In Defense of Dental Therapy: An Evidence-Based Workforce Approach to Improving Access to Care

Frank Catalanotto

Abstract: This article addresses new systems and practice models in community-based dentistry. Its purpose is twofold: to identify strategies and policies that support health equity and access to care; and to identify promising efforts that serve as new models for change in the dental workforce. Dental therapy meets both of these purposes and is the major focus of this article. The fundamental premises explored are threefold. First, the dental care system in the U.S. is broken for many people who then suffer the consequences of poor oral health; this is especially true for racial and ethnic minorities and lower income populations. Second, dental therapy is a proven, safe, high-quality, cost-effective, and ethical way to improve access to oral health care and oral health in general. Third, opposition to dental therapy comes only from the leadership of organized dentistry and is without an evidence base to support objections and criticism. This article reviews each of these three premises in detail. Based on this review, the article concludes that dental therapy is a safe, high-quality, effective, and ethical approach to improve the oral health workforce, increase access to dental care, and achieve oral health equity.

Frank Catalanotto, DMD, is Professor, Department of Community Dentistry and Behavioral Sciences, College of Dentistry, University of Florida. Direct correspondence to Dr. Frank Catalanotto, College of Dentistry, University of Florida, 1329 SW 16th Street, PO Box 103628, Gainesville, FL 32610-3628; 352-273-5970; fcatalanotto@dental.ufl.edu.

Keywords: community-based dentistry, access to health care, health care disparities, oral health care access, dental therapy, dental therapists, oral health equity, public health dentistry, social responsibility, ethics, minority health, underserved patients

doi: 10.21815/JDE.019.036

This article addresses new systems and practice models in community-based dentistry. Its purpose is twofold: to identify strategies and policies that support health equity and access to care; and to identify promising efforts that serve as new models for change in the dental workforce. Dental therapy meets both of these purposes and is my major focus here.

The fundamental premises of this article are threefold. First, the dental care system in the U.S. is broken for many people who then suffer the consequences of poor oral health; this is especially true for racial and ethnic minorities and lower income populations. Second, dental therapy is a proven, safe, high-quality, cost-effective, and ethical workforce model to improve access to oral health care and oral health in general. Third, opposition to dental therapy comes only from the leadership of organized dentistry and is without an evidence base to support objections and criticism. In this article, I review each of these three premises in detail.

A Broken Dental Care System for Many

The dental care delivery system in the U.S. is broken for the 191 million individuals who cannot access dental care on a regular basis.[1,2] While there are many other contributing factors, such as environment and genetics, the primary causes of this inability to access dental care are costs and poor oral health literacy.[3-5]

The first surgeon general's report on oral health and two Institute of Medicine (IOM) reports on oral health all called attention to the importance of oral health, the difficulties in accessing oral health care for many in this country, and the resulting oral health care disparities.[6-8] The access issue for underserved and vulnerable patients was clearly addressed by the IOM in 2011 in its groundbreaking report *Improving Access to Oral Health Care for Vulnerable and Underserved Populations*.[7] The Committee on Oral Health Initiative produced a "Vision for Oral Health Care in the United States" in which "everyone has access to quality oral health care across the life cycle." To be successful with underserved and vulnerable populations, this report concluded that an evidence-based oral health system will do the following: 1) eliminate barriers that contribute to oral health disparities; 2) prioritize disease prevention and health promotion; 3) provide oral health services in a variety of settings; 4) rely on a diverse and expanded array of providers competent, compensated, and authorized to provide evidence-based care; 5) include collaborative and

multidisciplinary teams working across the health care system; and 6) foster continuous improvement and innovation.

Before I address solutions to access problems, it is important to discuss the effects of lack of access to quality oral health care. Here, I will focus on only four negative effects: morbidity, mortality, school learning, and systemic health.

Morbidity

One appropriate way to approximate morbidity would be to examine hospital emergency department (HED) visits and hospitalizations for preventable dental conditions. HED visits for preventable dental conditions are on the rise across the states.[8] Florida data easily illustrate this concern. In 2016, there were 166,997 HED visits, and hospitals billed out $322,000,000 in charges.[9] Repeat visits to the HED for non-traumatic dental care were common: in 2015, patients with multiple visits accounted for nearly 35% of all visits for non-traumatic dental care at total charges of more than $83,000,000. Also note that these visits to HEDs did not usually result in any actual dental care. Patients primarily received antibiotics and pain medication and were advised to seek dental care in the community. However, if there was no affordable and accessible dental care on the day of the visit to the HED, why would one expect there to be availability tomorrow? In addition, in Florida, there were 4,307 admissions as inpatients for non-traumatic dental conditions in 2016 at total charges that exceeded $195,000,000. Thus, Florida hospitals charged over half a billion dollars for preventable dental conditions—a situation that is probably replicated across the country.

Mortality

Many people are familiar with the tragic death of Deamonte Driver in Maryland in 2008 after his mother and legal aid attorney could not find a dentist who accepted Medicaid who would treat his dental infection. Two more recent studies demonstrate that his death was not an isolated incident. In one study, 66 patients died in hospitals over a nine-year period from periodontal abscesses.[10] In the second study, 101 people who went to an HED for a dental problem died there; the vast majority of these patients had no other presenting conditions that may have been complicating factors.[11] Both of these studies demonstrate the serious effects—including death—of lack of access to oral health care on the U.S. population.

School Performance

One of the important ways out of poverty for poor children is education, but if you are in pain while in school or you miss school frequently because of dental problems, you cannot learn. Over the past few years, collected data have shown the serious effects of dental problems and dental pain in young school-aged children on school learning, including the following: children with poor oral health and general health were more than twice as likely to perform poorly in school; developmental delays among preschool-aged children from families with low incomes may have been associated with increased decayed, missing, and filled surfaces on primary teeth; among children and adolescents aged 5-18 years, oral pain and acute asthma similarly affected school attendance; and absences associated with oral pain or infection increased the likelihood of poor school performance whereas absences for routine oral health care did not.[12] Further, preventing and treating children's oral health problems improved functioning, educational achievement, and psychosocial development.

Systemic Health

Finally, there is a growing scientific literature on the effects of poor oral health, particularly periodontal disease, on systemic health, including diabetes, atherosclerotic heart disease, and low-birthweight premature births.[13-15] While double blind, placebo-controlled studies—the gold standard—have been less than fruitful, a recent study actually found a causal relationship.[16]

These four examples clearly document that poor oral health can have devastating effects on morbidity, mortality, school learning, and systemic health. Poor oral health may result in more medical illnesses and higher health care costs than in individuals with better oral health.

New Workforce Models to Improve Access

The IOM reports on oral health recommended a number of ways to address lack of access to quality oral health care.[7,8] There are numerous other published opinions and approaches, including the American Dental Association (ADA) "Call to Action for Oral Health," which the ADA calls "a declaration of dentistry's commitment to leadership in develop-

ing actionable, measurable solutions to oral health disparities, and has directed the organization to pursue its implementation aggressively."[17]

Other potential actions are increasing dental Medicaid reimbursement rates or the creation of loan forgiveness programs to motivate dentists either to participate in Medicaid programs or to practice in underserved areas. Such programs are relatively expensive but, more importantly, despite some modest successes, there is little supporting evidence that such programs have a significant and sustained impact on improving access.[18-20]

However, two recent U.S. workforce models are in early stages of implementation that can potentially help address costs and oral health literacy and improve access in vulnerable and minority populations. These models also meet some of the suggested characteristics of an evidence-based health care delivery system noted in the IOM reports.[7,8]

Community Dental Health Coordinator

The ADA recently developed the community dental health coordinator (CDHC).[21,22] These members of the oral health care team are essentially patient navigators or case managers who can perform the following tasks: "1) coordinate care and arrange transportation; 2) reduce dental anxiety/support access; 3) encourage patients to complete treatment; 4) enhance cultural competence; 5) educate the population about prevention; 6) navigate Medicaid or other dental systems of care; and 7) enhance productivity and integration of the oral health team."[21] In addition, the potential employment opportunities for CDHCs are noted to be community health clinics including Federally Qualified Health Centers (FQHCs); the Indian Health Service (IHS); local health departments; schools; women, infants, and children (WIC) programs; Head Start centers; institutional settings, social service agencies, and community dentists. A series of case studies touts the success of CDHCs, but little actual data are available at this time.[23]

These CDHCs receive about 18 months of education, usually in a community college. Some have prior dental training as a dental assistant or dental hygienist. It is clear that CDHCs should be helpful in assisting patients with accessing dental services and with oral health literacy related to prevention of dental diseases, but they are not trained to provide actual dental services unless they are also dental hygienists. Thus, they are of limited value in actually increasing access to dental care. If they are recruited from the populations they serve, they are more likely to be culturally competent.

More importantly, while they might be able to improve patient oral health literacy, they can do little about the primary barrier to access to oral health services, which is cost. Thus, it is unlikely that they will be utilized very much in private practice fee-for-service settings, unless those dentists participate in Medicaid. However, they should be of great value in safety net settings. Finally, utilizing individuals who are already trained as dental hygienists may shorten the length of education, but in the long run, this is a lot of education for a person who cannot provide actual treatment. More time and research will be important in evaluating the long-term effectiveness of CHDCs.

Dental Therapists

A second workforce model is the dental therapist. Brickle and Self provide an excellent brief history of dental therapy in the U.S.[24] They define dental therapists as "primary care professionals who are new members of the oral health care team. They engage in oral health promotion programs as well as provide evaluative, preventive, restorative, and minor surgical dental care. These new intraprofessional dental team members are educated to the same standard of care as a dentist for their defined scope of practice and currently provide care under the supervision of a licensed dentist through a collaborative management agreement and/or standing orders."

Dental therapy has a hundred-year history of safety and effectiveness in providing quality dental care in over 50 countries.[25] Nash et al. concluded their study of the international literature on dental therapy by stating, "There is no question that dental therapists provide care for children that is high quality and safe. None of the 1,100 documents reviewed found any evidence of compromise to children's safety or quality of care. Given these findings, the profession of dentistry should support adding dental therapists to the oral health care team."[26]

The Alaskan Dental Health Aide Therapist (DHAT) program, modeled on the original New Zealand program, has been functioning for about 12 years.[27] Education takes two calendar years post-high school and 2,000 hours of monitored preceptorship clinical activity. DHATs can provide a limited number of preventive, restorative, and surgical services under general supervision. DHATs in Alaska usually come from the Alaska Native population and return to those

villages and larger centers in Alaska. A number of evaluations have demonstrated the quality and effectiveness of their services.[28-30]

There are two versions of dental therapists in Minnesota that were established in 2009.[24] One is based at Normandale Community College and Metropolitan State College and is for existing dental hygienists who can pursue 14 months of education in dental therapy. The second is based at the University of Minnesota and takes about four years of education to produce a practitioner with both dental therapy and dental hygiene education. Both result in a licensed dental therapist. There is a second level of dental therapy in Minnesota called an Advanced Dental Therapist. To receive that certification, individuals must complete 2,000 hours of practice as a licensed dental therapist and take a certifying examination.

Beyond education, dental therapists in Minnesota take a clinical licensure exam similar to that taken by dentists but limited to procedures within their scope of practice.[24] Their scope of services is similar to that of DHATs in Alaska but, if they have dental hygiene education, they can also provide these services. Half (50%) of their patients must be enrolled in Medicaid or be otherwise underserved. These dental therapists are practicing in rural and urban settings and in private practices, FQHCs, and other not-for-profit settings. When dental therapy legislation was passed in Minnesota, there was a legislative requirement for periodic evaluations to be conducted. An excellent overview and links to many of these evaluations are included in a Minnesota Department of Health report.[31] The Minnesota Department of Health's in-depth evaluations of this model concluded that these dental therapists can practice safely and effectively and have been helpful in increasing access to quality oral health care.

Dental therapists have been licensed in Maine, Vermont, and Minnesota and on tribal lands in Oregon, Washington, and Alaska. In addition, dental therapy legislation is pending in another dozen states.

Responses to Criticism of Dental Therapy

My response to those who criticize dental therapy related to safety, quality, and effectiveness is the following: "Doctor, I understand you have concerns about dental therapists. But can you provide me any published evidence that demonstrates dental therapists are not technically competent for the procedures they perform or that they are unsafe or ineffective in doing what they do in providing oral health care to patients?" Then I stop talking and await the answer. I am usually greeted by deafening silence or blustering babble!

Two reviews of dental therapy are appropriate starting points for a discussion of safety and quality. The ADA Council on Scientific Affairs after a review of the existing literature stated, "The results of a variety of studies indicate that appropriately trained mid-level providers are capable of providing high-quality services, including irreversible procedures such as restorative care and dental extractions."[32] A more recent review by Mathu-Muju et al. concluded: "The U.S. movement to adapt the acclaimed work of the international dental therapist to the oral health workforce is still in its infancy. Yet, in spite of the aggressive opposition of organized dentistry, the movement is growing and expanding as individuals, activists, and policymakers understand the role that dental therapists can play in improving access to care, particularly for children."[33] Finally, I recently conducted a PubMed search on dental therapy that produced 74 publications, none of which contained evidence of a lack of safety and quality of dental therapy. I provide here some of the frequent criticisms of dental therapy accompanied by my response.

Provision of dental care is based on demand, not need. A frequent argument of organized dentistry about access to care distinguishes "need" from "demand" for dental care. For example, "When speaking of access to dental care today, we must consider both the availability of care and the willingness of the patient to seek care."[34] I do not accept this perspective in light of the high costs of dental care today, the low oral health literacy of the public, and the serious effects of lack of access to care. Based on the evidence discussed above, I believe it is our professional responsibility and ethical obligation as dentists to help turn need into demand. It is also clear to me that the current oral health workforce will be inadequate to meet that demand. Thus, dental therapists are a strong evidence-based solution to help address access to care for the 191 million people in the U.S. who cannot regularly access dental care today.

Where's the evidence of improved oral health outcomes for care by dental therapists? My initial response to this challenge is to ask for such studies following care by a dentist. There are none. However, a recent report from Alaska, summarized in a journal article, presents the first such oral health outcomes associated with dental therapy.[35,36] This study focused on oral health outcomes over time

across Alaska Native communities with varying access to DHATs. Researchers examined records of patients served by the Yukon Kuskokwim Health Corporation between 2006 and 2015. Over a ten-year period, Alaska Native communities served more intensively by DHATs saw improvements in dental care for children and adults in the form of lower rates of tooth extractions and greater rates of preventive care. Specifically, when comparing communities with the highest number of days where DHATs practiced with those communities where no DHATs practiced, the researchers found the following: 1) fewer extractions of the front four teeth for children under age three; 2) fewer adults with permanent tooth extraction; and 3) more people of all ages receiving preventive care.

While the DHATs study was not designed to prove causality, its findings strongly suggest that dental therapists are having a meaningful and positive impact on the oral health of communities they serve. Individuals living in communities with greater exposure to DHATs were shown to have fewer invasive dental procedures than those with no exposure.

"The training [of dental therapists] should follow CODA standards, but in fact, there are NO CODA-accredited dental therapy training programs anywhere in the United States."[37] This statement is factually true but misleading. After years of discussion and debate, and with a helpful letter from the Federal Trade Commission and many others, the Commission on Dental Accreditation (CODA) adopted accreditation standards for dental therapy in 2016.[38] The next step in the process is the development of guidelines for the self-study done by an educational institution prior to an accreditation site visit. Thus, the process takes time. Four educational programs are in various stages of preparing for CODA accreditation.[37] Thus, this criticism is without merit in my opinion.

It might be useful to briefly review the CODA standards for dental therapy.[38] They state that the curriculum must include at least three academic years of full-time instruction or its equivalent at the postsecondary college level. There are no degree requirements. Advanced standing could mean dental hygiene education and more. For example, military hygienists, Expanded Function Dental Auxiliaries (EFDAs), and certified dental assistants (CDAs) could be eligible for advanced standing to some level. Scope of practice requirements are that, at a minimum, graduates must be competent in providing oral health care within the scope of dental therapy practice with supervision as defined by state practice acts, including a long list of procedures, and states can add to the list of procedures. Supervision levels are left up to states to decide. Didactic dental sciences content must ensure an understanding of basic dental principles, consisting of a core of information in a long list of basic science topics. The program director must be a licensed dentist (DDS/DMD) or a licensed dental therapist possessing a master's or higher degree.

Despite claims that dental therapists will practice primarily in rural areas, there is little evidence to substantiate that claim. Minnesota is providing a solidly researched test case for dental therapists, so at this point evidence to refute this argument would come from that state. However, the first point to make is that the premise of that criticism is incorrect. It is not true that the Minnesota authorizing legislation requires that therapists work in rural areas. A simple review of the Minnesota Department of Health reports readily refutes this false claim.[31] Approximately 40% of Minnesota's dental therapists work in rural and otherwise underserved areas. Many are based in urban areas but travel to more remote sites to provide oral health care, and 80% of their patients are on Medicaid or otherwise underserved. These practice statistics show how dental therapists are meeting both the letter and the spirit of the law.

Saskatchewan's dental therapy program was closed because it was not working. Mathu-Muju et al. published an extensive review of the Saskatchewan dental therapy program, examining primary source documents and evaluations. They concluded, "During its thirteen years of existence, the Saskatchewan Dental Therapy school-based program proved popular with parents and achieved significant success in providing necessary dental care for children. It was terminated in 1987 by the newly elected provincial Conservative government, which was not supportive of such social programs."[39] Thus, this criticism of the Saskatchewan program is simply not true: it was closed for political reasons only.

U.S. dental therapist models are subsidized by sponsoring agencies and charge the same amount to payers as dentists. The first half of this sentence is a popular charge by the ADA, but I have not seen any evidence to support it. We thus must conclude that this claim is not true. The second half of the sentence is true, but the savings accrue to the safety net clinic that hires a dental therapist, enhancing its ability to provide lower cost care. To link these two points is thus a gross distortion of the truth. In fact, the evidence shows that dental therapists lower the cost of delivering dental care, as demonstrated in the Minnesota report.[31]

Dentists oppose dental therapy. The NIH-funded Dental Practice-Based Research Network conducted a poll of participating dentists, primarily in private practice settings.[40] About 48% of responding dentists said that dental therapists should be allowed to work in their state, and 30% said they would consider hiring a dental therapist. These findings are in contrast to the statements of leaders of organized dentistry that dentists would not support dental therapists.

Dental therapists are not competent to provide care to adults. Several of the studies cited by Nash showed that dental therapists had provided quality care to adults.[25] More recently, an Australian study from 2009 addressed dental therapists' care for adult patients.[41] The authors concluded that "therapists' restorative skills were already highly developed as a result of years of work with younger patients, so that the main point of this project was the transferability of existing skills to adult patients." This study found that dental therapists had a restoration failure rate lower than that of dentists as reported in the literature, and that restorations placed by therapists were "no different to what would be expected if a dentist had placed the restorations." A case study of the performance of dental therapists working in a senior long-term care facility with fragile elderly patients also demonstrated that therapists had provided quality oral health care services that addressed most of the needs of these adult patients.[42]

This review of some of the criticisms of dental therapy demonstrates quite clearly that there is no evidence in support of arguments against the safety, quality, and efficacy of dental therapists.

Ethics and Social Justice Considerations

Our primary ethical challenge as oral health professionals is to balance our individual needs, desires, and values with our collective responsibility to treat patients in their best interests. There are many individuals who believe that access to oral health care is an ethical issue.[43] There is an ethical justification to be made in support of dental therapy based on the ADA Principles of Ethics, social justice, and the social contract between the dental profession and society.[44-48]

Several of the ADA Principles of Ethics come into play in this discussion. Let us start with the principle of veracity or truth telling. As explained above, the existing data on the quality, safety, and efficacy of services provided by dental therapists show that the quality is equal to that of a dentist. If we in the dental profession consider ourselves an evidence-based profession and we read the literature about dental therapy, veracity requires us to be honest and truthful about the evidence in our conversations with the public, especially legislators. This requirement to adhere to the evidence also forces us to heed the fact that there is no evidence to support concerns about the quality, safety, and efficacy of dental therapists.

The principle of justice requires that we treat patients fairly and work with societal allies to ensure access to care for all. When rational, evidence-based solutions are proposed to poor access to dental care, and the profession opposes such solutions, that violates the principle of justice. The evidence from both Alaska and Minnesota clearly demonstrates that dental therapists improve access to underserved populations not able to access the regular dental care system. To oppose dental therapy thus violates the principle of justice.

The principle of beneficence also comes into play in this discussion: our duty to promote the patient's welfare and to act for the benefit of others. Under this principle, the dentist's primary obligation is service to the patient and the public at large. This obligation includes the people who cannot access our services under the current system because of costs, lack of oral health literacy, and other factors. Not supporting dental therapists thus violates the principle of beneficence.

While the ADA principles do not refer to social justice, I believe it is relevant to this discussion. Winslow states that social justice "refers to the convictions of a society about what it owes its constituent members, and, in turn, the responsibilities those members have to the whole society."[49] He went on to say that "questions of social justice have to do with the way social institutions, such as health care, distribute both benefits (services) and burdens (costs) throughout society." Dental therapy is a way to bring quality oral health care services to a broader segment of society at a lower cost of care and thus addresses social justice concerns. The social justice perspective is also raised from a racial equity perspective: dental disease is strongly associated with poverty but also reflects racial and ethnic disparities.[50]

Corsino and Patthoff have proposed a new ethical principle to be added to the ADA Principles of Ethics.[51] They argue that "Acceptance" is an often presupposed, hidden core value and ethic focused on

how dental and other health care practitioners first accept people as possible patients. The three basic styles of patient acceptance are random, selective, and universal. Reduced public access to care results from the practice of random and selective acceptance. Only universal acceptance creates a potential pathway for improved access to care.

There is also the argument that the health professions, including dentistry, have a social contract with society. The perceived social contract states that, in return for self-governance and autonomy and essentially a monopoly on dental care, society will support the education of professionals, for example, in state-funded dental schools where tuition only partially covers the costs of education. In return, the profession has an obligation to care for society. This contract does not imply only care for those who can afford care, but for all of society. Welie covers this issue very well in three articles and concludes that, if the profession does not hold up its part of the contract, society may remove or interfere with the dental profession's autonomy and self-governance.[46-48] Recent court, Federal Trade Commission, and judicial decisions support this prediction.[52] I believe organized dentistry's opposition to dental therapy is promoting such societal/legislative and judicial interference, and that is of great concern to me.

Finally, I should note that many other sources related to topics raised in my review can be found in a recently released special issue of the *American Journal of Public Health*.[53] That special issue explores various aspects of oral health inequities and the need to diversify the health care workforce with additional providers, including dental therapists.

Conclusion

This article has reviewed the published evidence and a variety of issues raised about dental therapy. Based on this review of the literature and published evidence, dental therapy is an evidence-based, high-quality, safe, and ethical addition to the oral health team and should be utilized to help improve access to oral health care across the country.

Acknowledgments

My sincere thanks to the Pew Charitable Trusts, W.K. Kellogg Foundation, and Community Catalyst for inviting me to participate in advocacy work for dental therapy, for their perseverance and bravery in promoting this important approach to improving access to quality oral health care, and for reminding us this is a social justice issue. Also thanks to the many colleagues and advocates across the country who have shared stories and insight into this issue and to the University of Florida for giving me the academic freedom to do this work.

Disclosure

I do not have any disclosures of any financial, economic, or professional interests that may have influenced the design, execution, or presentation of this scholarly work. The opinions I share in this article are my own and do not necessarily reflect the official viewpoint of the University of Florida, the University of Florida College of Dentistry, or any other organizations with which I work.

Editor's Disclosure

This article is one of five that were commissioned by ADEA staff for the ADEA Allied Dental Education Leadership Convening and Training Meeting held May 31-June 1, 2018 in San Diego, CA. The five articles are being published in a supplement to the February 2019 *Journal of Dental Education.* The manuscript was reviewed by the meeting staff and was copyedited by the JDE staff.

REFERENCES

1. Vujicic M. State of the dental market: outlook 2018 (webinar). American Dental Association, Health Policy Institute. At: www.ada.org/en/science-research/health-policy-institute/publications/webinars/state-of-the-us-dental-care-market-outlook-2018. Accessed 18 Dec. 2017.
2. Vujicic M, Buchmueller T, Klein R. Dental care presents the highest level of financial barriers, compared to other types of health care services. Health Aff 2016;35(12):2176-82.
3. American Dental Association, Health Policy Institute. Oral health and well-being in the United States. At: www.ada.org/en/science-research/health-policy-institute/oral-health-and-well-being. Accessed 18 Dec. 2017.
4. American Dental Association, Health Policy Institute. Cost barriers to dental care in the U.S. At: www.ada.org/~/media/ADA/Science%20and%20Research/HPI/Files/HPIgraphic_1117_4.pdf?la=en. Accessed 17 Dec. 2017.
5. American Dental Association, Health Policy Institute. The oral health care system: a state-by-state analysis—key findings. At: www.ada.org/~/media/ADA/Science%20and%20Research/HPI/OralHealthCare-StateFacts/Oral-Health-Care-System-Key-Findings.pdf?la=en. Accessed 21 Dec. 2017.
6. Oral health in America: a report of the surgeon general. 2000. At: www.nidcr.nih.gov/research/data-statistics/surgeon-general. Accessed 17 Dec. 2017.
7. Institute of Medicine and National Research Council. Improving access to oral health care for vulnerable and underserved populations. Washington, DC: National Academies Press, 2011.

8. Institute of Medicine. Advancing oral health in America. Washington, DC: National Academies Press, 2011.
9. Personal communication with Scott Tomar, University of Florida College of Dentistry, on unpublished research on hospital emergency department and hospital inpatient admissions in Florida for non-traumatic dental conditions, 2015-16, 17 Dec. 2017.
10. Shah AC, Leong KK, Lee MK, Allareddy V. Outcomes of hospitalizations attributed to periapical abscess from 2000 to 2008: a longitudinal trend analysis. J Endod 2013;39(9):1104-10.
11. Allareddy V, Rampa S, Lee KM, et al. Hospital-based emergency department visits involving dental conditions: profile and predictors of poor outcomes and resource utilization. J Am Dent Assoc 2014;145(4):331-7.
12. National Maternal and Child Oral Health Resource Center. Oral health and school readiness and performance. At: www.mchoralhealth.org/highlights/school-readiness.php. Accessed 17 Dec. 2017.
13. Nasseh K, Vujicic M, Glick M. The relationship between periodontal interventions and health care costs and utilization: evidence from an integrated dental, medical, and pharmacy commercial claims database. Health Econ 2017;26:519-27.
14. Jeffcoat MK, Jeffcoat RL, Gladowski PA, et al. Impact of periodontal therapy on general health: evidence from insurance data for five systemic conditions. Am J Prev Med 2014;47(2):166-74.
15. Avalere Health. Evaluation of cost savings associated with periodontal disease treatment benefit (memorandum). 4 Jan. 2016. At: pdsfoundation.org/downloads/Avalere_Health_Estimated_Impact_of_Medicare_Periodontal_Coverage.pdf. Accessed 19 Dec. 2017.
16. Bale BF, Doneen AL, Vigerust DJ. High-risk periodontal pathogens contribute to the pathogenesis of atherosclerosis. PGMJ 2017;93(1098):215-20.
17. Faiella RA. A call to action for oral health. J Am Dent Assoc 2013;144(1):95-6.
18. National Academy for State Health Policy. The effects of Medicaid reimbursement rates on access to dental care. 2009. At: nashp.org/effects-medicaid-reimbursement-rates-access-dental-care/. Accessed 17 Dec. 2017.
19. Buchmueller TC, Orzol S, Shore-Sheppar LD. The effect of Medicaid payment rates on access to dental care among children: working paper. National Bureau of Economic Research, 2013. At: www.nber.org/papers/w19218. Accessed 21 Dec. 2017.
20. The Commonwealth Fund. State and federal efforts to enhance access to basic health care. 2010. At: www.commonwealthfund.org/publications/newsletters/states-in-action/2010/mar/march-april-2010/feature/feature. Accessed 21 Dec. 2017.
21. American Dental Association. About community dental health coordinators. At: www.ada.org/en/public-programs/action-for-dental-health/community-dental-health-coordinators. Accessed 21 Dec. 2017.
22. Grover J, Beatty M. Community dental health coordinator: new member of the dental access to care team. National Network for Oral Health Access, 2014. At: www.nnoha.org/nnoha-content/uploads/2014/08/Grover-Final-Community-Dental-Health-Coordinator-New-Member-of-the.pdf. Accessed 21 Dec. 2017.
23. Watson-Lowry CD. Statement of the American Dental Association to the Subcommittee on Health, Committee on Energy and Commerce, U.S. House of Representatives, on examining initiatives to advance public health. 2017. At: docs.house.gov/meetings/IF/IF14/20170517/105972/HHRG-115-IF14-Wstate-Watson-LowryC-20170517.pdf. Accessed 21 Dec. 2017.
24. Brickle CM, Self KD. Dental therapists as new oral health practitioners: increasing access for underserved populations. J Dent Educ 2017;81(9 Suppl):eS65-72.
25. Nash DA. A review of the global literature on dental therapists in the context of the movement to add dental therapists to the oral health workforce in the United States. East Battle Creek, MI: W.K. Kellogg Foundation, 2012.
26. Nash DA, Friedman JW, Kardos TB, et al. Dental therapists: a global perspective. Int Dent J 2008;58(2):61-70.
27. Shoffstall-Cone S, Williard M. Alaska dental health aide program. Int J Circumpolar Health 2013;72(1):21198.
28. Wetterhall S, Bader JD, Burrus BB, et al. Evaluation of the dental health aide therapist workforce model in Alaska. Research Triangle Park, NC: RTI International, 2010. At: www.rti.org/pubs/alaskadhatprogramevaluationfinal102510.pdf. Accessed 18 Dec. 2017.
29. Alaska Native Tribal Health Consortium. Dental health aide therapists celebrate graduation and program enhancements in new partnership with Iḷisaġvik College. 2016. At: anthc.org/dental-health-aide. Accessed 18 Dec. 2017.
30. Bolin KA. Assessment of treatment provided by dental health aide therapists in Alaska: a pilot study. J Am Dent Assoc 2008;139(11):1530-5.
31. Minnesota Department of Health. Dental therapy toolkit: a resource of potential employers. St. Paul: Minnesota Department of Health, 2017.
32. Wright JT, Graham F, Hayes C, et al. A systematic review of oral health outcomes produced by dental teams incorporating midlevel providers. J Am Dent Assoc 2013;144(1):75-91.
33. Mathu-Muju K, Friedman JW, Nash DA. Current status of adding dental therapists to the oral health workforce in the United States. Curr Oral Health Rep 2016;3(3):147-54.
34. Guay AH. Access to dental care: solving the problem for underserved populations. J Am Dent Assoc 2004;135(11):1599-605.
35. Chi DL, Lenaker D, Mancl L, et al. Dental utilization for communities served by dental therapists in Alaska's Yukon Kuskokwim Delta: findings from an observational quantitative study. Seattle: University of Washington, 2017.
36. Chi DL, Lenaker D, Mancl L, et al. Dental therapists linked to improved dental outcomes for Alaska Native communities in the Yukon-Kuskokwim Delta. J Public Health Dent 2018; epub ahead of print.
37. American Dental Association. Comments about the HHS draft department strategic plan for FY 2018-2022, 82 Fed. Reg. 45032 (letter), 17 Oct. 2017.
38. Commission on Dental Accreditation. Accreditation standards for dental therapy education programs. 2015. At: www.ada.org/~/media/CODA/Files/dt.ashx. Accessed 19 Dec. 2017.
39. Mathu-Muju KR, Friedman JW, Nash DA. Saskatchewan's school-based dental program staffed by dental therapists: a retrospective case study. J Public Health Dent 2017;77(1):78-85.

40. National Dental Practice-Based Research Network. Quick poll results: dentists disagree on role of dental therapists. 2016. At: files.constantcontact.com/c7da0d4c001/9abc436d-17a7-4973-81c6-ec2b1940a6b0.pdf. Accessed 19 Dec. 2017.
41. Hopcraft M, Martin-Kerry JM, Calache H. Dental therapists' expanded scope of practice in Australia: a 12-month follow-up of an educational bridging program to facilitate the provision of oral health care to patients 26+ years. J Public Health Dent 2015;75(3):234-44.
42. Smith BJ, Prosa B, Jacobi D, et al. An advanced dental therapist in long-term care: an Apple Tree Dental case study. 2015. At: www.appletreedental.org/wp-content/uploads/2017/09/ADT-LTC-Case-Study-091517.pdf. Accessed 19 Dec. 2017.
43. Catalanotto FA, Patthoff DE, Gray CF. Professional promises: hopes and gaps in access to oral health care—the ethics of access to oral health care, an introduction to the special issue. J Dent Educ 2006;70:1117-9.
44. American Dental Association. Principles of ethics and code of conduct. At: www.ada.org/en/about-the-ada/principles-of-ethics-code-of-professional-conduct. Accessed 19 Dec. 2017.
45. Welie JM, ed. Justice in oral health care: ethical and educational perspectives. Milwaukee: Marquette University Press, 2006.
46. Welie JM. Is dentistry a profession? Part 1, professionalism defined. J Can Dent Assoc 2004;70(8):529-32.
47. Welie JM. Is dentistry a profession? Part 2, the hallmarks of professionalism. J Can Dent Assoc 2004;70(9):599-602.
48. Welie JM. Is dentistry a profession? Part 3, future challenges. J Can Dent Assoc 2004;70(10):675-8.
49. Winslow GR. Just dentistry and the margins of society. In: Welie JM, ed. Justice in oral health care: ethical and educational perspectives. Milwaukee: Marquette University Press, 2006:81-96.
50. Koppelman J, Cohen RS. Dental health is worse in communities of color. Pew Charitable Trusts. 2016. At: www.pewtrusts.org/en/research-and-analysis/analysis/2016/05/12/dental-health-is-worse-in-communities-of-color. Accessed 19 Dec. 2017.
51. Corsino BV, Patthoff DE. The ethical and practical aspects of acceptance and universal patient acceptance. J Dent Educ 2006;70(11):1198-201.
52. Catalanotto FA. Expected changes in regulation and licensure: influence on future education of dentists. J Dent Educ 2017;81(9 Suppl):eS11-20.
53. American Journal of Public Health, June 2017. At: ajph.aphapublications.org/toc/ajph/107/S1. Accessed 19 Dec. 2017.