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COVID-19 provides an opportunity for integration of dentistry into the health informatics system

Steven D. London, DDS, PhD, MPH, MBA; Paul Fontelo, MD, MPH; Shahdokht Boroumand, DMD, MPH; Bruce A. Dye, DDS, MPH

The COVID-19 pandemic is changing dentistry in ways unseen since the beginning of the HIV epidemic in the 1980s. These changes are broad and have encompassed temporary widespread closing of dental practices during the early months of the pandemic, using new protective measures that affect care delivery, and even transforming the perspective of dental care as an essential part of health care. Another effect of this pandemic is the changing view of the dental workforce and its potential integration into a health delivery system supporting the public's health. This includes providing COVID-19 testing in dental offices, providing expertise and staffing in nursing homes, monitoring vital signs, transporting patients, tracking cases, and providing respiratory support in acute health care settings.¹

The COVID-19 pandemic has also provided an opportunity to examine how the oral health profession can interact with the health system in providing support for the effort to end the pandemic, including counseling patients with vaccine hesitancy and potentially providing patients with vaccines in their dental practices. The pandemic has highlighted the importance of timely access to oral health records to facilitate coordination of health care between dental and medical teams. However, counseling and providing vaccines, as well as improved health record interoperability, are not limited to this coronavirus event but have direct applicability for preventing and controlling other viral diseases, such as the seasonal influenza and human papillomavirus (HPV) infections. Although many within the oral health care profession have received adequate training to participate in these important preventive activities, ongoing discussions focusing on permitted practice continue.

THE IMPACT OF THE COVID-19 PANDEMIC ON THE SCOPE OF DENTAL PRACTICE

The COVID-19 pandemic has affected the scope of practice, as several states have permitted dentists and dental hygienists to provide COVID vaccines.² At the federal level, the Seventh Amendment to the Public Readiness and Emergency Preparedness Act (PREP Act) in March 2021 extended the categories of qualified people authorized to prescribe, dispense, and administer COVID-19 vaccines to dentists and dental students.^{3,4} However, these expanded authorities are generally applicable only within the constraints of the ongoing public health emergency. In addition, it assumes that emergency authorizations do not permit dentists to administer the vaccines in their offices. Thus, dentists could only provide vaccinations at vaccine distribution centers to increase the workforce available to administer vaccines en masse. Oregon is the only state that provides broad authorities permitting dentists to offer vaccinations (such as seasonal influenza and HPV), including within their place of practice, through legislation implemented in 2019.⁵

BARRIERS THAT HINDER DENTISTRY FROM FULLY PARTICIPATING IN THE NATIONAL RESPONSE TO THE COVID-19 PANDEMIC

Although great strides have been made during the COVID-19 pandemic, we are still burdened with 1 area that has not progressed rapidly enough, which hinders our ability to deliver and monitor a vaccine during a national health emergency using the full capacity of our health care system—a fully integrated electronic health record (EHR). The challenge in dentistry is the result of 2 primary issues: many aspects of the health information infrastructure (that is, an EHR) are fragmented, and oral health care is barely integrated into our overall health care system. Although allowing dentists to administer COVID-19 vaccines at vaccination sites is an important step forward and shows oral health care professionals' integration into a national health emergency response, many more steps

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forward are needed to facilitate the full integration of oral health care professionals into our health care system. For example, although the administration of the COVID-19 vaccine in private practitioners' offices did not occur early in the pandemic, this has changed within the past year as federal authorities expanded COVID-19 vaccine distribution to primary care providers, that is, medical offices.⁶ This lack of integration is juxtaposed with our notion that oral health care is an essential health service and should remain so beyond this current pandemic.

APPLICATION OF HEALTH INFORMATICS IN MEDICINE AND DENTISTRY

Health informatics is a field of science focusing on the management of health care data and information through the application of computers and other information technologies, elements essential to an EHR. Health informatics has an important role in supporting patient care, teaching, and research. The American Medical Informatics Association considers health informatics more akin to an umbrella term covering bioinformatics (cellular and molecular processes), clinical informatics (patient), and public health informatics (population).⁷ Although bioinformatics is related to fundamental life processes and is more likely consigned to the basic and translational areas of research, clinical and public health informatics are directly related to the daily work of oral health care professionals.

Health informatics has long been embraced by the medical community. Physicians can now achieve subspecialization in clinical informatics through the American Board of Preventive Medicine and the American Board of Pathology. In addition, the Accreditation Council for Graduate Medical Education is now accrediting fellowship programs in clinical informatics and the American Medical Informatics Association is supporting the pedagogical development for many of these educational activities. Nothing like this exists in dentistry. However, there is some nascent movement in this area. In the United States, 2 nonaccredited programs in dental informatics are emerging in dental schools in Indiana University/Regenstrief Institute and the University of Texas Health Science Center at Houston. Since July 2016, the National Institutes of Health, through a partnership between the National Library of Medicine and National Institute of Dental and Craniofacial Research, has supported a combined dental informatics and dental public health fellowship focusing on oral health research and informatics. With so few advanced dental educational opportunities, the gap between medicine and dentistry is wide with regard to education and training in health informatics; thus, the gap in research and practice remains wide as well.

The Health Information Technology for Economic and Clinical Health Act provided the impetus for improvement of EHRs in the United States. Certified EHRs that meet the criteria of meaningful use allowed practitioners (including dentists) and hospital systems to receive incentive payments through Medicare and Medicaid.^{8,9} Meaningful use is defined by the use of certified EHR technology in a purposeful manner based on 5 pillars of health outcomes policy priority areas: improving quality, safety, efficiency, and reducing health disparities; engaging patients and families in their health; improving care coordination; improving population and public health; and ensuring adequate privacy and security protection for personal health information.¹⁰

Since 2018, participants in the revised Meaningful Use Program (Medicare Promoting Interoperability Program) were required to report on Quality Payment Program indicators within these four areas:

- Electronic Prescribing
- Health Information Exchange
- Provider to Patient Exchange
- Public Health and Clinical Data Exchange.¹⁰

Relevant to the COVID-19 pandemic, the fourth objective area included reporting in Immunization Registries and Public Health Registries as areas in which participants can gain points.¹⁰

The advantages of EHRs are many, including providing accurate, complete, up-to-date information at the point-of-care; enabling quick access to patient records for more coordinated, efficient care; securely sharing EHRs with patients and other clinicians; helping providers more effectively diagnose, reduce medical errors, and provide safer care; improving patient and provider interaction and communication and health care convenience; enabling safer, more reliable prescribing; helping promote legible, complete documentation and accurate, streamlined coding and billing; enhancing privacy and security of patient data; helping providers improve productivity and work-life balance; enabling providers to improve efficiency and meet their business goals; and reducing costs through decreased paperwork, improved safety, reduced duplication of testing, and improved health.¹¹

At the most basic level, having an EHR would be considered the minimal requirement for a practitioner in the 21st century and in the era of health informatics. Although the use of computers in general practice dental offices in the United States has increased from 11% in 1984 to more than 85% in 2009, a more comprehensive survey completed in 2012 indicated that EHR adoption rate in dental care was only 52%.¹² The likely discrepancy is that the use of computers in dental office for administrative purposes outweighs the use of computers for EHR. However, there are some signs that the adoption rate is changing as usage is noticeably higher among younger dentists (those with < 15 years in practice) and those providing care within group practices.¹² This suggests a trend toward increased use of EHR as older practitioners retire and as the trend toward group dental practices continues. This is in contrast to office-based physicians, where adoption of an EHR was approximately 72% in 2012 and had increased to approximately 86% in 2017.¹³

Although the Health Information Technology for Economic and Clinical Health Act has provided the impetus for substantial progress in the continued development and use of the EHR in medical care, the development and use of EHR in dental care has not progressed at a similar pace. Even though a fully integrated medical and dental EHR would be a long-term goal, there are some examples of innovation in this area where 3 engaged health care entities have begun to integrate oral and primary medical health care delivery.¹⁴⁻¹⁷ Entities like Permanente Dental Associates, the Marshfield Clinic Health System, and Health Partners, each based on unique health care delivery models, reflect the goals of Berwick's Triple Aim (better care, better health, and reduced cost) toward integration of dental and medical care providers through a common EHR.¹⁵⁻¹⁹

IS DENTISTRY PREPARED TO INTEGRATE INTO THE HEALTH INFORMATICS SYSTEM?

The nature of dental practice has changed significantly in the past 2 decades. In 1999, two-thirds of dentists worked in solo practices compared with one-half in 2017.²⁰ Although approximately 75% of dentists 45 years and older are practice owners, dentists younger than 45 years are attaining ownership at a decreased rate in 2017 compared with 2005.²⁰ In 2019, 1 in 10 of US dentists were affiliated with dental service organizations, with younger dentists substantially constituting most of the employed dentists.²¹ Since the Great Recession, the average age at retirement has increased (58.5 years in 2007 versus 62.2 years in 2017 for female dentists and 67.1 years in 2007 versus 68.9 years in 2017 for male dentists), a trend that would temper the decline in solo practitioners as older dentists are in solo practice at higher numbers than younger dentists.^{20,22} Furthermore, the average reported practice size has increased from 2000 (1.5 dentists/practice) to 2015 (1.9 dentists/practice).²³ Although the workforce trend is for more dentists in larger practices and fewer dentists as practice owners, dental practice remains dominated by solo practitioners or small group practices. Consequently, incentives remain low for dental practices to implement an EHR that is interoperable with an electronic medical record,²⁴ further perpetuating the information technology discordance between medical and dental care and limiting the role health informatics can play in improving the delivery of oral health services.

Why is this important? In a virtual Oral Health Seminar Series event held by Harvard School of Dental Medicine addressing the importance of oral health and the prominence of social determinants in December 2020,²⁵ the US surgeon general delivered comments that directly connected oral health to health informatics. When asked if dentists and other oral health care providers will have the ability to help deliver a COVID-19 vaccine, he responded that "as far as administering the vaccine ... we've amended the PREP Act several times, to allow pharmacists greater ability to administer vaccines. I don't see any medical reason why we shouldn't include dentists." However, he added that there would be several practical challenges in administering this vaccine on a national scale, ranging from multiple versions with different administration requirements to logistics. But another critical challenge to overcome was directly related to information technology:

... we're going to need to make sure we have systems in place to really track who got what and when. And the honest truth is that we know that infrastructure needed lies in doctors' offices, in clinics, and in pharmacies because they've been doing this. Whereas dentists, I have no problem with them, from a medical perspective, being able to administer this vaccine. But what's going to be more difficult is making sure ... that if you do give a vaccine, that we know six months from now that a person was vaccinated, or twenty-one days from now, that they got the Pfizer vaccine and not the Moderna vaccine.²⁴

Although it is encouraging that the surgeon general was supportive of oral health care professionals delivering COVID-19 vaccines nearly 3 months before the amendment of the PREP Act allowing dentists to administer COVID vaccines,^{3,4} it is significant to note the concern that dental practitioners are in essence siloed from the overall health care delivery system from a health informatics perspective. It is also important to recognize that the PREP Act Third Amendment (August 24, 2020) expanded the authority of pharmacists and pharmacy interns to administer FDA-approved vaccines to people ages 3 through 18 years on completion of required training.²⁶ Of particular relevance, the Third Amendment states

The licensed pharmacist must comply with recordkeeping and reporting requirements of the jurisdiction in which he or she administers vaccines, including informing the patient's primary-care provider when available, submitting the required immunization information to the State or local immunization information system (vaccine registry), complying with requirements with respect to reporting adverse events, and complying with requirements whereby the person administering a vaccine must review the vaccine registry or other vaccination records prior to administering a vaccine.²⁶

About 180,000 retail pharmacists work in the United States, representing about one-half of actively working pharmacists, with the top 4 pharmacy chains employing more than 100,000 pharmacists. A substantial number of pharmacists also work in hospitals, ambulatory care centers, and community clinics. Consequently, it is probably safe to assume at least 2 of 3 working pharmacists in the United States have access to the information infrastructure needed to comply with PREP Act reporting requirements. Moreover, in the past decade, pharmacists had been allowed to administer adult vaccinations in all 50 states, and pharmacies have been identified as the second most used site for influenza vaccination among adults after physicians' offices.^{27,28} Thus, pharmacists had already been approved to provide adult vaccinations, and exceptions for the COVID-19 pandemic were a reasonable extension of this prior authorization. In contrast, dentists practicing in almost all jurisdictions in the United States have not been authorized to provide vaccinations in their offices, thus making inclusion of dentists in the COVID-19 vaccination response somewhat impractical.

COVID-19 has been a transformational force on health care since it appeared in early 2020. With the closure of many dental offices in the early months of the pandemic, dentists turned to virtual oral health care (teledentistry) as a means to engage with their patients.^{29,30} The American Dental Association developed policies related to dentistry and the COVID-19 pandemic including promoting the concept "Dentistry Is Essential Health Care" and that it also requires a "Temporary Expansion of Scope During a Public Health Crisis."^{31,32} In this context, oral health care professionals, particularly dentists, have seen greater opportunities to participate to increase medical capacity including the following:

- administering critical vaccines
- performing US Food and Drug Administration–authorized diagnostic screening tests
- obtaining medical histories and triaging medical patients
- performing other ancillary medical procedures and activities, as requested by medical personnel, to expand the nation's surge capacity.

The surgeon general's comments raise the issue that it may not be possible for dentists participating in these expanded primary care roles to do so under normal practice conditions after the end of this pandemic.²⁵ This may reflect the oral health care profession's slow and tepid embrace of health informatics in general and, more specifically, clinical informatics—and how we use EHRs.²⁵ In his comments, the surgeon general pointed out that dentistry is not integrated into the overall health care health information technology universe. Although oral health care professionals have electronic dental records, these are tailored to the specific need of dental service providers and are designed to record procedures provided and services billed. They are not designed to track changes in health status, monitor diagnostic changes or assist with diagnostic triage, communicate with other health care providers, and provide rudimentary health surveillance, all of which can improve clinical decision making and patient health outcomes. Therefore, the ability to expand dentistry's role in our collective effort during this national health emergency (that is, screening for COVID-19 and tracking vaccine administration) is a practical challenge that cannot be overcome overnight.

That is why pharmacists were identified as an essential health care workforce in our national efforts at fighting the greatest health challenge in a century, long before dentists were considered.

CONCLUSIONS

Dentistry needs to accelerate its embrace of health informatics in education, research, and practice, especially in the areas of clinical and public health informatics. Moving toward a more functional dental EHR for the 21st century is 1 important step. For this to occur, interoperability to allow digital health information from various sources to be connected and aggregated³³ must be achieved between dental and medical records. Interoperability between all components of the health information universe will allow health information to follow patients throughout care³⁴ and will be able to bring diverse datasets, such as clinical trials and public health surveillance, to dental and medical EHR datasets.³⁵ Because electronic medical and dental records have not developed in parallel, there has been little true interoperability between the 2 systems.²⁴ One study addressed this issue via a survey of dentists and physicians and found that although both dentists and physicians desired an interoperable EHR, the desired information was different.³⁶ Another study focusing on medical providers found substantial value in having access to oral health data, particularly in the areas of communication, appointments, medications, treatment plan, and dental alerts as the major areas relevant for a medical-dental integrated EHR.³⁷ An initial option toward a medical-dental integrated EHR would be the implementation of structured communication between dental and medical providers with the goal of establishing electronic consultation or referrals between dentist and physician practices.²⁹ This will help facilitate work that can move us toward the broader goal of an integrated EHR system^{38,39} that provides better care, leading to better health at a more manageable cost.

The world is quickly changing because of demographic shifts, migration, commerce, and travel. Consequently, disease will travel, too. Although this is not new to the human experience, it does require us to identify new actions

that can strengthen our capacity to respond more effectively to future national health emergencies and other significant health challenges. As the surgeon general stated, we need to figure how dentists can provide COVID vaccines in a way that:

... can be done so that we can do right by the patients ... [but we also] ... need to continue to try to leverage opportunities from dentists, providing alternative means of care, and alternative opportunities for care, to help not just with COVID, but with flu, with HPV, and beyond.²⁵

To help with this, we need to incorporate a more robust and comprehensive health informatics approach in dentistry if we want oral health care professionals to have an important role in providing essential health care and to help improve people's lives. This approach will make oral health care professionals essential and strengthen oral health as essential health care. ■

<https://doi.org/10.1016/j.adaj.2021.11.003>

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Dr. London is a postdoctoral fellow, National Library of Medicine and National Institute of Dental and Craniofacial Research, National Institutes of Health, Bethesda, MD, and a professor, Department of Oral Biology and Pathology, School of Dental Medicine, The State University of New York, Stony Brook University, Stony Brook, NY.

Dr. Fontelo is a staff scientist, National Library of Medicine, Bethesda, MD.

Dr. Boroumand is a dental public health consultant, National Institute of Dental and Craniofacial Research, National Institutes of Health, Bethesda, MD.

Dr. Dye was a dental epidemiologist, National Institute of Dental and Craniofacial Research, National Institutes of Health, Bethesda, MD, when this commentary was written. He now is a professor and the chair, Department of Community Dentistry and Population Health, University of Colorado, School of Dental Medicine, University of Colorado, 13065 E 17th Ave, Aurora, CO 80045. Address correspondence to Dr. Bruce A. Dye, University of Colorado School of Dental Medicine, 13065 E 17th Ave, Aurora, CO 80045, email bruce.dye@ucanschutz.edu.

Disclosure. None of the authors reported any disclosures.

The views and opinions of the authors expressed herein do not necessarily state or reflect those of the National Institute of Dental and Craniofacial

Research, National Library of Medicine, National Institutes of Health, or US Department of Health and Human Services.

The National Institute of Dental and Craniofacial Research and National Library of Medicine (NLM), Lister Hill National Center for Biomedical Communications supported this work. The National Institutes of Health paid a salary to Drs. Fontelo and Dye. This research was also supported in part by an appointment to the NLM Research Participation Program (Dr. London), administered by the Oak Ridge Institute for Science and Education through an interagency agreement between the US Department of Energy and NLM.

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