

Disruptions during a pandemic: Gaps identified and lessons learned

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Abstract

Global disruptions caused by coronavirus disease 2019 (COVID-19) affects all walks of life, and dentistry and dental education are no exceptions. Dental education uniquely blends didactic courses and hands-on clinical training seamlessly to prepare oral healthcare providers of the future. Apart from economical and access to care implications, closure of all the dental institutions in the United States affects their educational mission greatly, equally disturbing pre-doctoral and graduate training. Efforts are ongoing to continue the educational mission in dental institutions by delivering scheduled course content remotely using multiple online tools. In spite of those efforts, since clinical experiences cannot be completely replaced by any available alternative method of instruction that is delivered remotely, students are missing out on valuable patient-based clinical experiences. In this perspective article, we briefly discuss the several implications of COVID-19, in the context of dental education. We then highlight some of the lessons we can learn from this pandemic which we hope will have several positive implications, including curricular changes, increased public health awareness and preparedness for future public health emergencies.

KEYWORDS

clinical experiences, COVID-19, dental education, disruption, pandemic

Coronavirus disease 2019 (COVID-19) is a highly contagious infectious disease caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2).¹ The World Health Organization (WHO) declared COVID-19 a Public Health Emergency of International Concern on January 30, 2020,² and finally declared it a Pandemic on March 11, 2020.³ Patients affected by COVID-19 can remain asymptomatic or develop symptoms ranging from flu-like manifestations to severe pneumonia with a relatively high fatality rate.⁴ This novel coronavirus is believed to spread mainly via respiratory droplets and contact transmission. The close proximity of dental professionals to patients' oral cavity and the generation of aerosols and droplets

during a large majority of dental procedures, puts dentists and their teams at high risk for contracting this disease and for cross-contaminating and transmitting the disease among patients.⁵

1 | EFFECT OF COVID-19 ON DENTAL EDUCATION IN THE UNITED STATES

Due to the rapid spread of COVID-19, a large majority of states in the United States implemented stay-at-home orders and limited or prohibited professional activities, including elective dental care. Based on the most recent national survey of dentists and specialists, it is clear that

dental care delivery has been significantly disrupted due to COVID-19 crisis.⁶ Institutions that train future dental professions also closed their doors (except for emergency care) and sent students home during this crisis. In addition to increasing the health risks for those involved in delivering emergency care at the dental institutions, the disruption of both pre-doctoral and post-doctoral dental education caused by COVID-19 has several implications, including but not limited to the ones described below:

1. **Educational:** The sudden halt in the educational mission due to this pandemic has led to an intense and fast exploration and implementation of creative ways to continue delivery of educational content remotely. In spite of this, disruptions in practical hands-on training in patients and demonstration of clinical competencies that occupy a bulk of the overall training requirements, the educational mission is greatly affected, for both dental students and residents.
2. **Patient Care:** Many patients across the United States, especially those who are in low socio-economic strata or those who lack dental insurance, rely heavily on dental institutions for their regular dental care and any disruption of care will greatly affect these vulnerable populations.
3. **Research:** With the closure of dental institutions, both basic and human subjects-based research activities are greatly affected leading to an enormous setback in research and discovery missions of the institutions.
4. **Faculty Growth and Retention:** Research consequences mentioned above will also have promotion and tenure implications for faculty members involved in research, and disruptions in patient care will impact clinical track and adjunct faculty. In response to the pandemic, several universities across the United States had implemented the tenure roll-back policy that will provide additional time period for probationary faculty members to compensate for their loss of productivity during this crisis before they are required to go for promotion. In addition, the cancellation of multiple conferences and scientific meetings prohibited faculty members to communicate their research and clinical findings and collaborate with colleagues from other institutions.
5. **Financial:** Most of the dental institutions rely heavily on the revenue from clinical activity for financing their operations; therefore, closure of clinics to elective care will create a significant burden on the financial management of these institutions.

In this report, we would like to focus mainly on the educational implications of COVID-19 based disruptions. Our goal is to highlight the lessons learned during this period

and how we can apply them to strength the education mission of dental institutions and create a workforce that is prepared to tackle a future pandemic.

According to American Dental Education Association, the following are some of the key changes implemented in US dental training institutions specifically due to the COVID-19 crisis.⁷

1. Students sent home for a period of time with a plan to periodically evaluate their return strategy.
2. Didactic courses moved online and delivered via synchronous or asynchronous delivery of content.
3. Continuing preclinical simulation exercises (in some institutions) adhering to social distancing.
4. Closing the doors for elective dental care and limiting the care only to urgent and emergency needs.
5. Cancellation of external rotations and travel by students and faculty.
6. Cancellation and rescheduling of dental licensure exams.
7. Graduation ceremonies either moved online, rescheduled, or cancelled.

The U.S. accreditation body for dental education (the American Dental Association Commission on Dental Accreditation—CODA) is attentive to the changes and has issued a Guideline in which CODA took the unpredicted disruption of dental education across the nation into consideration, and provided guidance on how to report these changes.⁸ CODA should be notified in writing by May 15, 2020. Upon notification and assessment of the reports, CODA Review Committees may recommend (1) approval of the report; (2) approval and request for more information; (3) post-pone action and continue program accreditation status, but requesting for more information; (4) post-pone action and continue program accreditation status, but conducting a special site visit in relation to the changes; (5) report denial.⁸

Apart from the aforementioned effects on current students' educational experiences, this crisis will also potentially affect prospective students who will apply to dentistry in the coming years. Since we can expect a change in the grading scheme in undergraduate education for this semester, this might affect their final grade and, therefore, pose a potential problem when these applicants are reviewed for admission. The incoming class size might also be reduced, depending on how soon the routine dental care dental schools will resume after the peak of the crisis and until a vaccine is available. It is feasible that some potential applicants might consider postponing their dental training, if significant temporary reduction of clinical training is expected during their planned dental school years.

2 | GAPS IDENTIFIED AND LESSONS LEARNED

2.1 | Online delivery of education and curricular decompression

As mentioned earlier, dental educators and administrators were forced to come up with creative strategies to continue the education mission during the crisis. The availability of online platforms and software applications [such as Zoom (<https://zoom.us/>), Webex (<https://www.webex.com/>) or Panopto (<https://www.panopto.com/>)] that allow for seamless online delivery of content synchronously (live delivery) or asynchronously (recorded lectures) made it possible to offer all of the didactic courses online during this period of crisis. Flipped classroom exercises, in which the students do some previous research and/or assignments for discussion during online meetings have also been used as a learning strategy to increase student engagement. Interestingly, using the private chat option has allowed more anonymity, and therefore some otherwise shy students have been more likely to ask questions, spearheading more discussion. In addition to the possibility of delivering lectures to several students at the same time, learning management software such as Canvas (<https://www.instructure.com/canvas/>), also offers mechanisms to conduct examinations remotely. Although it is extremely difficult to create an educational module remotely that simulates clinical experiences, many schools implement small group case presentations/discussions and case-based learning exercises remotely to mimic clinical environment and keep students engaged. For student engagement, discussion forums and live meetings have showed to be very effective, with some faculty and students even claiming it to be more effective than traditional classroom-based sessions, which finds some support in the recent dental education literature.⁹

Assignments delivered online using cases with different levels of complexity and with different learning objectives that guide student learning using a structured skillset, such as the ones previously described for rapid oral health deterioration risk assessment¹⁰ and interprofessional practice,¹¹ can also be used remotely to foster critical thinking. Objective structural clinical examinations (OSCE) is another tool that has been effectively used to remotely evaluate students in an environment that mimics clinical settings. It is becoming clear that, post-COVID-19 crisis, these strategies to remotely deliver course content, mimic clinical experiences, and conduct examinations will have a place in dental education. When strategically implemented in conjunction with irreplaceable clinical experiences, it will allow for more customized schedules for the students, and consequently better adaptation to differ-

ent learning styles leading to curriculum decompression, offering more time for reflection, knowledge assimilation, and application. This decompression will also allow for introduction of newer educational ventures within the curriculum or offer much needed time for mental well-being programs for students.¹²

With regard to clinical experiences, the postdoctoral students (residents) are equally affected by this crisis, if not more than pre-doctoral students. Many of the aforementioned strategies will be applicable to post-doctoral students as well and will have a place in their trainings post-crisis. For these students, providing curricular decompression by strategically integrating online education into their curriculum will provide more time for their clinical experiences. Moreover, these students who are commonly in a Master or Doctorate-residency combined program, will get more time for their scholarly pursuits, if some of their courses are moved online.

2.2 | Preparing the dental workforce for future crises

The unexpected period of public health crisis also raises the question “Are we effectively preparing the future dental workforce to deal with such epidemics?”

It becomes essential to create programs within the dental curriculum that offer training specific to crisis management during health crises and natural disasters, including how to secure access to credible information; to promote effective communication with patients, community, and staff during crisis; to be able to deliver appropriate emergency dental care and effectively triage patients (either by phone, video, or in office); and to be able manage the financial burden.

It also makes it necessary to implement training in teledentistry. A recent national survey indicated that close to 20% of the dental professional who responded closed their practice completely, and this is where teledentistry can play an important role. Although dentistry is a field that requires in-person consultations to comprehensively assess and treat oral diseases, teledentistry is a great platform to offer consultations and referrals, mainly when social distancing is warranted.¹³ By minimizing direct patient interactions, teledentistry also has the potential to reduce the use of personal protective equipment (PPE) and other highly valuable clinical resources during a pandemic.

It is clear from this crisis that there is a dire need for health professionals in the frontline, and there were calls for retired physicians to rejoin the medical team. As of 2018, there were close to 200,000 active dentists in the United States and close to 80% of them were general

dentists (GDs).¹⁴ If they are willing to volunteer during such crisis, they should be able to do it, and for that, adequate training of future dental workforce and appropriate continuing education programs to help prepare our dental workforce are essential. A good example is the executive order passed in California that will consider dentists as essential healthcare workers, and a call was made to dental professionals to join California Health Corps to tackle the surge in COVID-19 cases.¹⁵ The same was also done in other countries, such as Brazil.¹⁶

2.3 | Alternative pre-clinical instruction models

Traditionally, dental institutions have typically used manikins and physical typodonts in simulations labs, mainly during the first 2 pre-clinical years of dental education to train students before they perform procedures on patients. However, the past decade has seen significant advancements in technology. The entertainment industry, like movies and video games, were the first to harness that surge in computing technology, bringing photorealistic virtual worlds to life through virtual 3-dimensional modeling and animations. Dental education can also benefit from such technology by using free, easy to learn software to generate virtual 3-dimensional models that can be accessed from any laptop, desktop, or mobile device.^{17,18} Using 3-dimensional virtual models has shown to increase student's spatial visualization¹⁹ and results in a more positive students' perception of dental education.²⁰ Significant advancement in haptic and virtual reality (VR) and augmented reality (AR) space gave rise to AR/VR-based simulation devices (examples: eHuman, Simodont, Dentsim, or Periosim) exclusively used as adjunct instruction tools during the pre-clinical training period.²¹⁻²³ Although they are in the early stages, when adequately enhanced and made portable, this technology has the potential to mimic patient encounters and aid in virtual continuity of clinical education and assessment during crises, when used in personal devices, such as tablets or phones. Evidence suggests that AR/VR-based devices will become the new normal in the future. At the current rate of technological advancements, it is not difficult to imagine the future of education relying heavily on digital and virtual technology, which will provide a more versatile, immersive, and accessible method of delivering information, especially during crisis situations.

The disruptions caused by COVID-19 are plenty in all walks of life, and dentistry and dental education are not immune to it. Dental schools across the United States have adapted to this crisis in innovative ways to deliver continuity in dental education. There is no replacement for hands-on clinical experience, but this crisis brought to light

several avenues that, if strategically incorporated into the pre- and post-doctoral curricula, if addressed can strengthen our dental education system to better cope with future unexpected scenarios.

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