Dental Therapy Toolkit

LITERATURE REVIEW

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Table of Contents

Introduction

Widespread disparities in access to dental services have resulted in a disproportionate prevalence of dental disease for low-income and vulnerable patients and communities, which are often racially and ethnically diverse. The Minnesota legislature approved the establishment and incorporation of Dental Therapists (DTs) into the healthcare workforce in 2009 as one means of addressing these oral health disparities. In order to maximize the benefits of the services that DTs are qualified to provide it is critical that they be fully integrated into the workforce. This integration can be facilitated through a good understanding of the dental therapy profession and through the development of resources for employers interested in hiring one of these emerging professionals.

Approach: This paper reports on a narrative review of available literature to better understand the characteristics of DTs and the contributions these mid-level providers can make to the oral health of the citizens of Minnesota. The review will address the following goals:

- Goal 1: Define the MN DT provider; review the history of mid-level and alternate provider models used internationally and within the U.S.
- Goal 2: Describe the scope of practice of oral health care provider models that have emerged within the U.S. since the early 2000s, including DTs.
- Goal 3: To identify barriers and facilitators to integrating DTs into the workforce that will assist with developing support materials for employers interested in hiring a DT.

Methodology

A search of PubMed/MEDLINE was conducted using keywords and phrases for this literature review. Keywords used in the review included the following categories: *dental therapist, dental auxiliaries, dental nurse, midlevel provider, health aide, and dental.* The final search strategies included using a combination of keywords/phrases and using dental therapist and/or mid-level provider as the target population. Synonymous terms for dental therapists were also used, including: *Dental Auxiliaries OR dental therapy OR dental therapist OR dental nurse OR mid-level OR midlevel OR health aide AND dental OR Dental Auxiliaries AND dental therapy OR dental therapist OR dental nurse OR mid-level OR midlevel OR health aide.* Combination phrases such as: *Job Satisfaction, manpower, utilization, workforce, AND dental AND Delivery of Health Care OR Dental Health Services OR manpower OR utilization OR workforce OR skill OR performance* were also used. Reference lists from the articles obtained were scanned for additional relevant sources. Google Scholar, information on websites, professional organizations, and personal-professional contacts of the authors were also included in this review. Only sources published in English were included in this review.

Goal 1: Define the MN DT Model; Review the Development History of Mid-level and Alternate Provider Models Used Internationally and Within the U.S.

This section summarizes highlights from research and information that focused on: Defining the MN DT provider model and on the history of a variety of provider models that preceded and laid the groundwork for the eventual development of the DT provider model that has been established in MN.

Defining DTs

In May 2009 Minnesota became the first state in the United States to authorize the practice of dental therapists. The actual language reported in the Minnesota State Statute, Section 1. Minnesota Statutes, 2008, section 150A.01, Subd. 1b. *Practice of dental therapy* reads:

> "A person shall be deemed to be practicing as a dental therapist within the meaning of this chapter who: (1) works under the supervision of a Minnesota-licensed dentist under a collaborative management agreement as specified under section 150A.105; (2) practices in settings that serve low-income, uninsured, and underserved patients or are located in dental health professional shortage areas; and (3) provides oral health care services, including preventive, oral evaluation and assessment, educational, palliative, therapeutic, and restorative services as authorized under sections 150A.105 and 150A.106 and within the context of a collaborative management agreement." [1]

According to career center information posted on the Minnesota Dental Association's website:

> "A dental therapist is a licensed oral health professional who practices as part of the dental team to provide educational, clinical and therapeutic patient services. There are two types of dental therapists in Minnesota, one is a traditional licensed Dental Therapist and the other is a licensed Dental Therapist that has met certain criteria and achieved certification for Advanced Dental Therapist distinction. Dental Therapists and Advanced Dental Therapists have a specific scope of practice and are required to have a collaborative management agreement with dentists." [2]

In a report published by the Minnesota Department of Health related to "Emerging Professions", they go on to add the following description of DTs role within the workforce:

> "Dental Therapists and Advanced Dental Therapists play a key role in increasing access to dental care and preventing emergency room visits for dental related problems, and they help fill the gaps in providing dental care to low-income, undeserved communities." [3]

Minnesota DTs join the ranks of other mid-level oral care providers who have practiced internationally, in over fifty countries, beginning over ninety years ago in New Zealand. [4,5] The primary drivers for the establishment of mid-level oral health providers have been the same worldwide and include: challenges for low-income, uninsured, and underserved patients to access affordable dental services, especially in professional work-force shortage areas. This has been especially true where children's oral health is concerned. In fact, the first mid-level provider model ever instituted was established to facilitate the delivery of dental services using a school-based dental program.

History and Evolution of Mid-Level and Alternate Provider Models Used Internationally and within the U.S.

International Mid-level Provider Models

Globally, mid-level providers have delivered oral health care for many years, beginning in New Zealand with the establishment of the School Dental Service in 1921 and the use of *dental nurses* to meet the oral health needs of children. [4,5]

According to Robin W. Roberts in his article The New Zealand Dental Nurse Program*,* "The dental nurse program was initiated over 50 years ago to provide routine dental care to the country's children from 2 1/2-13 years of age. Participation by parents is completely voluntary, but the fact that more than 60% of the preschool children and 95% of the school children are registered shows its wide acceptance." [4] In reporting the outcomes attributed to the dental nurse program in New Zealand, Roberts goes on to report that, "In 1925 there were 78.6 teeth requiring extraction for every 100 teeth that were restored. In 1974 this figure was reduced to 2.5 extractions per 100 restorations." [4]

Subsequent to the establishment and success of the New Zealand dental nurse school-based program over 50 additional countries, both developing and developed, have instituted mid-level provider models to better serve their populations' oral health care needs. Substantive literature exists documenting the education standards, [6-10] technical abilities, [11-15] and safety [7,16,17] of the services provided by these international mid-level providers. Several excellent reviews of the literature related to these topics have been published. For example, Edelstein (2011) prepared an extensive review of mid-level provider training programs in Australia, Canada, Great Britain, the Netherlands, New Zealand, and in the United States. [18] This review includes comparisons across mid-level training by program length and content, as well as the policy issues, such as scope of practice and supervision practices, that are also relevant to the consideration of instituting dental therapists in the U.S. In 2014 the most comprehensive review to date of the global literature on mid-level dental providers was published by Nash and colleagues. [16] The aim of this extensive body of work was to, "…inform the discussion on dental therapists in the workforce, particularly in the United States."

This comprehensive and exhaustive review of international literature was funded by the W.K. Kellogg Foundation and includes over eleven hundred documents from fifty-four countries. Nash recruited seventeen consultants from various countries, all recognized mid-level experts,

to assist in assembling and reviewing the documents and data. They collectively concluded that the evidence clearly demonstrates that, "…dental therapists provide effective, quality, and safe care in an economical manner and are generally accepted both by the public and…by the dental profession." [16]

Yet, despite the plethora of data related to the successful integration of mid-level dental providers into the international dental community workforce, it has been much more challenging to introduce the dental therapy provider model into the United States' workforce. Over the years there have been several failed attempts to do so.

Previous Attempts to Introduce DTs into the U.S. Workforce

In an article published in 2011, Mathu-Muju chronicles three different attempts to specifically introduce dental therapists to the US workforce. According to Mathu-Muju both the 1949 (Massachusetts) and 1972 (California) attempts to specifically establish dental therapy provider models, both initiatives failed due to concerns voiced by organized dentistry. The third attempt described in this article was the dental health aide therapist (DHAT) provider that was modeled after the New Zealand (NZ) dental nurse and proposed to provide treatment in underserved American Indian/Alaska Native (AI/AN) communities. [15] Because these communities are under federal jurisdiction and, therefore, immune from the barriers posed by state dental practice acts, they were able to establish this new provider-model to deliver independent dental services to AI/AN communities in Alaska. The establishment of the DHAT providers in Alaska has been documented by Nash and others. [19,20] Following a pilot study that assessed the treatment provided by DHAT providers, Bolin concluded, "No significant evidence was found to indicate that irreversible dental treatment provided by DHATs differs from similar treatment provided by dentists." [21]

In addition to efforts to introduce dental therapists and other mid-level provider models into the U.S. workforce, it is important to note that numerous other strategies have been explored and/or initiated over the decades in an attempt to make affordable dental care more accessible. These initiatives have primarily proposed expanding the training of existing dental auxiliary models (i.e. dental hygienists and assistants) to include the provision of expanded dental services (a.k.a. expanded functions).

Expanded Function Dental Auxiliaries in the U.S.

In 1971 Karl Koerner published an extensive review article in the *Journal of Public Health Dentistry* titled "Dynamic Transition in Dentistry; Expanded Functions for Auxiliaries" that detailed the political and social pressures that were putting increased demands for services on the dental profession. The article reviewed initiatives undertaken by the American Dental Association (ADA) to work to address the demand for increased access to dental care. [22] Population and economic growth, rising education levels, and expanding dental insurance coverage were all reported as contributing to the increased demand for dental services. The author goes on to chronical the policy recommendations of the American Dental Association (ADA), beginning with a policy statement issued by the ADA's House of Delegates in 1961, encouraging accredited dental schools to carefully explore programs designed to train dental

hygienists and dental assistants to perform additional functions under the direct supervision of a dentist. Expanding the scope of practice that dental hygienists and assistants, who were already part of the workforce, seemed like the most logical way to rapidly expand the delivery of services.

In a subsequent article published by Mullins et al. (1983) they reported, "In the early 1970s the concept of expanded practice was heralded as a major innovation in the delivery of dental care. Initially, this new mode of practice was advocated by federal researchers, dental educators, and American Dental Association officials as having the potential to address problems of shortages and mal-distribution of dentists". [23]

During this era, numerous academics within the U.S. developed and implemented training programs and scholars evaluated the outcomes of expanded function procedures performed by dental hygienists and assistants. The literature related to these initiatives and published during this era evaluated numerous aspects, including: the auxiliaries' technical competence, [24-27] the attitudes by dentists and patients towards the expanded use of auxiliaries, [28-31] and the financial feasibility of expanding the functions of auxiliaries. [25,29,32] The majority of these studies documented both the clinical and economic feasibility of expanding the delegation of expanded functions to dental auxiliaries. However, despite the evidence documenting the clinical and financial feasibility, state regulatory agencies and legislative bodies were slow to accept the concept of expanded practice. Then, in the late 1970s, subsequent to the initiation of federal capitation incentives to increase the numbers of applicants accepted into dental schools, the ADA and many dental educators withdrew support for expanding the roles of dental hygienists and dental assistants. [29]

Unfortunately and despite an increase in the number of students accepted into dental programs, the issues of access to and disparity in the delivery of dental care have persisted. The political and social pressures for increased access dental services have persisted as well. With time, the roles and responsibilities of dental hygienists in many states have gradually expanded. One of the initial changes that occurred in a number of states was allowing the provision of dental hygiene services under general (indirect) supervision. Changes in several state practice acts made it possible for dental hygienists to practice independently and/or unsupervised. Examples of states that have changed their state practice acts include Washington (1984), Colorado (1987), Michigan (1991), New Hampshire (1993), Maine (1995), Connecticut (1997), Oregon (1997), California (1998), New Mexico (1999), and Minnesota (2001). In MN the *Limited Authorization for Dental Hygienists* that directed what has come to be referred to as "collaborative dental hygiene practice" required changes in state statutes (i.e. MN Statute 150A.10 subd 1a). This change was instituted in an attempt to extend dental hygiene services to locations and populations that otherwise would be underserved. [33]

Collaborative Practice Model in Minnesota

The authorization of the collaborative dental hygiene practice or, collaborative practice model allowed for the provision of dental hygiene services to low-income and underserved patients in community settings without a dentist present and without a prior examination by a dentist. In 2003, the placement of dental sealants was added to the expanded functions that could be

provided by dental hygienists in MN. Then, in 2005, expanded functions for dental hygienists in MN were further expanded to include the administration of local anesthesia. The dental hygienists who took the additional training for these expanded functions and who practice under a collaborative practice model are referred to as a collaborative dental hygiene practitioner (CDHP).

A prerequisite to becoming a CDHP is entering into a Collaborative Management Agreement (CMA) with a collaborating dentist. A CMA is a written agreement between a dentist and dental hygienist that outlines things such as the circumstances in which a registered dental hygienist (RDH) may initiate treatment, practice protocols, and to ensure that there is an emergency management plan. (Having a CMA with a collaborating dentist would also go on to become a prerequisite for practicing DTs). The items included in a CMA vary depending upon each state's practice act. While the adoption of the Collaborative Practice Model made the delivery of dental hygiene services more flexible and more accessible, access to advanced oral care and restorative services has continued to be an issue both in Minnesota and nationwide. In fact, concerns about limited access to dental services and the consequences of poor oral health gained considerable attention following several high profile commentaries that highlighted and called attention to the ongoing national problems of widespread disparities in oral health, especially given the prevalence of dental disease and poor access to dental care for low-income and vulnerable patients and communities, which are often racially and ethnically diverse. These reports and calls for action ignited a renewed interest in moving beyond expanded function auxiliaries and to actually expanding oral health care workforce and a revival of exploring the institution of the dental therapy, mid-level provider model. [34]

Factors That Have Focused Attention on Oral Health Disparities in the U.S.

On May 25, 2000, then Surgeon General David Satcher released the 51st Surgeon General's report and the first one dedicated to oral health. In this landmark report, Dr. Satcher states that no less than a "silent epidemic of oral diseases is affecting our most vulnerable citizens–poor children, the elderly, and many members of racial and ethnic minority groups." [35] The report concluded that the public infrastructure for oral health was not sufficient to meet the needs of disadvantaged groups. Based upon these findings, the Surgeon General called for action to promote access to oral health care for all Americans, especially disadvantaged and minority children. In June, 2000, the Surgeon General's Conference on Children and Oral Health was held in Washington, DC to promote action steps to eliminate disparities in children's oral health. [36] Dr. Satcher wasn't the only Surgeon General to call attention to the disparities and inequalities that exist related to the delivery of dental services.

In the 2003 Surgeon General's "The National Call To Action To Promote Oral Health", Dr. Richard Carmona reported that tooth decay continues to be the single most common chronic childhood disease. Dr. Carmona described the "Call to Action" report as a way of guiding efforts to improve oral health. The "Call to Action" is an on-going invitation to expand the oral health workforce in order to promote oral health and prevent disease, and especially to reduce the health disparities that affect members of racial and ethnic groups, poor people, people who are geographically isolated, and others who are vulnerable because of special oral health care

needs. [37] These issues would soon make national attention due to two high profile, oral health related tragedies that occurred in the U.S.

It was not long after this call to reduce oral health care disparities and invitation for an expanded oral health workforce that the tragic, preventable deaths of two children, Deamonte Driver (2007) and Alexander Callendar (2007), due to a lack of access to treatment for tooth-related infections, brought national attention about concerns and potential consequences of the failure to adequately provide oral care to segments of our population. [38] While oral health-related deaths are not common, the impact of untreated dental disease extends to all aspects of physical, mental, and behavioral health. According to Casamassio, et al. (2009) untreated dental disease can affect children's development, school performance, and behavior. Ultimately, managing chronic oral pain and the accompanying consequences leads to a diminished quality of life. [39] The legal and ethical issues related to oral health-related disparities in accessing affordable dental care call into question the dental profession's responsibility relative to developing strategies to help resolve these inequities. This is especially true when it comes to providing dental care for children.

A publication in the *Yale Journal of Health Policy, Law, and Ethics* titled, "The Epidemic of Children's Dental Disease: Putting Teeth into the Law" [40] does an excellent job of reviewing and explaining the elements of good pediatric preventive dental care, the known problems caused by failure to receive this care, the current structural problems that impede children's access to timely care, and current reform proposals, focusing on the necessary legal changes and corresponding impediments. As described by the author, "…diseases such as tooth decay and cavities are debilitating in themselves and can lead to other problems such as constant pain, malnourishment, loss of teeth, and in adulthood, increased risk of cardiac problems and diabetes. This epidemic is almost entirely preventable, costly to society, and cost-effective to remedy". [40] The article concludes by arguing for a significant change to the infrastructure for providing dental care in order to achieve universal preventive care for all children, including the implementation of new provider models such as the dental therapy provider model. Other publications have also highlighted known barriers related to access to dental care.

Barriers to Providing Improved Access to Dental Care

The barriers associated with and contributing to the difficulty in accessing appropriate and affordable care for underserved populations have been well documented in the dental literature. The primary barriers to accessing dental services include: the mal-distribution of dentists; [41-43] limitations in delivery systems; [44-47] the lack of dentist participation in Medicaid; [48] the low priority of dental public health within public funding mechanisms, [49] and the inability of the current workforce model to meet the oral health needs of diverse populations. [50] Geographic location can also be a barrier to access to dental services. Susan Skillman et al. [41] have published a comprehensive review of the challenges to delivering oral health services specifically to rural Americans. [41 41 41]⁴¹ According to the Minnesota Department of Health's website, 6 out of every 10 Minnesota counties have a full county dental health professional shortage area designation. [51] Strategies to reduce these barriers and facilitate a more equitable delivery of oral health services have been proposed; in particular, calls for

improving delivery systems, and for the expansion of and/or more innovative workforce models. [35,37,38,47,52-54] Anne Gwozdek summarized the workforce concerns very nicely when she wrote, "As this national discussion ensued, oral health professionals as well as associations and advocates representing vulnerable populations advocated for a more flexible, efficient workforce pointed to a need for legislative changes to allow for alternative models of delivery. The mid-level dental practitioner became a part of this conversation". [38] In addition, federal agencies, such as the NIH, have advocated and provided funding for action steps to facilitate more equitable distribution of oral health care for all.

Initiatives and Strategies to Overcome Disparities and Inequalities in Oral Health

In response to the Surgeon Generals' reports, the National Institute of Dental and Craniofacial Research (NIDCR) of the National Institute of Health (NIH) established the Oral Health Disparities Research Center and added improvements in reducing oral health care disparities to their 2003, and all subsequent strategic plans since then. For example, Goal 3 of NIDCR's current strategic plan is, "Apply rigorous, multidisciplinary research approaches to overcome disparities and inequalities in dental, oral, and craniofacial health." [55] Having goals for driving down oral disease in all populations as part of the NIDCR's strategic plan means that funding gets appropriated to work toward meeting these goals. In fact, the NIDCR, together with the National Center on Minority Health and Health Disparities (NDMHHD) solicited proposals to establish research centers to address the needs of communities with poor oral health and to develop on strategies to reduce children's oral health disparities. A very nice review of the five centers that were funded has been published by Peter Milgrom et al. (2004) and describes how the creation of these centers, together with their community partners, "…has forged partnerships that include ties with dental societies, state and local health agencies, community and migrant health centers, American Indian tribal nations and institutions that serve other diverse patient populations." [56] The primary strategies implemented and evaluated by investigators in these centers has involved interventions such as school-based sealants, [57] oral health-related education for physicians, [58] and community-based programs to improve oral health literacy. [59] In addition to the response by institutes within the NIH to the Surgeon Generals' reports, other organizations and societies also responded and proposed ways to facilitate improved access to dental services. Both the American Dental Association (ADA) and the American Dental Hygiene Association (ADHA) devised plans to integrate new models for bringing better health to underserved communities.

In 2006, the ADA initiated a pilot project to establish a new community health worker whose primary focus was on patient education, disease prevention, and patient navigation. By September 2012, the Community Dental Health Coordinator (CDHC) program had graduated 18 students who were employed in underserved areas. [60] The ADA and their affiliate state dental societies are working to encourage state governments, charitable, and private organizations to support the funding and operations of the CDHC programs. More information about this provider will be outlined in the next section of this review. In addition to the ADA's CDHC provider model, the ADHA also came up with a proposed provider model.

In June 2004, the American Dental Hygiene Association's (ADHA) House of Delegates adopted policies regarding the development of the advanced dental hygiene practitioner (ADHP) as a

means of, not only benefiting the public's oral health, but also advancing the future of the dental hygiene profession. [34,61] This policy included support for the creation of a standardized educational curriculum to be developed by the association. During the ensuing years a task force of curriculum experts worked to develop the ADHP curriculum. The distinguishing feature of the ADHP is that they are proposed to provide restorative dental services in addition to preventive services. This provider model more closely resembles the mid-level provider models established and working internationally. In fact, it was the ADHP provider model that was originally proposed in Minnesota in 2006 [62] and that preceded the DT provider model that was finally authorized by the Legislature to practice in the state.

Given the ongoing strategies to improve access to dental services through a myriad of initiatives and proposals to expand the workforce, it is important to review the current oral health care provider models, and their respective scopes of practice, that are established and/or proposed to integrate within the U.S., including DTs.

Goal 2: Describe the Scope of Practice of the Oral Health Care Provider Models That Have Emerged in the U.S. Since the Early 2000s, including DTs.

Mid-level and Alternative Oral-Healthcare Provider Models

The ongoing calls to improve access to dental services through expanding the workforce has ultimately led to a number of new provider models emerging within the U.S. In her publication related to mid-level dental practitioners, Anne Gwozdek outlines three of the mid-level provider models currently being advocated for and/or practiced in the U.S.: Alaskan Dental Health Aide Therapist, Advanced Dental Hygiene Practitioner, and Dental Therapist/Advanced Dental Therapist. She provides an excellent overview of their specific education, licensure, and scope of practice specifications. [38] These mid-level providers are briefly summarized here and in Table 1.

Alaskan Dental Health Aide Therapist (DHAT)

The DHAT oral health-care provider model was created in 2003 when a group of six Alaskan students began training as dental therapists at the University of Otago in New Zealand. In 2007, the Alaska Native Tribal Health Consortium and the University of Washington, School of Medicine Physician Assistant Training Program, MEDEX Northwest, launched a collaborative Alaska-based training program, the DENTEX Dental Health Aide Therapist Program. The training program is funded mainly with foundation grants, with additional federal funding from the Indian Health Service and the Health Resources and Services Administration. Students are sponsored by tribal health organizations for two years of training, and then owe four years of service to that entity as salaried employees.

Advanced Dental Hygiene Practitioner (ADHP)

The ADHP oral health-care provider model has been developed and promoted by the American Dental Hygienists' Association and was the original provider model that was initially proposed in Minnesota. The ADHP is based on a master's level education that is open to currently licensed dental hygienists who have a bachelor's degree. In addition to the services that they can provide as a licensed dental hygienist the ADHP is envisioned to provide the additional services listed in table 1 (below). Subsequent to being considered and discussed in Minnesota, stakeholders came to consensus around an alternative mid-level provider model they called dental therapists.

Minnesota Dental Therapist/Advanced Dental Therapist (DT/ADT)

The DT/ADT oral health-care provider models are the models that have been instituted in Minnesota. An overview of their education, licensure, and scope of practice is outlined in Table 1.

Table 1: Overview of U.S. Mid-Level Providers Education, Licensure, and Scope

	Alaskan Dental Health Aide (DHAT)	Advanced Dental Hygiene Practitioner (ADHP)	Minnesota Dental Therapist/Advanced Dental Therapists (DT/ADT)
Education	Alaska Native Tribal Health Consortium-Community Health Aide Program • Program through University of Washington DENTEX	Developed by the American Dental Hygienists' Association based on Master's level education at accredited institutions; open to currently licensed DH who have a Bachelor's degree	Metropolitan State University* and University of Minnesota School of Dentistry • DT minimum Bachelor's level • *RDH/DT Master's Level degree • Test for ADT status can be taken once
Licensure	Certified and regulated by Indian Health Service's Community Health Aide Program	Providers are envisioned to be state licensed	State licensed providers
Supervision	Presence of dentist is not required	Collaborative arrangement envisioned with referral network; presence of dentist not required	DT: On-site or general supervision depending upon the service; collaborative management agreement (CMA) with dentist ADT: CMA with dentist, presence of dentist not required for most services
Preventive Scope	• Oral health and nutrition education • Sealant placement • Fluoride application • Supragingival scaling • Coronal polishing	• Oral health and nutrition education • Full range of DH preventive services	• Oral health and nutrition education • Preliminary charting • Radiographs • Sealant placement • Fluoride application • Pulp Vitality Testing • Oral Cancer Screenings • Caries risk assessment • Coronal polishing
Restorative Scope	• Primary and permanent teeth • Uncomplicated extractions	• Primary and permanent teeth • Uncomplicated extractions of primary and permanent teeth • Palliative temporization	• Primary and permanent teeth • Extractions of primary teeth • Nonsurgical extractions of permanent teeth (ADT only) • Pulpotomies • Stainless steel/preformed crowns • Atraumatic restorative therapy
Additional Scope	• Local anesthesia and nitrous oxide	• Local anesthesia and nitrous oxide • Diagnosis within scope of practice • Limited prescriptive authority • Triage and case coordination • Public health programming and advocacy	• Local anesthesia and nitrous oxide • Dispense analgesics, anti-inflammatories, and antibiotics (ADT may *provide* as well as dispense) • Assessment and treatment planning as authorized in CMA (ADT) • Desensitizing /resin application • Soft mouth-guard fabrication • Soft reline/tissue conditioning • Dressing changes • Tooth re-implantation

Adapted from a table in an article by Anne Gwozdek [38]

Once a DT has logged 2000 hours of documented clinical practice, they are eligible for certification as an advanced dental therapist (ADT). In addition to the services already outlined in Table 1, an ADT, certified by the board of dentistry, may perform additional services and procedures if they are outlined in the written CMA, including:

- Evaluate and assess dental disease and develop treatment plans
- Perform, under general supervision, nonsurgical extractions of permanent teeth
- May supervise up to four dental assistants.

In addition to these three provider models and as described earlier the American Dental Association (ADA) implemented a pilot project to educate, train, and deploy a new provider model called the Community Dental Health Coordinator.

Community Dental Health Coordinator (CDHC)

This provider was inspired by the community health workers (CHWs) who are members of a community who provide basic health and medical care within their own community. According to the ADA website, these workers "…live in or are at least familiar with the unique health challenges facing the communities in which they work**."** As of Fall 2014, the CDHC project has graduated 34 students who are now serving in 26 communities in eight states: Arizona, California, Montana, Minnesota, Oklahoma, Pennsylvania, Texas, and Wisconsin. (ADA, 2014). This model differs from the previously described provider models because CDHC's are not seen as "mid-level providers"; rather, their mission is to prevent dental disease and connect patients to dentists. The CDHC curriculum involves seven core competencies:

- The knowledge and skills to develop and implement community-based oral health prevention and promotion programs
- The knowledge and skills required to prioritize population and patient groups.
- The knowledge and skills required to provide individual preventive services based on approved plans.
- The knowledge and skills required to collect diagnostic data.
- The knowledge and skills required to perform a variety of clinical supportive treatments.
- The knowledge and skills required for administrative procedures.
- The knowledge and skills required to temporize dental cavities in preparation for restorative care by a dentist.

Since the focus of this review is to explore the dental therapy provider model we will not elaborate on the CDHC model in this review. There are excellent CDHC resources CDHC on the ADA website. [63] In addition, while Dental Health Aide Therapists (DHAT) have been employed by Alaskan Native tribes since 2004 (http://www.anthc.org), that model differs from the Minnesota dental therapy model, because DHAT's are not a state-licensed profession; rather, they practice under the authority of Alaskan Native tribes on native lands that are exempt from state regulation whereas the Minnesota DTs are authorized by state legislation under licensure

administered by the Minnesota Board of Dentistry. Therefore, the remainder of this review will focus on DT and ADT models that are licensed to provide dental care in Minnesota.

Minnesota Approves a New Mid-level Oral-Healthcare Provider

As previously mentioned, in May 2009, Minnesota became the first state to enact state legislation establishing the licensing and practice of a new oral health practitioner, called a dental therapist (and "advanced practice dental therapist" for those obtaining advanced certification), to improve access to oral health care services. Two dental therapy educational programs were established to train dental therapists. The Metropolitan State University (MSU), in partnership with Normandale Community College, developed a program that was based on the ADHP competency framework and required a baccalaureate dental hygiene degree and a dental hygiene license as conditions for admission to the educational program. Graduates from the MSU program meet the education requirements for state dental therapy licensure and the advanced dental therapy certification.

The University of Minnesota, School of Dentistry (UMN-SOD) then established a dental therapy education program designed to educate dental therapy students alongside dental and dental hygiene students in a team environment. Unlike the MSU program, the UMN-SOD program did not require prior dental hygiene licensure or a baccalaureate degree for acceptance into their DT program. Graduates from this program met the education requirements for state dental therapy licensure but not for the advanced dental therapy certification. As experience with the dental therapy profession in Minnesota evolved, faculty in the SOD studied the DT skill-set sought in the marketplace. In the fall of 2012, based on findings from research studies and conversations with safety net dental providers and other potential employers of DTs, it became clear that optimal delivery of dental services could be accomplished if the SOD program graduated students who would also be eligible for advanced dental therapy (ADT) certification. Additionally, employers and potential employers voiced their desire for a dental therapist to be dually licensed in dental hygiene. Dental therapy graduates also communicated that ADT certification *and* a dental hygiene license would broaden their employment opportunities and expand the delivery of dental care.

Taking these factors into consideration, a decision was made to modify the UMN-SOD dental therapy program such that graduates would be educationally eligible to pursue ADT certification if they desired. Next, after receiving program approval from the MN Board of Dentistry to educate students to the Advanced Dental Therapy level, the SOD developed a dual license dental hygiene/ dental therapy program. The versatility of this mid-level provider is expected to increase employment opportunities, thereby increasing access to oral health care for Minnesotans**.** This new Bachelor of Dental Hygiene/Master of Dental Therapy dual degree program will begin in Fall 2016. These evolutionary changes in the curriculum are to be expected as new professionals emerge and integrate within a profession.

As Burton Edelstein points out, with any new healthcare professional, "…questions arise about their scope of practice, roles, and responsibilities relative to existing providers, and the training they will need to assure public safety, quality of care, and acceptance." [18] A new profession requires creating the legal structure to sustain it. Further actions, such as establishing more

schools to train dental therapists, creating liability insurance programs, and changing third party payer arrangements so that dental therapists can be reimbursed are additional necessary steps to altering the infrastructure so that it can incorporate this new model. In addition, the existing professional workforce is often times resistant to accepting the new kind of workforce members. In order to maximize the benefits of the services that DTs are qualified to provide it is critical that they be fully integrated into the workforce. In order to fully integrate DTs into the workforce, it is important to identify the barriers and the facilitators that need to be resolved and implemented to achieve this goal.

Goal 3: Identify Barriers and Facilitators to the Integration of DTs into the workforce.

Barriers to Establishing and Integrating Dental Therapists into the Workforce

Any time a new professional is introduced into the workforce, the established, related workforce members often question the need for, competence of, and acceptance of these new care providers. In the case of integrating DTs/ADTs into the workforce it is important to understand the perceptions and attitudes of dentists and patients towards DTs, to explore the impact of DTs on productivity and finances to determine if this new provider model is financially sustainable, and to determine if their presence actually improves access to dental services by the underserved in our communities.

Attitudes of Patients, Dentists, and Dental Faculty Towards Dental Therapists

Limited information is available that reports patients' attitudes towards having their dental services performed by a DT. In a study carried out in Britain, fifteen patients and 3 parents of a child patient were interviewed for feedback regarding their perspectives about having their/their child's dental procedures performed by a dental therapist. The authors described an over-all report of having had a positive experience; however, trust and familiarity with the dental team was a critical aspect. [64] While the British study was published in 2014, a paper published by Martens et al. in 1975, [30] also reported favorable responses from patients who had had cavity preparation and restoration services provided by expanded function dental hygienists as part of a special program carried out in a TEAM clinic (special clinic for expanded function auxiliaries) at the University of Minnesota School of Dentistry and in a private practice setting. The patients in the Martens et al. study also reported that communication and trust were important factors in their sense of satisfaction. [30] While patient satisfaction is critical, the satisfaction and support of dentists with DT providers is also critical to their successful integration into the workforce.

Internationally, where DTs are more established dental service providers, supervising and supporting dentists have rated the knowledge level and clinical skills of dental therapy students that they have evaluated as being good to high at the completion of their education. [7] New Zealand and British dentists and dental specialists have also responded favorably to hiring mid-level providers. [65,66] In Minnesota, where dental therapy is a relatively new provider model, more resistance to the acceptance of DTs by dentist has been reported. In a survey of Minnesota dentists' attitudes toward the DT workforce model, Blue et al. [67] reported that the majority of dentists surveyed (n=551) were opposed to DTs performing irreversible procedures. A similar resistance to DTs was noted in the results of a survey of 151 faculty members at the School of Dentistry at the University of Minnesota. The study found that, while the majority of these dental faculty members believe dentists have a personal responsibility in the care of the underserved, they do not agree that the dental therapists are part of the solution to improve access. [68] Similar apprehension was reported in a survey of U.S. dental school deans. Forty-four of 58 deans responded (76%). Their attitudes were mixed with approximately 80% reporting a positive response for supporting the expansion of the roles of dental hygienists; however, only 55% reported a positive response for future dental practices including mid-level practitioners or dental therapists. [69] A group that has been more accepting of the DT provider model is the safety net dental clinic directors. In a survey of 32 clinic directors (23 dentists/9 non-dentists), 77% of respondents overwhelmingly supported the DT provider model. [70] In fact, the safety net clinics have been the early employers of many DTs in MN. [70] In their paper about the attitudes of U.S. dental school deans' attitudes about mid-level providers, Aksu, et al. do a nice job of reviewing both U.S. and global literature related to the dental professions knowledge and attitudes towards DTs and report, "…in particular, the large gaps in knowledge and perceived barriers to employment, are echoed in studies from other countries." [69] Aksu goes on to discuss that workforce matters can be emotionally charged and that decisions about workforce models should be based on evidence rather than emotion. The profession needs to critically assess the current status of oral health disparities and the role that the dental profession plays in improving the way in which dental services are provided. [69]

Each year the graduating dentists from the School of Dentistry at the University of Minnesota take the "Oath for New Dentists" which, in part reads, "…I shall do my utmost to provide the vulnerable members of society the care and attention they need to assure their health, dignity, and protection. I see all human life as sacred." [71] As Asku et al. commented in their paper, "Healthcare professions have the responsibility to critically assess themselves and adjust their practice to what the evidence suggests is prudent and proper in order to achieve high-quality public health outcomes. [69] Therefore, one way to improve the attitudes of the dental profession toward the integration of the DTs into the workforce is to base employment decisions on the evidence relative to the community needs as well as increasing dentists/potential employers' knowledge about the training, scope of practice, and technical abilities of DTs. This is one of the goals of the Dental Therapy Toolkit that will be developed for potential DT employers. In addition, the success of integration of DTs into the workforce is dependent upon their being financially sustainable.

Financial Sustainability of Hiring a Dental Therapist

One of primary questions of interest to potential employers is to determine if this new provider model is financially sustainable. Limited data is currently available to assess the financial impact of employing a DT, especially in a private practice setting. One article used a standard economic analysis and national general dental practice data to estimate the reduction in general practice costs by using the services of a DT and using their broadest scope of practice. They estimated and reported a mean reduction in general practice costs of between 1.57 and 2.36 percent. [72] Several articles have been published by Bailit and Beazoglou et al. that look at the financial impact of dental therapists on Federally Qualified Health Center (FQHC) dental clinics (treating children). [73,74] The authors only reported a modest reduction in over-all costs in these settings as well. One could argue that, even if there is only a modest reduction in the over-all practice costs of providing the same services by using a DT, that the ability to expand dental services to patients who otherwise would not be seen by that practice still represents a gain in terms in reducing the current disparity that exists in the delivery of oral health care procedures. As the DT profession moves forward it will be important to monitor and measure the financial data as more DTs are employed and integrated into the profession. In addition, it is also important to establish appropriate outcome measures, collect data, and review existing data in order to determine what their actual impact is and in order to justify their creation.

Impact of Dental Therapists on Delivery of Dental Services to Underserved

As part of the law permitting the licensing of dental therapists, provisions were outlined that provided for the Board of Dentistry to: 1) evaluate the impact of the use of dental therapists on the delivery of and access to dental services; 2) track the number and type of dental services performed by DTs; and 3) develop an evaluation process together with the MDH.

Two recent state reports have been released that review the research related to the impact of these new professionals, describe the access problem, and discuss potential solutions: Early Impacts of Dental Therapists in Minnesota, published by the Minnesota Department of Health (MDH) and the Minnesota Board of Dentistry; [75] and Recommendations for Improving Oral Health Services Delivery System published by the Minnesota Department of Human Services (DHS). [76] Given that the first licensed DTs have only practiced since mid-2011, the amount of data available to evaluate is limited. However, two key findings from these reports are worth highlighting because of their relevance to the rationale for the establishment of the new level of licensure and the reasons for integrating dental therapists into the workforce:

1. Low-income Minnesotans have high rates of oral health disease but low utilization of dental services. A primary factor in low utilization is the inability to find a dentist willing to treat low-income populations due to low public program reimbursement rates and the added complexity, access barriers and no-show rates that are typical when serving low-income patient populations.
2. Many rural Minnesotans lack access to dental care regardless of their income and insurance status because of a shortage of dentists practicing in rural communities. Over 70 percent of Minnesota counties are fully or partially designated as Health Professional Shortage Areas for dental care (MDH-Early Impacts).

It will be important to continue to monitor the impact of the dental therapy profession on the oral health of the citizens of Minnesota. This data will be important, not only for evaluating the

success of the DT profession in our state, but also for states throughout the U.S. who are considering the licensing of DTs.

Other states have also shown interest in pursuing similar legislative and educational action. Minnesota's experience and data collection should prove useful for other states with similar goals to maintain high educational standards, high quality of care and patient safety, and the ability to meet the needs of underserved populations. Even without the political impediments such as the opposition of organized dentistry, programs for training therapists have to be created. Licensing procedures in every state must be enacted, requiring the creation of numerous appropriate regulatory bodies to govern the process. In addition, efforts that have been/are being used in Minnesota, such as the federally funded State Innovation Model (SIM) grant program, which the MDH is using to fund the development of resources (e.g. a toolkit) to assist potential employers with the integration of DTs into the workforce, may also help to reduce barriers and encourage willing employers to integrate a DT into their practice. It is important to continue to identify questions that exist related to establishing DTs and integrating them into the dental workforce.

The limitations of the evaluation that were described in the MDH report, Early Impacts of Dental Therapists in Minnesota are important to note. The authors also noted that the data was based on a very limited number of DTs and that there was very limited data available on ADTs' services because no DTs had yet become certified as ADTs when the data was first being collected. There were only three certified ADTs by the end of the data collection period. In addition, at the time of data collection, the Department of Human Services (DHS) data systems could not distinguish services provided by DTs or ADTs. Moving forward it will be important to determine a way to measure this data in order to answer the question of the impact of DTs on any increase in utilization of dental services by public program patients due to the integration of DTs/ADTs into a practice/clinic. As noted earlier, the DT curriculum at the SOD has evolved to a dual-licensure model that will be implemented in the fall of 2016. It will be important to collect data about how these changes are received by students, faculty, and the profession.

Finally, it is important for new provider models to remain malleable during the initial years and to be willing to evolve to acquire the education and training necessary to successfully meet the needs of the community that they serve.

Facilitating the Integration Dental Therapists into the Workforce

Given the history of how challenging it has been to achieve even expanded roles and responsibilities for dental hygienists and assistants within the U.S., the fact that the dental therapy provider model was instituted in Minnesota is evidence that the need to facilitate the delivery of dental services to the underserved had reached a critical juncture. The challenge now is to work with dentists and their professional associations to move towards greater acceptance and integration of this new dental provider in order to maximize the benefits of utilizing their full capacity. One way to facilitate the integration of DTs into the workforce is through a good understanding of the dental therapy profession and through the development

of resources for dentists/employers interested in hiring one of these emerging professionals. This is the goal of the ensuing Dental Therapy Toolkit development.

Additional questions that the authors of this review believe will be important to answer over time include:

1 How knowledgeable are stakeholders about the implementation of dental therapy in Minnesota?
2 What barriers to expanding the use of DTs and ADTs exist?
3 What, if any, changes to the scope of practice of DTs and ADTs should be considered by policymakers, regulators, the profession or other stakeholders?
4 Will the availability of DTs result in an increase in the number of dentists who serve patients enrolled in Minnesota Health Care Programs and the numbers of patients they see?
5 What is the level of job satisfaction amongst DTs/ADTs? How many DTs/ADTs leave the profession within the first 5 years of graduation?
6 Have dentists employing DTs and/or ADTs increased the number of complex services they personally provide?
7 In what settings is the DT/ADT model financially sustainable?
8 Does the presence of DTs/ADTs within the state translate to increased access to and utilization of dental services and improved oral health care outcomes?
9 Do DTs improve the delivery of dental care to rural, low-income and underserved patients?

Moving forward, it will be important to continue to conduct workforce surveys in order to have a comprehensive picture of who DTs are, what they do, where they practice, and what type of settings they work in and who they serve. This data will be critical in assessing future developments in the DT workforce.

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