19, it is easy to understand why physicians would preferentially seek online CME activities, but it is not clear if they are seeking these online CME activities from trusted sources or how they make their CME choices. An even more important question is whether in the COVID-19 era these behaviors will return to base-

line, with trusted sources dominating the CME world, or whether this transition toward more free and low-cost CME content will change CME and grant inroads to lower-caliber CME providers.

During this time of COVID-19, medical professionals may discover the range and volume of intriguing online medical content, such as lectures, webinars, demonstrations, surgical techniques, product demonstrations, and so on. These materials have existed before and health-care professionals may even have used them before, but in these days of social-distancing, clinicians may find that for the time being, online programs are their only access to medical lectures and demonstrations. It is unclear if this will change their behavior over the long term and how it may reshape attitudes toward medical lectures, seminars, symposia, and conventions. Will clinicians still be drawn to sit in a crowded lecture hall to hear one speaker addressing the group with little opportunity for questions? Will physicians be willing to take time off and travel to conventions to hear speakers describe their scientific posters or to passively attend plenary sessions or special symposia? The answer resides in part in the reasons that draw clinicians to these events in the first place. If they attend conferences for networking, social, and business opportunities, the large gathering still has a viable and unique place in the medical education landscape. But if conferences are attended mainly to gain

access to high-quality didactic sessions by experts and CME credits, then large scientific meetings may have to retool to be relevant in the post-COVID-19 era. This may also result in blending these approaches. For example, it may be that for live events, large lectures give way to smaller break-out sessions, more niched subject matter, small focus groups, and the opportunity for attendees to interact with speakers. A wealth of virtual sessions may supplement the live program; the virtual environment offers advantages, in that moderators can take better control of the discussion and manage questions from the audience (25). In virtual activities, participants, faculty, and others behind the scenes can message each other in real-time. Questions are typed in by the audience and can be scanned, culled, and prioritized by a support person rather than using the older method where a person could grab the microphone and ask long-winded and sometimes off-topic questions (25). In short, both live events and virtual events offer real benefits and drawbacks in physician education.

According to the Healthcare Convention and Exhibitors Association, there are over 30,000 medical meetings in the United States each year, some of which attract thousands of participants (26). The COVID-19 crisis prompted the cancellation or rescheduling of many professional meetings, and at this point, it is too early to report on the actual consequences of this disrupted year (Table 2). To navigate this un-

Table 2. Status of key pain society meetings in 2020. Note that information is accurate at the time of publication but may be subject to change.

Society	Originally Scheduled Meeting Date	Status	Revised Meeting Date	Location	Plans
AAPM	Past	No change	February 3 – 7, 2021	Phoenix	Live event
ASIPP	April 2 – 4, 2020	Rescheduled	Sept 4 – 6, 2020	Dallas	Virtual
ASRA	April 23 – 25, 2020	Cancelled	Not Yet Determined	San Francisco	Live event
ESRA Residents and Trainees Workshop	June 19 – 20, 2020	Postponed to 2021	Not stated yet	Portugal	Live event
ESRA Congress	Sept. 16 – 19, 2020	Rescheduled	Date not set	Thessaloniki, Greece (location may change)	Live event
IASP	February 2020	Rescheduled	June 27 – July 1, 2020	Amsterdam	Live event
PainWeek	Sept. 8 – 12, 2020	No change	Sept 8 – 12, 2020	Las Vegas	Virtual
World Institute of Pain	March 14, 2020	Rescheduled	Aug 26 – 29, 2020	Rome	Live event

AAPM, American Academy of Pain Medicine

ASIPP, American Society of Interventional Pain Physicians

ASRA, American Society of Regional Anesthesia and Pain Medicine

ESRA, European Society of Regional Anaesthesia & Pain Therapy

IASP, International Association for the Study of Pain

known terrain, conference organizers tried virtual approaches (for example, the American College of Cardiology canceled its live March 2020 meeting and was one of the first large meetings to morph to a virtual meeting held the same month as the originally scheduled meeting) (27). Even meetings scheduled further into the future, such as the Genome Science conference slated for September in the United Kingdom has been “indefinitely postponed.” It is too early to speculate the effects of such schedule changes and virtual meetings will have on this industry. Clearly, there have been substantial negative economic consequences on medical specialty societies, the hospitality industry that hosts these meetings, the travel sector, and employees such as meeting planners and conference organizers.

Have these changes and the transition to fewer and more virtual meetings impacted medical education and, if so, in what way? Virtual meetings offer some important advantages: Recorded sessions and seminars allow conference participants to consume content on their own schedule, technology facilitates small meetings of affinity groups with specialized interests within the conference attendees, and neither participants nor faculty need spend time or money to travel to the event (28). Despite these advantages, virtual meetings deprive participants and faculty of personal human interaction and it is not clear if the networking typical at large meetings can be replicated in any kind of virtual setting. While it is too early to speculate at this time, it may be that a hybrid meeting can evolve which combines the advantages of both.

In this context, it is important to address the double-edged sword of industry support of medical education and medical meetings. Industry has tremendous potential to leverage its connections to key opinion leaders and provide free, high-quality, “big name” online CME activities. While this may be beneficial for individual programs, a comprehensive diet of industry-sponsored CME activities is likely to be inherently unbalanced in favor industry products, goals, and viewpoints. It is important that when industry support is involved that the program remains in compliance with CME regulations and is balanced. As always, this becomes a matter for CME committees to seek balance and objectivity, partnering with industry without becoming overwhelmed by industry. The role of industry in CME is controversial in virtually all aspects and not just in terms of COVID-related transitions (29).

THE ROLE OF TECHNOLOGY ON TELEMEDICINE

COVID-19 has significantly accelerated the feasibility and acceptance of telehealth care by physicians, patients, and payers. Prior to the COVID-19 pandemic, the telehealth market was expected to be valued at approximately \$36 billion in 2022 (30). Telehealth care can be summarized into 4 major categories including (1) telehealth visits (30), (2) audio only E/M services, (3) virtual check-ins, and (4) e-visits (31). The events of the pandemic have only further increased this estimate (32). The benefits of telehealth have been explored and demonstrated in other fields including neurology, emergency room medicine, surgery, and primary care (33-38). Multiple studies have demonstrated patients’ appreciation of the benefits of telehealth and in some cases preference of telehealth visits over in person office visits (39). Documented reasons for preferring telehealth visits include convenience, and time and cost savings. For example, for postoperative visits after routine surgery, the associated visit time was decreased from approximately 80 minutes to 8 minutes when including preintervention and postoperative times in the calculations. In a survey of 1,734 patients who received telehealth visits through urgent care clinics, greater than 90% of patients reported being very satisfied with all telehealth attributes and one-third of patients preferred the telehealth visit to a traditional in-person visit (39).

Prior to the COVID-19 crisis, the field of pain medicine had also documented the benefits of telehealth in providing medical care, and these benefits have been reinforced during the pandemic. Numerous pain management studies demonstrated the ability of telemedicine to improve access, reduce wait times, maintain patient satisfaction, and decrease costs (40-43). Specifically, a cost analysis from a randomized controlled trial comparing in person consultation with telemedicine consultation, not only demonstrated significantly higher patient satisfaction with telemedicine but also lower direct patient costs (43).

Although telehealth’s benefits had been established from both the patient and physician perspectives, implementation of this technology was slow, secondary to challenges with reimbursement, coverage policies, and technology restrictions. When the COVID-19 pandemic entered the United States and imposed significant emergent and life-sustaining clinical demands and restrictions to care delivery, methods to provide nonemergent and elective care needed to be rapidly

implemented. The Centers for Medicare and Medicaid Services (CMS) developed a tier framework to prioritize services and to define care pathways. For pain management, most of the medical and interventional care was classified as a Tier 1 (low acuity treatment or service) or a Tier 2 (intermediate acuity treatment or service) service (44). Secondary to this classification, it was recommended that the nonemergent and elective services were canceled and that medical care be provided via telehealth services. For this telehealth integration to occur in the field of pain management multiple legislative and reimbursement barriers had to be removed. (Table 3). The Coronavirus Preparedness and Response Supplemental Appropriations Act and the 1135 waiver authority enacted on March 6, 2020, temporarily removed many barriers to the utilization of telehealth for Medicare beneficiaries (31,45). Many private payers also followed these strategies. Furthermore, the United States Health and Human Services waived potential penalties for HIPAA violations that involve telehealth medical services for patients. Due to this waiver, everyday communication technologies could be utilized, including FaceTime, Skype, Facebook messenger video chat, Google hangouts video, and Zoom. Certain communication strategies that are public-facing platforms still need to be avoided, including Facebook live, Twitter, and TikTok (46).

In addition to removal of many of the barriers to telehealth services, the Drug Enforcement Agency (DEA) also modified policies to allow for the remote prescribing of controlled substances. On March 20, 2020, the DEA stated that telehealth may be used for prescribing controlled substances if 3 conditions are met by the prescriber. The 3 conditions were the following: (1) the prescriber is acting within the usual standard of care and the prescription is for legitimate medical purposes; (2) acting within applicable federal and state laws; and (3) telehealth communication is conducted using real time, 2-way, audiovisual interactive communication system. Even though the DEA reduced restrictions allowed for the prescribing of controlled substances via telehealth, physicians must still follow safe opioid prescribing procedures and take appropriate risk mitigation steps (49).

Patients suffering with musculoskeletal conditions are often referred for physical therapy, but because of the need to socially distant, the ability of patients to attend physical therapy clinics is often limited. Therefore, other alternatives must be considered such as electronic health supported home exercise interventions. A systematic review evaluating the efficacy of electronic health supported home exercise intervention for patients with osteoarthritis of the knee demonstrated improvements in pain, physical function, and health-related quality of life outcomes (50). However,

Table 3. Barriers to the implementation of telehealth for Medicare patients prior to the COVID-19 pandemic

Pre-COVID-19 Status	Current Status
Originating site	Removed*
Rural area designation	Removed*
Place of service requirement	Removed* Beneficiaries may receive services in the home.
Established patient requirement	Removed* New patients now have access to telehealth care.
Cost-sharing obligations	Officer of Inspector General will not impose administrative sanctions for reducing or waiving any cost sharing obligations for Medicare patients (coinsurance and deductibles).#
HIPAA compliant telecommunication	United States Department of Health and Human Services waived potential penalties for health-care providers that involve telehealth medical services.Ψ
Telehealth financial barriers	Audio and video, real-time communication telehealth visits will be paid at the same rate as in person visits. §
Telehealth financial barriers for telephone only evaluation and management (E/M) services	On April 30, 2020, CMS further expanded telehealth and increased payments for audio only telehealth services to match payments for similar office outpatient visits.α

*1135 Waiver Authority and Coronavirus Preparedness and Response Supplemental Appropriation Act (31,45)

#OIG Policy Statement Regarding Physicians and Other Practitioners That Reduce or Waive Amounts Owed by Federal Health Care Program Beneficiaries for Telehealth Services During the 2019 Novel Coronavirus (COVID-19) Outbreak (47)

§Notification of Enforcement Discretion for Telehealth Remote Communications During the COVID-19 Nationwide Public Health Emergency (46)

αTrump Administration Issues Second Round of Sweeping Changes to Support U.S. Healthcare System During COVID-19 Pandemic (48)

the improvements were small and adherence was challenging. As these technologies are further enhanced, ways of improving patient motivation and adherence are needed.

During the last 2 months, the integration of telehealth and electronic health in pain practices has occurred at a rapid rate. Telehealth has allowed physicians to provide nonemergent care. The reduction in legislative barriers, coverage policies restrictions, and improvements in reimbursement have augmented this growth. Increased patient acceptance of telehealth has occurred. Furthermore, practitioners and medical staff have become accustomed to the technology. The future utilization of telehealth will depend on multiple conditions with the major one being whether these temporary restrictions which made the use of the technology possible continue beyond the pandemic. Patient acceptance has been high. In order to maintain this degree of patient satisfaction it is critical to remember the telehealth characteristics that are important to patients

including ease-of-use and privacy (36). In addition, telehealth is a very effective way to deliver care to individuals dealing with chronic conditions, the situation often seen with many patients dealing with chronic pain (51). When utilizing telehealth, extra efforts will be needed to build and maintain a patient-physician relationship. This has been one of the limitations of telehealth documented in surveys by patients (41). The future of pain care most likely will involve both in-person and telehealth visits. The COVID-19 pandemic has pushed the advancement and acceptance of telehealth, and it is unlikely that patients will not demand the convenience of this service in the future. Practitioners and office managers will need to continue to monitor coverage determination, policy, and reimbursement to maintain compliance and financial viability when using the telehealth platform.

Clinicians selecting telemedicine programs should consider platforms that are user friendly and preserve user confidentiality (Table 4). Regulations about per-

Table 4. *Guidance about the use of telemedicine during the pandemic based in part on guidance from the American Academy of Family Physicians (52).*

Guidance in Using and Selecting Telemedicine Applications	
Consideration	Examples
Telemedicine systems should be useable on smartphones, tablets, laptops, and desktop computers and in many cases, “device agnostic” approaches are appropriate as many patients have a preferred device and/or there may be devices they do not have or cannot use with confidence.	Most patients have and are comfortable with a smartphone.
Popular applications can be used during the COVID-19 crisis for convenience and speed.	Facebook Messenger video chat, Google Hangouts video, Skype, Apple Facetime Telemedicine may also include telephonic consultations and emails.
The use of certain public-facing applications may pose security risks.	Facebook Live, Twitch, and TikTok should not be used as they may pose security risks.
Some dedicated services charge a fee, often on a continuity basis.	Fees may be monthly sometimes with an initial free trial; a contract may be required.
Features to Consider in Telemedicine Applications	
Feature	Considerations
“Waiting room”	Allows patients to queue up; patients are not denied access if the clinician is busy.
Platform agnostic	Can be used with whatever device you or your patients choose (smartphone, tablet, laptop, desktop). Patients may have a preferred device.
“Out of office” messages	Informs patients when no one is available.
Message service	Allows patients to leave a message when no one is there. Messages must be retrieved often and calls returned.
Schedule visits	Some of the more advanced applications allow the device to schedule the visit automatically, saving valuable administrative time.
User-friendly interface	System must be easy for patients to use and easy for the clinical team to use and interpret.
Set up	It is often imperative to get set up, trained, and running in days.

sonal health data and privacy that have loosened during the COVID-19 crisis will no doubt be reinstated as the crisis concludes, so telemedicine options should be selected with a long-term view.

REGULATORY REFORM

A national-level legal framework is required that authorizes, regulates, and reimburses telemedicine in the care of patients, particularly but not exclusively during epidemics and other public health crises (53). Direct to consumer (DTC) telemedicine options are available in the United States and other countries, but these solutions may be owned and managed by private companies and require self-payment or private insurance (53). For telemedicine, many free applications exist, such as Skype, WhatsApp, Facetime, and others, but these applications have not been specifically repurposed for telemedicine, that is, they may not offer security and privacy necessary to meet medical needs. Such free solutions are extremely helpful in a crisis but may not offer a good long-term solution. Lower-tech options may be used, such as email, texts, and telephone, but again privacy and security issues may be involved. As much as possible, telemedicine applications should be integrated with electronic medical records systems or other health-care databases and, for pandemics, data should be sent to appropriate public health authorities for epidemiological surveillance (53). Regulatory issues regarding patient privacy and cybersecurity with respect to telemedicine must be clarified, defined, and resolved.

Education and training should be developed for health-care providers to equip them to use and be more effective with telemedicine applications. Patient-facing materials on telemedicine are also needed to be sure patients can take full advantage of these services. The concept of telemedicine may sound frightening to a patient, while the idea of Skyping with the clinic may seem less intimidating. Finally, for times of public health crisis such as COVID-19, telemedicine should have an established system and strategy to collect and report data that may help better define the nature, scope, and extent of a given outbreak (53).

OPIOID REGULATION IMPACT

Telemedicine has also been recommended for the evaluation, initiation, and maintenance of opioid therapy, with specific emphasis on avoiding abrupt discontinuation of these drugs or other cessations that could precipitate distressing symptoms of opioid with-

drawal (54). Opioid patients at elevated risk for opioid use disorder or overdose should be counseled about this risk and given naloxone with instructions as to how it is to be used (54). It is also crucial that patients who are taking or considering initiation of indicated opioid therapy be informed about the potential immunosuppressive impact of opioids and how this may affect their risk for COVID-19 (54). Such conversations and counseling can take place using telemedicine. During the pandemic, face-to-face patient encounters, physical examinations, and urine tests may not be possible for opioid patients, although they are imperative for long-term management of patients on chronic opioid therapy (54). To the extent possible, clinicians should assess the patient's health and status, review adverse events, and discuss risks and benefits with the patient by telemedicine. Some conventional efforts in the care of opioid patients are still possible with telemedicine, for example, pill counts can be done by video (54). In the care of chronic pain patients on opioid therapy, it is important to recognize that these individuals may be suffering with higher than normal levels of anxiety, apprehension, and fear, all of which may exacerbate their pain and also contribute to insomnia. Chronic pain patients represent a vulnerable population and this vulnerability has likely been heightened by fears about the pandemic.

Although prescribing regulations related to controlled substances have been relaxed in the COVID-19 era, it must be anticipated that this will be reversed when the pandemic ends. Clinicians must be prepared to return to the old standards, although some of the advances of telemedicine may still be preserved such as virtual visits, video pill counts, and online patient education.

PAIN MEDICINE FELLOWS' PERSPECTIVES ON EDUCATION AND HEALTH DELIVERY

Nationwide, the COVID-19 crisis has impacted both fellowship and resident educational environments in a variety of ways. The most obvious and immediate effect has been the decreased amount of interventional experiences available during the pandemic. The bulk of procedures performed across training programs were deemed elective, with a near unanimous decision from most fellowships to halt interventions in the interest of public health and patient safety. This effect has been particularly exaggerated for one-year training programs, where precious little time remains for technical training.

Already, imposter syndrome among physicians is cited as ranging from 22% to 60%, (55) which has been linked to decreased confidence, low self-esteem, burn-out, and self-harm. A perceived dearth in procedural training may only serve to exacerbate such feelings, which is likely compounded with the uncertainty for the future in young trainees.

Uncertainty for the graduating fellow is not limited to training alone. From the decreased ability to travel for job interviews, the unpredictability of the economic market and weaker compensation offerings, and overall loss of jobs, difficulties may only compound the longer economic restrictions. Many fellows across the country have already had future contracts voided due to the closure or inability of the practices to hire them as promised. The ramifications of a potential shift in employment availability from private practice toward academic or hospital-based positions are yet to be realized.

For the resident physician applying for a fellowship, virtual interviews have replaced the conventional personal discussions to which most interviewees had grown accustomed. Forced by restrictions on both group gatherings and air travel, the experience will likely leave both interviewer and candidate less able to make valuable first impressions. Current candidates have expressed anxiety that academic centers that had previously entertained applicants from other training institutions may tend to accept in-house applicants due to familiarity and convenience.

The pandemic does come with a few silver linings regarding fellowship education. Never before has information been shared as freely as in the current moment. Access to lectures and presentations during conferences which previously required considerable travel-related expenditures are now offered freely by medical societies as are weekly webinars and online discussions. Easy access to virtual meetings decreases the time inefficiencies associated with travel, potentially increasing engagement. Video demonstrations of various interventions have also led to lowered barriers to education, while the rise of social media has increased networking opportunities among peers and mentors.

Another obvious change to medical training across all specialties has been the adoption of telemedicine, a mode of practice that will likely remain viable long after the end of COVID-19 restrictions. Training in this regard has allowed fellows to “future-proof” and refine real-world applications to clinical practice during fellowship. Telemedicine has the potential to increase

access to many patients, as well as increase compliance of visits given ease of access.

Finally, the outbreak of COVID-19 at the epicenter in New York City and elsewhere in the country saw widespread cooperation of medical professionals at all levels of training unite to contribute to the common cause of weathering the worst contagion of our lifetimes. Interns and attending physicians of all specialties stepped out of their respective comfort zones and into the intensive care unit (ICU), because the fundamental desire of clinicians to prevent suffering and alleviate pain remains unchanged. Similarly, it is not merely the satisfaction of refining new procedural skills, but learning to preserve and restore quality of life in others that has always been the real appeal of pain medicine. That aspect has been, and will continue to remain, an unshakable constant. Pain medicine remains the most versatile fields of medicine, and it is now that it shines brightest.

DISCUSSION

In terms of telemedicine, the COVID-19 pandemic has accelerated trends that were already in place and showing strong but modest year-over-year growth. Patient consultations by phone, email, and specialty online portals were well underway before the crisis and many of the barriers to broader implementation of virtual visits between patients and providers have been swept away by the urgency imposed by COVID-19 precautions. Reimbursement, for example, has been clarified, regulatory issues about privacy and security are under review, and technological platforms are available that offer a wealth of important and helpful patient-friendly features.

Health-care education, fellowship programs, and residencies, on the other hand, have been impacted in unprecedented ways and it is not clear at this time whether these major changes of 2020 will be rolled forward, reversed, or if some sort of hybrid medical education model is reached. A benefit of these changes for these training programs is that redundancy across the nation’s more than 100 training programs may be reduced. Virtual training components will likely never completely replace hands-on, face-to-face clinical experience, but it may supplement the traditional approaches with more participant-centric and convenient content. It is likely that some education and fellowship programs that emerge will be stronger, more robust, and better suited for the future and this may drive a free market approach to education in the coming

years. Hybrid programs are likely to develop, such as the combination of grand rounds with multiple training opportunities conducted already by the University of California.

Many medical and specialty society meetings for 2020 have been postponed, reinvented as virtual meetings, or canceled outright. It is not sure if these changes will shift perception about the value of the old model of medical meetings and if any or all of these recent changes, such as virtual sessions and webinars-on-demand, will influence the design of future meetings. Medical meetings, like all large congresses and conventions, have been severely disrupted by the COVID-19 crisis but many specialty congresses have re-invented themselves in a virtual format. If these virtual meetings find resonance and provide clinicians with real value, it may be that future conventions and meetings transition to a hybrid format of shorter live meetings with a strong virtual “backend” of specialty sessions. It is difficult now to predict how the 2020 series of medical meetings will impact the way meetings are developed and offered in the future. CME is likewise affected, and as it increasingly transitions to more and more online activities, it is not yet clear if physicians will prefer the convenience and price point of online activities to other delivery systems for CME or if there will be a broad return to live CME activities once the crisis is over.

The health-care system, physicians, administrators, regulators, public health authorities, and patients have all come together in remarkable ways to transition the urgent and unprecedented health-care needs of our time into viable solutions. As we emerge from the COVID-19 pandemic, some of these temporary fixes may well be forgotten, but we should build on the workable technological innovations this crisis forced us to adopt

so abruptly. In short, medical education for the health-care industry may change because of the COVID-19 pandemic, but it should change for the better.

CONCLUSION

In addition to patients, the health-care system itself has been impacted by the COVID-19 crisis to the extent that fellowship programs and medical training programs have been disrupted, specialty society and other medical meetings canceled or shifted to a virtual format, CME activities are migrating more and more to online formats, and the care of patients demands the more widespread use of telemedicine. These changes have been abrupt and at times inconvenient and adverse but some of these shifts in “health-care business as usual” may bring about needed change or benefits in finding ways to deliver optimal care in the most effective and efficient ways possible.

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