


ORIGINAL ARTICLE

Pandemic preparedness in dental education: A US-based national survey

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Abstract

Objectives: The Coronavirus Disease-19 (COVID-19) pandemic highlighted the need for pandemic preparedness (PP) in health professions training. We aimed to (1) establish a current profile on curricular content of PP in US dental schools and (2) examine how schools were adapting their curricula in response to COVID-19.

Methods: An online survey was developed and sent to senior leadership to all 66 Commission on Dental Accreditation (CODA)-accredited US dental schools including Deans of Academic or Clinical Affairs from November 2020–February 2021. Questions addressed PP curricular content, teaching methods, and evaluation. Participants were asked about the barriers and facilitators for the inclusion of this content. The survey also included questions on redeployment of the clinical workforce in response to the pandemic.

Results: The response rate was 31.8% ($n = 21$) with representation from every US Census Bureau-designated division. While all responding dental schools agreed that dental professionals can play an important role during pandemics, 38.1% reported including content on PP into their pre- or postdoctoral curriculum. In response to the COVID-19 pandemic, approximately 47.6% indicated redeployment of their clinical workforce to participate in disaster life support, assisting physicians in COVID-19 cases, and assisting hospitals with personal protective equipment (PPE).

Conclusion: There was general agreement that dental professionals can play an important role during pandemics. The participating US dental schools responded to the COVID-19 pandemic by integrating novel clinical activities. More efforts are required to include PP in dental education.

KEYWORDS

coronavirus, COVID-19, dental education, emergency preparedness, oral health, pandemic

1 | INTRODUCTION

The coronavirus disease of 2019 (COVID-19) pandemic created unprecedented upheaval in dental education and care delivery.¹ Early in the pandemic, most dental offices closed as part of local and national lockdown strategies to contain virus spread.¹ To mitigate pressure on overwhelmed systems during the COVID-19 crisis, dental and other primary care services were suspended so that personnel could be redeployed to other healthcare settings, and personal protective equipment (PPE) could be reallocated to intensive care units and emergency rooms.^{2,3} In educational institutions, dental programs had to work with universities, academic health centers, and state health departments to make informed decisions to ensure safety of students, faculty, and staff.^{4,5} Dental education underwent significant shifts in training of pre- and postdoctoral candidates.^{1,4} These included moving didactic education online, restricting patient care, and canceling external rotations, and travel.^{1,4} The redeployment of dental responders into hospital settings as well as major shifts in dental education during the pandemic created a platform for the introduction of pandemic preparedness curricula.

Since the September 11th attacks, dentists assumed significant roles in providing triage and infrastructure during national emergencies.⁶ The Secretary of the Department of Health and Human Services has declared a number of national threats in the past 20 years, including H1N1 Flu outbreak in 2009, Zika Virus outbreak in 2016 and COVID-19 in 2020.⁷ Experience from past public health and humanitarian crises demonstrates how these events can happen unexpectedly, underscoring the importance of advance preparation.⁶ The COVID-19 pandemic shows that there is a role for dentists to contribute to both indirect and direct patient care during a public health crisis. While each crisis may differ, the lessons learned can help hone critical skills, communications, collaborations, and policies needed to be better prepared for future emergencies. Therefore, this study aims to: (1) establish a current profile on curricular content of pandemic preparedness (PP) in US dental schools and (2) examine how schools were adapting their curricula in response to COVID-19.

2 | METHODS

2.1 | Ethical approval

The study was reviewed, approved, and given an exempt determination by the Harvard Longwood Medical Area Office of Human Research and Administration (IRB20-1902) Institutional Review Board.

2.2 | Study population

A 20-item survey was developed and distributed to all 66 Commission on Dental Accreditation (CODA)-accredited US dental schools in 2020 listed in the American Dental Education Association (ADEA) connect database.⁸ The nature of the study required participants to have extensive knowledge of their curriculum; therefore, the survey was sent to the Deans of Academic or Clinical Affairs in each school. Participants were also encouraged to have a designee complete the survey.

2.3 | Survey development and data collection

The survey was developed based on published literature on PP in health professions education and inputs from subject matter experts. The survey included closed- and open-ended, and Likert-scale questions on the inclusion of PP in dental school curriculum and the curricular and workforce response to the COVID-19 pandemic. The survey included 13 questions focused on the inclusion of PP such as respondent attitudes, topic areas, timing in the curriculum, mode of content delivery, the involvement of external organizations, evaluation of PP, competency of learners, and barriers and facilitators to include PP in the curricula. Three questions were included to assess changes in curriculum in response to COVID-19. The survey's final four questions asked about the respondent's current academic position, location of the school, and number of students matriculating into the program. For validity and coherence, the survey was piloted by several department chairs in Harvard School of Dental Medicine who were not involved in the study.

The Qualtrics Survey Software (Qualtrics, Provo, UT, USA) was used to administer the survey to participants between November 20, 2020 and February 2, 2021. A cover letter accompanied the survey explaining the purpose of the study and the voluntary nature of the survey. Nonresponders received two reminder emails at 2-week intervals to increase the response rate. Additionally, in a final attempt to boost the response rate, the study team made phone calls to nonrespondents.

2.4 | Data analysis

The data were analyzed (STATA; StataCorp, V15.1, 2017) using univariate statistics such as frequencies and percentages to describe all survey items. Reporting of the study followed the Strengthening the Reporting of Observational Studies in Epidemiology guideline.⁹

3 | RESULTS

This study response rate was 31.8% (21 respondents of 66 target population). There was representation from every US Census Bureau-designated regions and divisions. Table 1 summarizes the characteristics of the respondents from CODA-accredited US dental schools and their responses to some of the general survey questions. Overall, 76.2% of the respondents were Deans of Clinical or Academic affairs, 14.3% were Vice Deans, and 9.5% were senior faculties and program directors (Table 1).

TABLE 1 Characteristics of respondents from Commission on Dental Accreditation (CODA)-accredited US dental schools and their responses to general survey questions ($n = 21$)

Characteristics	<i>n</i> (%)
United States region	
South	5 (23.8)
West	5 (23.8)
Northeast	4 (19.0)
Midwest	3 (14.3)
Missing	4 (19.0)
Academic position	
Vice dean	3 (14.3)
Dean of clinical/academic affairs	16 (76.2)
Senior faculty/director/professor	2 (9.5)
How many new students matriculate into your program each year?	
Less than 100 students	11 (52.4)
More than 100 students	8 (38.1)
Missing	2 (9.5)
Does your predoctoral or postdoctoral curriculum include content on pandemic preparedness?	
Yes	8 (38.1)
No	13 (61.9)
What are the major challenges that prevent pandemic preparedness curricular change? ^a	
Lack of time in the existing curriculum	15 (30.6)
Lack of faculty expertise	12 (24.5)
Lack of accreditation standards/ defined competencies	9 (18.4)
Limited funding or resources	8 (16.3)
Lack of flexibility to change curriculum	2 (4.1)
Other	2 (4.1)
No perceived role for oral health professionals in pandemic preparedness	1 (2.0)
Lack of acceptance within your institution	0 (0.0)
Lack of governmental policies	0 (0.0)

^aAnswers are not mutually exclusive. The question was asked by allowing the respondent to check all that apply.

3.1 | Pandemic preparedness in the curriculum

There was general agreement (agree or strongly agree) that dental professionals can play an important role during pandemics. The majority of respondents ($n = 13$, 61.9%) reported that their predoctoral or postdoctoral curriculum does not include content on PP. Among those 13 respondents, 76.9% ($n = 7$) were willing to consider incorporating a curriculum to include PP content. Lack of time in the existing curriculum and faculty expertise were the most reported major challenges that prevent PP curricular change (Table 1). Respondents also reported other challenges such as lack of accreditation standards or defined competencies, limited funding or resources, and lack of flexibility to change the current curriculum as barriers to including a PP curriculum.

Table 2 summarizes answers from respondents who indicated that their curricula include content on PP. Approximately, 38.1% ($n = 8$) of the respondents indicated that their dental school included PP in their pre- or postdoctoral curriculum. Some of the main topics included in the curriculum were the relationship between public health and medicine, personal protection and safety training, and health communication, which includes communicating clearly with other medical staff, and the community at large. However, strategic planning for pandemic response and ethical decision making for resource allocation during public health emergencies were not frequently included in the PP curricula. Respondents noted several facilitators to the inclusion of PP. Some of the most common facilitators were faculty commitment, interested leadership, perceived need by home institution, and the presence of national policies for PP inclusion (Table 2).

Dental schools, which included PP in their curricula, most frequently identified the first 3 years of the predoctoral program for timing of content delivery (Table 2). Lectures and online curriculum were the most common mode of delivery for this content. The next most frequent mode for delivery was case-based studies, and grand rounds where providers meet and discuss clinical cases with students. When asked whether external organizations were involved in developing PP content in the curriculum, half of the respondents (50.0%, $n = 4$) cited the involvement of organizations such as the Organization for Safety, Asepsis and Prevention, university-affiliated hospitals, public health departments, and community health centers (Table 2). Additionally, 75.0% ($n = 6$) stated that they evaluate their students on PP content. The most mentioned evaluation methods were written or computer testing (37.5%; $n = 6$), direct observation (25.0%; $n = 4$), case presentation (18.8%; $n = 3$) and Objective Structured

TABLE 2 Summary of answers from respondents who indicated that their curricula include content on pandemic preparedness ($n = 8$)

What is the timing of this curriculum?^a	n (%)
Year 1	7 (23.3)
Year 2	7 (23.3)
Year 3	7 (23.3)
Year 4	5 (16.7)
Postdoctoral or residency	4 (13.3)
What is the method of delivery of the curriculum?	
Lecture	6 (27.3)
Webinar/online curriculum	6 (27.3)
Case-based conferences	4 (18.2)
Grand rounds	3 (13.6)
Simulation exercises	2 (9.1)
Other	1 (4.5)
Was there involvement from external organizations in developing the content of this curriculum?	
Yes (described in the results text)	4 (50.0)
No	4 (50.0)
Which of the following topic areas are included in this training?^a	
Other (respondents answered: vaccinations)	8 (14.5)
Relationship between public health and medicine	7 (12.7)
Personal protection and safety training (e.g., issues of personal preparedness in public health emergencies)	7 (12.7)
Health communication (e.g., communicating clearly with other medical staff, community resources, and the community at large)	7 (12.7)
Public health systems and governance	6 (10.9)
Disease surveillance and outbreak investigation	6 (10.9)
Professional training (e.g., volunteer training and opportunities available to dental students)	6 (10.9)
History and biology of pandemics or epidemics	4 (7.3)
Pandemic planning (steps for response to pandemics that include evolving information and input from multiple stakeholders)	3 (5.5)
Ethics and resource allocation (e.g., issues related to use of scarce resources in public health emergencies)	1 (1.8)
What were some facilitators to adopting pandemic preparedness curricular changes?^a	
Faculty commitment	6 (18.2)
Interested leadership	5 (15.2)
Perceived need by home institution	4 (12.1)
National policy	4 (12.1)
Faculty expertise	3 (9.1)
Prior experience from previous infectious disease outbreaks (e.g., EBOLA/H1N1/MERS)	3 (9.1)
Student interest	3 (9.1)
Globalization of current COVID-19 crisis	2 (6.1)
Other (respondents answered: ADEA supportiveness)	2 (6.1)
Funding or grants	1 (3.0)

Abbreviation: ADEA, American Dental Education Association.

^aAnswers are not mutually exclusive. The question was asked by allowing the respondent to check all that apply.

Clinical Examinations (12.5%, $n = 2$). Approximately, 66.7% ($n = 4$) of those who evaluated their students expressed confidence in their students' competence in pandemic preparedness.

3.2 | Response to the COVID-19 pandemic

Table 3 summarizes the answers from respondents regarding their dental institutions' response to COVID-19

TABLE 3 Summary of answers from respondents regarding their dental institutions' response to COVID-19 pandemic

Response	n (%)
Has your predoctoral and/or postdoctoral curriculum changed in response to the COVID-19 pandemic? (<i>n</i> = 21)	
Yes	15 (71.4)
No	6 (28.6)
Do you have local or national guidelines on pandemic response for oral health personnel? (<i>n</i> = 21)	
Yes	13 (61.9)
No	3 (14.3)
Don't Know	5 (23.8)
Has there been any redeployment of your clinical workforce in response to COVID-19? (<i>n</i> = 21)	
Yes	10 (47.6)
No	11 (52.4)
In which of the following ways has the clinical workforce in your organization responded to COVID-19? ^a (<i>n</i> = 10)	
Core disaster life support/ basic disaster life support	10 (23.8)
Assisting physicians in COVID-19 Cases (e.g., in general treatment and monitoring of patients with mild pneumonia, antimicrobial therapy)	8 (19)
Assisting hospitals in counting and handing out protective equipment and medicines	5 (11.9)
Nursing duties (e.g., dentists and dental nurses caring for patients to help hospital nurses)	4 (9.5)
Assisting in triage procedures	4 (9.5)
Online consultation and prescription (assisting in online medical consultations or telehealth)	4 (9.5)
Clinic Infection prevention and control activities	4 (9.5)
Biometric screening (e.g., height, weight, temperature, blood pressure, etc.)	2 (4.8)
Immunizations	1 (2.4)
The clinics were temporarily closed	0 (0)
Radiology diagnosis (e.g., dental radiologists assisting medical radiologists)	0 (0)
COVID-19 testing (e.g., collection of swab specimens for diagnosis)	0 (0)
Specimen collection unrelated to COVID-19 testing (e.g., blood draws, urine, or saliva samples)	0 (0)
Medical evacuation and transfer of patients	0 (0)
Contact tracing or community monitoring	0 (0)

^aAnswers are not mutually exclusive. The question was asked by allowing the respondent to check all that apply.

pandemic. Of all respondents, 71.4% (*n* = 15) reported that their predoctoral and/or postdoctoral curriculum changed in response to COVID-19 pandemic. Approximately, 61.9% (*n* = 13) reported having local or national guidelines on pandemic response for oral health personnel. Approximately, 47.6% (*n* = 10) indicated that their dental school

clinical workforce had been redeployed in response to the current pandemic. Disaster life support, assisting physicians in mild COVID-19 cases, and assisting hospitals with PPEs and medication allocation were the most reported ways the clinical workforce was redeployed (Table 3). Other tasks the dental workforce participated in included assisting hospital nurses with nursing duties, triaging procedures, and providing telehealth prescriptions, and consultations. Of note, none of the respondents reported that their dental workforce provided COVID-19 testing to the community.

4 | DISCUSSION

We sought to establish a current profile on curricular content of PP in US dental schools and examine how schools were adapting their curricula in response to COVID-19. While all respondents agreed that dentists can play an important role during pandemic outbreaks, less than half of respondents' curriculum included content on PP. However, the majority of those respondents stated that they were willing to incorporate a PP curriculum into their educational plans.

The participating US dental schools responded to the COVID-19 pandemic by adapting their curricula to include topics about the relationship between public health and medicine, personal protection and safety training, and health communication. Most of the PP curricula were introduced to predoctoral students using a didactic approach (lectures and/or webinars), possibly due to the schools' closures at the time of survey administration. Lessons can be learned from medical schools and their work toward embedding PP or disaster medicine training into predoctoral training.^{10,11} For example, a recent systematic review of disaster medicine training in medical schools found that schools adapted practical trainings alongside didactic sessions for their curricula.¹² Practical training included simulations, field trips, role playing, and hands-on exercises.¹² These modes of training teach students to work in interdisciplinary teams, develop problem-solving, and critical workforce skills that can be applied in times of crisis. In dental schools, practical PP training should also be administered to postgraduate students and dental residents. Regular practical training and continuing education options for oral health students and providers will make them more effective and better equipped emergency responders during future crises.^{6,13}

In this study, top-down administrative support was reported as a critical element to the adoption of a PP curriculum. Faculty commitment and interested leadership were major drivers to PP curriculum implementation. Meanwhile, multiple barriers to adopting a PP curriculum

exist and include lack of funding and resources, institutional acceptance, time in curriculum, flexibility for curricular change, and faculty expertise to lead the curriculum. Thus, improved investments in training educators and creating flexibility within the pre- and postdoctoral schedules for independent study could better facilitate PP programs. Another potential way to address these barriers involves increased scholastic support from external organizations, such as the ADEA. Partnerships can also be formed with local governments, departments of public health, community health centers, and the federal government to help develop training programs. Identifying adaptable solutions to overcome these barriers is critical to fostering necessary interdisciplinary collaboration between dentistry and medicine and integrating the two fields especially during public health crises.^{2,3,6}

Our study found that half of the respondents indicated that their school's clinical workforce had been redeployed in response to the current pandemic. The most stated expanded roles included assisting physicians in mild COVID-19 cases treatment, hospitals in managing and dispensing PPE, and with core disaster and basic life support. However, none of the respondents reported that their dental workforce provided COVID-19 testing to the community. The 2013 reauthorization of the Pandemic and All-Hazards Preparedness Act grants dentists and dental hygienists the legal authority to support national emergency response efforts by providing infrastructure, clinical care, biometric information, and vaccination support.¹⁴ During the pandemic, dentists volunteered in some states such as California and Virginia to assist in critical care and emergency units.¹⁵ California has also made changes to laws to expand scope of practice and licensure in times of emergency.¹⁶ Additionally, the state of Massachusetts authorized dental professionals to administer the influenza and COVID-19 vaccines in accordance with the Emergency Use Authorization from the US Food and Drug Administration.¹⁷ Internationally, dental professionals have also served as a valuable workforce resource. Li et al. reported that Chinese dental professionals responded by assisting physicians in respiratory wards, providing nursing work and community infection control services.² In Singapore, the National Dental Centre deployed dental professionals to be part of the medical team in providing mass swab testing to foreign workers.¹⁵ In the United Kingdom, dentists and clinical academics supported the National Health Service in critical care, emergency units, and maternity wards.¹⁸

Dental and medical training share many similarities in terms of their preclinical education and clinical workforce skills including communication, history-taking, professionalism, and leadership.³ By participating in interdisciplinary practical training focused on triage, swab testing,

immunization campaigns, nursing duties, telehealth consultations, and prescriptions, as well as infection control and prevention, oral health professionals can alleviate increasing strain on limited healthcare resources in any current and future public health emergency.²

This study was subject to some limitations. The survey captured a glimpse of US dental schools' responses to COVID-19 pandemic. While the survey response had representation from every US Census Bureau-designated region and division, the data were limited to 21 vice deans, deans of clinical or academic affairs and senior faculties. This response rate may not accurately capture all distinctions between regions throughout the US. For example, dental schools located in densely populated cities may have differing rates of COVID-19 cases and resources than dental schools in a different geographic location. Additionally, overall stress and increased workload added by the COVID-19 pandemic could have influenced survey responsiveness. Furthermore, the survey was distributed preceding the availability of the COVID-19 vaccines and the gradual reopening of dental schools. Since these new developments, respondents may have changed their opinion or answers to some of the questions. For example, certain facilitators and barriers to change may no longer be applicable; some schools may have hired staff with greater PP expertise to spearhead incorporation into curriculum. Despite the changing nature of the COVID-19 pandemic, the current results do clarify an overall need for stronger, streamlined, and integrated pandemic preparedness.

Oral health students and professionals can serve a vital pandemic resource to medical teams and health systems. Inclusion of a responsive PP curriculum in dental schools is critical to addressing overburdened health systems and successfully facilitating workforce redeployment of pre- and postdoctoral students. Adopting pandemic and emergency preparedness curricular content can further help prepare pre- and postdoctoral dental professionals with the skills needed to be successful leaders in times of crisis as they expand their traditional clinical roles. Ultimately, maintaining a skilled and adaptable clinical workforce and promoting greater communication or collaboration between dentistry and medicine will be key to effectively addressing future public health crises.

5 | CONCLUSION

There was a general agreement that dental professionals can play an important role during pandemics. Dental schools with PP in their curriculum included topics about the interaction of public health and medicine, personal protection and safety training, and health communication. Redeployed school clinical workforce participated

in disaster life support, assisting physicians in COVID-19 cases, and assisting hospitals with PPEs. The participating US dental schools responded to the COVID-19 pandemic by integrating novel clinical activities. More efforts are required to include PP in dental education.

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CONFLICT OF INTEREST

No conflict of interests was reported by the authors.

AUTHOR CONTRIBUTIONS

Dania Bahdila and Shenam Ticku analyzed the data. Dania Bahdila, Shenam Ticku, Sapna Nath, Nikki Aflatooni, Maria C. Dolce, Donna M. Hackley, and Jane R. Barrow were involved in the article's conception and design, interpreted the data, drafted the manuscript, provided final approval of the version, and agreed to be accountable for all aspects of this work.

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