Collaborative Dental Hygiene Practice in New Mexico and Minnesota

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Abstract

Purpose: This descriptive, comparative study was conducted to examine characteristics, services, models and opinions among collaborative dental hygiene practitioners in New Mexico and Minnesota.

Methods: A self-designed online questionnaire, distributed via SurveyMonkey®, was utilized to collect data from 73 subjects who met the inclusion criteria. A multi-phase administration process was followed. Content validity and reliability was established. Descriptive statistics were used for analysis of 6 research questions. The Mann-Whitney U, Pearson Chi-Square and Fisher's Exact tests were employed to analyze 4 null hypotheses ($p=0.05$).

Results: Most participants (n=36) were experienced clinicians who chose to work in an alternative setting after 28 years or more in the field and reported increased access to care as the reason for practicing collaboratively. A variety of services were offered and private insurance and Medicaid were accepted, although many practitioners did not receive direct reimbursement. The majority of New Mexico participants worked in private dental hygiene practices, earned advanced degrees and serviced Health Provider Shortage Areas. The majority of Minnesota respondents worked in various facilities, earned associate's degrees and were uncertain if Health Provider Shortage Areas were served. There were no significant differences in the variables between practitioners in both states.

Conclusion: New Mexico and Minnesota collaborative dental hygiene practitioners are similar in characteristics, services, and opinions although models of practice vary. Collaborative dental hygiene practice is a viable answer to increasing access to care and is an option for patients who might otherwise go without care, including the unserved, underserved, uninsured and underinsured.

Keywords: oral health, health care disparities, health services, health services accessibility, dental hygienist, independent practice, access to health care

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Introduction

A landmark report in 2000 identified oral disease as a "silent epidemic" affecting millions of Americans.[1] This epidemic is enhanced by oral health disparities found in minority groups,[2,3] low-income families including Medicaid-enrolled children,[4,5] older adult populations,[6] institutionalized individuals[3] and in population groups in oral health professional shortage areas.[5] These factors influence oral health outcomes in a population.

In 2003, the National Call to Action to Promote Oral Health established the necessity for public and private entities to work together to enhance oral and general health.[3] In response, many states developed strategies to expand oral health services provided by dental hygienists.[7] Some states lifted practice restrictions and permitted provision of direct access services where dental hygienists treat patients according to their assessment of patient needs, work independently of a dentist's supervision, and maintain a provider-patient relationship.[8]

In 2014, 46 states allowed some form of direct access dental hygiene care such as independent practice, collaborative practice dental hygiene (CPDH), access permits and other delivery models.[8] There is a growing number of dental hygienists with special permits to provide care beyond what was established in the original state's laws.[9] In 2007, 47.3% of all dental hygienists reported having a certification or permit to practice under special provisions, such as unsupervised practice.[9]

CPDH is the science of prevention and treatment of oral disease by providing education, assessment, prevention, clinical and therapeutic services in a cooperative working relationship with a consulting dentist without supervision.[10] Alaska, Colorado, Maine, New Mexico and New York have further increased the scope of practice by allow-

ing direct access services to be provided in any setting, including privately owned dental hygiene practices.[8]

In 1999, New Mexico became the second state to allow dental hygienists to practice in any setting without the supervision of, but in collaboration with dentists. In 2001, Minnesota legislation permitted dental hygienists to be employed by a health care facility, program or non-profit organization to provide authorized services.[8] Treatment can be initiated without the patient first being examined by a dentist. The required written agreement for both states contains mandatory written documentation, suggested written records and protocols for care.[10,11] The U.S. Department of Health and Human Services emphasized the importance of researching innovative ways, such as the CPDH model, to increase the oral health workforce and improve access to care to reduce oral health inequities.[3]

Historically, research conducted in California and Colorado revealed that direct access dental hygiene practice provided high quality oral health care, offered a viable solution to address access to oral health care problems and referred patients to surrounding dentists on a yearly basis.[12-15] Unmet oral health needs have placed a huge burden on the American population.

The National Institute of Dental and Craniofacial Research suggested the most common health problems among low-income, disadvantaged, disabled and institutionalized individuals were oral diseases.[16] Specifically, low-income and Medicaid-enrolled children were at an increased risk for poor oral health.[17]

The older adult population is another high-risk population group. Periodontal disease is present in 75% of adults over the age of 65 and is the most common cause of tooth loss in older adults.[18] Many elderly individuals have lost dental insurance upon retirement which has influenced decisions to seek care.[1] Couple the risk of periodontal disease, tooth loss and other diseases such as caries, xerostomia and heart disease with the loss of dental insurance and the risk for oral disease is intensified.

Unfortunately, institutionalized and homebound individuals have suffered a disproportionate burden of accessing dental care, regardless of their ability to pay for services.[19] In the recent past, approximately 1.8 million people were living in nursing homes, and this number is increasing as the population ages.[20] With limited access to oral health care, affordable or not, optimum oral health is difficult to achieve.

Lastly, disparities in oral health are also the result of an unevenly distributed oral health workforce. The U.S. Department of Health and Human Services estimated that an additional 7,208 dentists were needed in the U.S. to meet the adequate population to practitioner ratio of 4,000:1 for high need communities.[21] Unless changes are made in oral health workforce initiatives, access to care issues will most likely further deteriorate.

The initial direct access research was conducted with dental hygienists participating in the Health Manpower Pilot Project #139 (HMPP #139) from 1987 to 1990 in California.[13-15] Kushman et al reported that HMPP #139 practices showed a steady increase of new patients, low fees for services and referrals being made to surrounding dentists.[14] The authors concluded that the HMPP #139 practices offered dental hygienists a viable and flexible alternative to traditional settings.[14] A year later, another study determined that patients were satisfied with treatment, followed the dental hygienists' advice and visited a dentist within 12 months.[15] The HMPP #139 was a precursor to the Registered Dental Hygienist in Alternative Practice, which was initiated in 1998 allowing dental hygienists in California to perform direct access services.[8]

A study of 6 independent practice Colorado dental hygienists assessed productivity, services, office structure and patient process of care, and made a comparison to the HMPP #139.[12] Conclusions suggested that care and services provided by independent dental hygiene practitioners were safe and posed no harm to the public. This study and the HMPP #139 studies concluded that independent dental hygiene practice and direct access dental hygiene not only offered a viable solution to address access to care problems, but provided a referral source for surrounding dentists and a safe alternative for the patient.[12-15]

Limited Access Permits (LAPs) in Oregon were another form of direct access. In 2007, a positive working relationship was found between LAP dental hygienists and the affiliated dentists, and this practice model offered patients high quality oral health care.[22] As of 2011, the LAP was replaced by the Expanded Practice Dental Hygienist (EPDH) further expanding the scope of practice.[8]

Depending on state law, dental hygienists are able to provide certain services without the presence of a dentist and, thus, can contribute to improving access to oral health care.[8] Currently, Colorado is the only state in which dental hygienists can practice in all settings without collaboration or supervision of a dentist. Four direct access states allow practice in any setting with a written agreement and/or availability of a dentist for referral

or consultation.[8] Many other direct access states permit practice in limited settings and require any or all of the following: written agreement, referral plan and/or prior dentist authorization.[8]

Direct access dental hygiene plays an important role in the accessibility and affordability of oral health care; therefore, as early as 2001, the American Dental Hygienists' Association (ADHA) recognized that direct reimbursement from Medicaid and private insurance companies was critical.[23] Only 16 of 46 direct access states had statutory or regulatory language allowing a dental hygienist to be directly reimbursed by the state Medicaid department.[23]

Of the many direct access states, 7 (Alaska, Arkansas, Massachusetts, Minnesota, New Mexico, New York and South Dakota) had practice acts that included collaborative practice terminology.[8] New Mexico and Minnesota were studied because they were similar in regards to the services provided, the year CPDH was established and the lack of research on collaborative practice; although, the CPDH settings were different.

The state of New Mexico is rich in culture and diversity with the majority of its population being of ethnic origin and 20.4% of persons live below poverty level.[24] In 2013, a New Mexico Strategic Plan was devised, including an objective to increase access to preventive and dental services.[25] It includes 5 strategies such as developing a culturally appropriate and bilingual prevention campaign for oral health, increasing access to care for those in long term and nursing home facilities, and developing an oral health strategic plan.[25]

Since 1999, CDHPs in New Mexico have been practicing with fewer restrictions than other licensed dental hygienists in the state. There have been conflicting reviews, however, on the feasibility and complexity of establishing this type of practice. Some restrictions still apply that limit the CPDH from performing efficiently and effectively including, but not limited to, difficulty building partnerships with dentists and complications in receiving reimbursement from third-party payers.[26] In 2011, 12 out of 17 CDHPs did not have a Medicaid reimbursement number because the paperwork was challenging and confusing.[26] The greatest barriers to CPDH were finding a willing dentist and receiving reimbursement.[26] Currently, efforts are being made to develop a dental therapist in New Mexico.

In contrast to New Mexico, the majority of the Minnesota population (86.2%) was white and only 11.5% was below poverty level.[27] In early 2008, efforts were made in Minnesota to establish 2 new "mid-level" oral health providers; the Dental Therapist (DT) and the Advanced Dental Therapist (ADT).[28] DTs graduate with a bachelor's or master's degree and provide basic preventive services without a dentist onsite, however, all basic restorative services and extractions require the presence of a dentist. The ADT is a master's level prepared dental hygiene model permitting evaluation, assessment, treatment planning, nonsurgical extractions, preventive services and basic restorative services without the presence of, but in collaboration with, a consulting dentist.[28] Also, the Advanced Dental Hygiene Practitioner (ADHP) model, developed by the ADHA, describes a dental hygiene "mid-level" practitioner who provides primary oral health care directly to patients through assessment, diagnosis, treatment and referrals.[29]

Although these states differ demographically, they are similar in regards to CDHP. Therefore, 6 research questions were studied about CDHPs characteristics, services provided, models, opinions, benefits or obstacles of operating or working in a collaborative practice in New Mexico and Minnesota. In addition, 4 null hypotheses were tested to assess any differences in CDHP in New Mexico and Minnesota in regards to characteristics, services provided, models and opinions about CPDH.

Methods and Materials

A descriptive, comparative survey design was used and non-probability sampling employed to obtain a purposive sample. The population consisted of 156 CDHPs in New Mexico and Minnesota with active collaborative licenses providing services for a minimum of 1 year. A 43-question instrument was developed including closed-ended, open-ended, and 6-point Likert scale questions, the latter with responses from "strongly agree" to "strongly disagree." Six professional experts used a 4-point Content Validity Index Scale to rate each question for relevance to establish content validity. Questions scoring less than 0.80 were rewritten to improve clarity, or discarded.[30] A pilot test, conducted to establish test-retest reliability, employed 3 New Mexico and 7 Minnesota CDHPs who completed the survey on two separate occasions. A 0.83 level of agreement was established indicating reliability.

The licensing agency in each state was contacted for lists of CDHPs containing names, addresses and telephone numbers. First, each qualifying CDHP was contacted by letter to obtain an email address. Two weeks later, telephone calls were made to collect email addresses of those who did not respond to the mailed letter request. Next, a pre-notice email letter was sent to potential participants inviting them to participate. One week later, a cover letter email and questionnaire was sent using Sur-

veyMonkey®. Informed consent notified potential respondents that participation was voluntary and there were no consequences for declining to participate or withdrawing. Participants indicated consent and provided an email address if interested in entering the incentive drawing. A follow-up email was delivered to all potential participants 1 week later. Lastly, an email was sent to those who failed to respond to the follow-up email within 7 days. Data were collected over a period of 3 weeks.

Data were downloaded, confidentiality of responses was maintained and anonymity of participation was protected. Descriptive statistics (means, percentages) were used to summarize data and inferential statistics tested for differences between the New Mexico and Minnesota CDHPs. Nonparametric tests, including the Mann-Whitney U, Pearson Chi-Square and Fishers Exact, were employed to analyze the 4 null hypotheses (p=0.05). The responses to the open-ended questions were analyzed by first assigning codes to small segments of data representing a significant piece of data that potentially could be used to answer the research question.[31] Once the entire data set was deconstructed into initial codes, these codes were reviewed to determine common descriptive themes in which to group numerous initial codes.[31] The themes related to benefits and obstacles of CDHP by categorizing responses by state and organizing responses into common themes.

Results

Of 156 potential CDHPs, 73 email addresses were obtained; 25 from New Mexico and 48 from Minnesota. The remaining 83 email addresses were unattainable due to disconnected telephone numbers (n=38) and not answering or returning telephone calls (n=26). Fourteen potential participants were no longer a CDHP and 5 declined to participate. Of the 73 surveys distributed, 36 responses were obtained (49.3%, 6 from New Mexico and 30 from Minnesota; 23% and 64% response rate respectively). Four respondents from Minnesota did not answer questions about "practice models" and "opinions."

Most respondents (n=32) were 40 years or older and had 28 years or more dental hygiene experience (n=14). Eighty-three percent of New Mexico CDHPs and 33% of Minnesota CDHPs earned a bachelor's degree or higher. The primary reasons for becoming a CDHP were "greater control of patient care" and "increase access to care" (Table I).

Table II presents the services provided by respondents practicing in a CDHP model. Thirty-three percent (n=2) of New Mexico CDHPs provided 20 to 29 adult prophylaxes per week. Eight Minnesota CDHPs (26.7%) provided 30 to 39 per week. Most CDHPs provided child prophylaxes, nonsurgical periodontal therapy, and periodontal maintenance therapy on a weekly basis. Most respondents cared for patients with private insurance coverage (100% New Mexico and 76.6% Minnesota). The majority of respondents (88.9%, n=32) cared for those with Medicaid coverage, and 96.7% (n=29) of the Minnesota practitioners provided care for patients with Medicaid coverage. Only about 30% of the participants received direct reimbursement from Medicaid or private insurance companies.

Half of New Mexico responding CDHPs (n=3) referred patients to other oral health care providers and half (n=3) preferred the collaborating dentist to make referrals. Approximately 66.7% (n=4) of New Mexico CDHPs referred patients to general physicians for medical consultations. In Minnesota, about 70% of CDHPs preferred that the collaborating dentist make both types of referrals.

Table III reports the CDHP models. These data show that most respondents provided services in health provider shortage areas. The majority of models had 3 or more dentists providing services within the collaborative practice model (New Mexico 50%, Minnesota 69.3%). Half of New Mexico collaborative practice models (n=3, 50%) employed 1 or 2 additional part-time dental hygienists, whereas in Minnesota, the majority employed 2 or more additional part-time or full-time dental hygienists (n=18, 69.1%). Employment of additional dental assistants and receptionists was common, however, only half of the New Mexico respondents employed additional staff members. Most collaborative practices were in operation for at least 5 to 6 years and longer (78.1%). Regarding the structure of the collaborative practice, in New Mexico half were office-based (n=3, 50%), 2 were institutional-based, and 1 was mobile-based. In Minnesota, half of the collaborative models were institutional-based (n=13, 50%), 9 were office-based and 4 were mobile-based.

Opinions of CDHPs are outlined in Table IV. Most respondents "strongly agreed" that patients were satisfied with the services they received, CPDH offered autonomy and collaborative dentists were supportive. The majority of CDHPs (n=29, 90.6%) "agreed," "moderately agreed" or "strongly agreed" that finding a collaborative dentist was easy, however, 2 New Mexico CDHPs "strongly disagreed." Also, the majority of respondents (n=24) agreed that patient's followed-up on dentist referrals, however, 8 Minnesota CDHPs were unsure about this follow through. Unfortunately, direct reimbursement from Medicaid or private insurance companies was unlikely (n=20, n=19, re-

Table I: Characteristics of Collaborative Dental Hygiene Practitioners (n=36)[a]

Characteristics	New Mexico		Minnesota	
	n	Percent	n	Percent
Own the Practice				
Yes	4	66.70%	1	3.30%
No	2	3.30%	29	96.70%
Own the Facility				
Yes	1	16.70%	0	0.00%
No	5	83.30%	30	100.00%
Gender				
Male	0	0.00%	0	0.00%
Female	6	100.00%	30	100.00%
Age				
<20 years	0	0.00%	0	0.00%
21 to 29 years	0	0.00%	1	3.30%
30 to 39 years	0	0.00%	3	10.00%
40 to 49 years	2	33.30%	11	36.70%
50 to 59 years	2	33.30%	13	43.30%
>60 years	2	33.30%	2	6.70%
Highest Degree				
Associate degree in Dental Hygiene	1	16.70%	20	66.70%
Baccalaureate degree in Dental Hygiene	2	33.30%	5	16.70%
Baccalaureate degree in another field	0	0.00%	2	6.70%
Master's degree in Dental Hygiene	1	16.70%	0	0.00%
Master's degree in another field	2	33.30%	3	10.00%
Doctoral degree	0	0.00%	0	0.00%
Years of Clinical Dental Hygiene Experience				
<6 years	0	0.00%	0	0.00%
7 to 13 years	0	0.00%	4	13.30%
14 to 20 years	2	33.30%	7	23.30%
21 to 27 years	1	16.70%	8	26.70%
>28 years	3	50.00%	11	36.70%
Hours per Week Providing Collaborative Dental Hygiene Services				
<10 hours per week	2	33.30%	9	30.00%
11 to 19 hours per week	2	33.30%	1	3.30%
20 to 29 hours per week	0	0.00%	3	10.00%
30 to 39 hours per week	2	33.30%	16	53.30%
>40 hours per week	0	0.00%	1	3.30%
Reason for Becoming a Collaborative Dental Hygienist				
Autonomy	1	16.70%	2	6.70%
Finances	1	16.70%	0	0.00%
Career growth opportunity	2	33.30%	1	3.30%
Increase access to care for underserved	2	33.30%	12	40.00%
Greater control of patient care	0	0.00%	15	0.5

[a]Total percentages might not equal 100% due to rounding

spectively). Only 12 CDHPs (37.5%) received direct reimbursement from Medicaid, 8 of which felt it was an easy process. Thirteen CDHPs (40.6%) received direct reimbursement from private insurance companies, 9 of which felt it was an easy process. On the other hand, 4 CDHPs (12.5%) "disagreed" or "strongly disagreed" that receiving direct reimbursement from Medicaid or private insurance companies was easy. Seventy-eight percent (n=25) of CDHPs were "not the owner of the collaborative practice," however, 5 of 7 owners "agreed," "moderately agreed" or "strongly agreed" that the income generated exceeded expenses.

Table II: Collaborative Dental Hygiene Services (n=36)[a]

Services	New Mexico		Minnesota	
	n	Percent	n	Percent
Adult Prophylaxis				
None	0	0.00%	6	20.00%
Yes, < 10 patients per week	1	16.70%	4	13.30%
Yes, 11-19 patients per week	2	33.30%	1	3.30%
Yes, 20-29 patients per week	2	33.30%	6	20.00%
Yes, 30-39 patients per week	1	16.70%	8	26.70%
Yes, > 40 patients per week	0	0.00%	5	16.70%
Child Prophylaxis				
None	0	0.00%	4	13.30%
Yes, < 10 patients per week	5	83.30%	20	66.70%
Yes, 11-19 patients per week	1	16.70%	5	16.70%
Yes, 20-29 patients per week	0	0.00%	1	3.30%
Yes, 30-39 patients per week	0	0.00%	0	0.00%
Yes, > 40 patients per week	0	0.00%	0	0.00%
Nonsurgical Periodontal Therapy				
None	0	0.00%	6	20.00%
Yes, < 10 patients per week	5	83.30%	23	76.70%
Yes, 11-19 patients per week	1	16.70%	1	3.30%
Yes, 20-29 patients per week	0	0.00%	0	0.00%
Yes, 30-39 patients per week	0	0.00%	0	0.00%
Yes, > 40 patients per week	0	0.00%	0	0.00%
Periodontal Maintenance Therapy				
No	0	0.00%	6	20.00%
Yes, < 10 patients per week	3	50.00%	14	46.70%
Yes, 11-19 patients per week	3	50.00%	8	26.70%
Yes, 20-29 patients per week	0	0.00%	2	6.70%
Yes, 30-39 patients per week	0	0.00%	0	0.00%
Yes, > 40 patients per week	0	0.00%	0	0.00%
Fluoride				
None	0	0.00%	1	3.30%
Yes, < 10 patients per week	3	50.00%	14	46.70%
Yes, 11-19 patients per week	1	16.70%	12	40.00%
Yes, 20-29 patients per week	1	16.70%	3	10.00%
Yes, 30-39 patients per week	1	16.70%	0	0.00%
Yes, > 40 patients per week	0	0.00%	0	0.00%
Radiographs				
None	1	16.70%	5	16.70%
Yes, < 10 patients per week	1	16.70%	7	23.30%
Yes, 11-19 patients per week	1	16.70%	2	6.70%
Yes, 20-29 patients per week	3	50.00%	8	26.70%
Yes, 30-39 patients per week	0	0.00%	6	20.00%
Yes, > 40 patients per week	0	0.00%	2	6.70%

[a]Total percentages might not equal 100% due to rounding

Results supported the null hypotheses that there was no significant difference between New Mexico and Minnesota CDHPs characteristics, services, models or opinions (p=0.05). However, there was a suggestive difference between states when comparing highest degrees earned by CDHPs (associate's degrees versus bachelor's and higher) as analyzed with the Fisher's Exact test (p=0.063). There was also a suggestive difference between states when comparing the ease of finding a dentist willing to participate collaboratively using the Mann-Whitney U test (p=0.07).

Selected comments about benefits and obstacles were organized by themes (Table V). Improve access to care, autonomy, finances, patient care and interprofessional practice were identified as benefits of CPDH. Obstacles included collaborating dentists, direct reimbursement, employees and facility, financial concerns, patient follow-up care, and mobile equipment. On the other hand, multiple respondents reported no obstacles to CPDH.

Table II: Collaborative Dental Hygiene Services (n=36)[a] (continued)

Services	New Mexico		Minnesota	
	n	Percent	n	Percent
Pit and fissure sealants				
None	1	16.70%	7	23.00%
Yes, < 10 patients per week	5	83.30%	23	76.70%
Yes, 11-19 patients per week	0	0.00%	0	0.00%
Yes, 20-29 patients per week	0	0.00%	0	0.00%
Yes, 30-39 patients per week	0	0.00%	0	0.00%
Yes, > 40 patients per week	0	0.00%	0	0.00%
Patients per Week Having Private Insurance Coverage				
None	0	0.00%	7	23.30%
Yes, < 10 patients per week	2	33.3% 50.0%	10	33.30%
Yes, 11-19 patients per week	3	16.70%	4	13.30%
Yes, 20-29 patients per week	1	0.00%	8	26.70%
Yes, 30-39 patients per week	0	0.00%	1	3.30%
Yes, > 40 patients per week	0		0	0.00%
Patients per Week Having Medicaid Coverage				
None	3	50.00%	1	3.30%
Yes, < 10 patients per week	2	33.30%	16	53.30%
Yes, 11-19 patients per week	1	16.70%	9	30.00%
Yes, 20-29 patients per week	0	0.00%	1	3.30%
Yes, 30-39 patients per week	0	0.00%	2	6.70%
Yes, > 40 patients per week	0	0.00%	1	3.30%
Received Direct Reimbursement from Medicaid				
Yes	1	16.7% 83.3%	10	33.30%
No	5	0.00%	19	63.30%
Did not provide answer	0		1	3.30%
Receive Direct Reimbursement from Private Insurance Companies				
Yes	1	16.70%	9	30.30%
No	5	83.30%	20	67.30%
Did not provide answer	0	0.00%	1	3.30%
Referral of Patients to other Oral Health Care Providers				
Refer patients directly	3	50.00%	8	26.70%
Collaborating dentist(s) refer	30	50.00%	21	70.00%
Did not provide answer	-	0.00%	1	3.30%
Referral of patients for medical consultations				
Refer patients directly to a physician	4	66.70%	9	30.00%
Collaborating dentist(s) refer	2	33.30%	20	66.70%
Did not provide answer	0	0.00%	1	3.30%

[a]Total percentages might not equal 100% due to rounding

Discussion

CDHPs in both states were seasoned, established, experienced clinicians. Therefore, CDHPs appear confident in their knowledge and skills and chose to diversify their model of practice to collaborative care. One possible reason for this change is that CDHPs were concerned about increasing access to oral health care, particularly when compared to concerns about professional autonomy or financial rewards. These results demonstrate that CPDH is a viable alternative model of oral health care intended to increase access to care.

When comparing CDHPs from both states, practitioners in New Mexico tended to hold an advanced degree such as a baccalaureate or masters. New Mexico CDHPs acquired an advanced degree before or while owning and operating a collaborative practice, supporting the idea that CDHPs were confident in pursuing this type of practice. It would be valuable to assess when the advanced degrees were earned to determine if a relationship exists between degree earned and practicing with the collaborative model. Contrary to New Mexico, Minnesota CDHPs did not have the option of owning a collaborative practice, therefore, they might not have felt the need to obtain an advanced degree. Results might have been different if Minnesota law allowed practitioners to own a private practice.

Table III: Collaborative Dental Hygiene Practice Models (n=32)[a]

Models	New Mexico		Minnesota	
	n	(Percent)	n	(Percent)
Health Provider Shortage Area counties served				
none	1	16.70%	6	23.10%
1	1	16.70%	1	3.80%
2	0	0.00%	1	3.80%
3	2	33.30%	0	0.00%
4 or more	1	16.70%	4	15.40%
Unknown	1	16.70%	14	53.80%
Dentists providing services within the collaborative practice				
none	1	16.70%	1	3.80%
1	2	33.30%	2	7.70%
2	0	0.00%	5	19.2%
3	2	33.30%	12	46.2%
4 or more	1	16.70%	6	23.10%
Employment of additional dental hygienists				
No	3	50.00%	5	19.20%
1 hygienist full-time	0	0.00%	2	7.70%
1 hygienist part-time	1	16.70%	1	3.80%
2 hygienists full-time	0	0.00%	7	26.90%
2 hygienists part-time	2	33.30%	3	11.50%
> 3 hygienists full-time	0	0.00%	5	19.20%
> 3 hygienists part-time	0	0.00%	3	11.50%
Employment of additional dental assistants				
No	3	50.00%	5	19.20%
1 dental assistant full-time	2	33.30%	1	3.80%
1 dental assistant part-time	1	16.70%	1	3.80%
2 dental assistants full-time	0	0.00%	0	0.00%
2 dental assistants part-time	0	0.00%	1	3.80%
> 3 dental assistants full-time	0	0.00%	16	61.50%
> 3 dental assistants part-time	0	0.00%	2	7.70%
Employment of additional dental receptionists				
No	3	50.00%	4	15.40%
1 dental receptionist full-time	1	16.70%	1	3.80%
1 dental receptionist part-time	1	16.70%	2	7.7% 23.1%
2 dental receptionists full-time	0	0.00%	6	0.00%
2 dental receptionists part-time	1	16.70%	0	42.30%
> 3 dental receptionists full-time	0	0.00%	11	7.70%
> 3 dental receptionists part-time	0	0.00%	2	
Length of operation				
1 month to 2 years	1	16.70%	1	3.80%
3 to 4 years	1	16.70%	4	15.40%
5 to 6 years	1	16.70%	9	34.60%
7 to 8 years	1	16.70%	4	15.40%
> 8 years	2	33.30%	8	30.80%
Structure of the collaborative practice				
Office-based	3	50.00%	9	34.60%
Institutional-based	2	33.30%	13	50.00%
Mobile-based	1	16.70%	4	15.40%

[a]Total percentages might not equal 100% due to rounding

There appeared to be similarities between CDHPs and other mid-level provider models, such as the ADT and the ADHP, including the earning of advanced degrees to serve the public. With new mid-level provider options becoming available, there might be an increase in the number of CDHPs with advanced degrees in the near future. The aforementioned high number of dental hygienists with special permits points to a growing demand for ADHPs.[9] Young dentists are relying on dental hygienists to perform complex care and dental hygienists desire to expand their knowledge base as

Table IV: Opinions about Collaborative Practice Dental Hygiene (n=32)[a]

Opinions	New Mexico		Minnesota	
	n	(Percent)	n	(Percent)
Patients are generally satisfied with the services I provide.				
Strongly agree	5	83.30%	19	73.10%
Moderately agree	0	0.00%	3	11.50%
Agree	0	0.00%	2	7.70%
Disagree	0	0.00%	0	0.00%
Moderately disagree	0	0.00%	0	0.00%
Strongly disagree	1	16.70%	2	7.70%
Collaborative Dental Hygiene Practice offers me more autonomy.				
Strongly agree	3	50.00%	9	34.60%
Moderately agree	3	50.00%	7	26.90%
Agree	0	0.00%	8	30.80%
Disagree	0	0.00%	1	3.80%
Moderately disagree	0	0.00%	0	0.00%
Strongly disagree	0	0.00%	1	3.80%
Dentist(s) I am in collaboration with are supportive.				
Strongly agree	3	50.00%	19	73.10%
Moderately agree	2	33.30%	4	15.40%
Agree	1	16.70%	2	7.70%
Disagree	0	0.00%	0	0.00%
Moderately disagree	0	0.00%	0	0.00%
Strongly disagree	0	0.00%	1	3.80%
Finding dentists who are willing to participate in collaborative dental hygiene practice has been easy.				
Strongly agree	1	16.70%	15	57.70%
Moderately agree	2	33.00%	2	7.70%
Agree	1	16.70%	8	30.80%
Disagree	0	0.00%	1	3.80%
Moderately disagree	0	0.00%	0	0.00%
Strongly disagree	2	33.30%	0	0.00%
Patients in the collaborative practice follow-up on dentist referrals that I or other dental hygiene practitioners make.				
Strongly agree	1	16.70%	4	15.40%
Moderately agree	2	33.30%	4	15.40%
Agree	3	50.00%	10	38.40%
Disagree	0	0.00%	0	0.00%
Moderately disagree	0	0.00%	0	0.00%
Strongly disagree	0	0.00%	0	0.00%
Unknown	0	0.00%	8	30.80%

[a]Total percentages might not equal 100% due to rounding

well as broaden their career options.[9] Further research is needed to explore the assumptions about relationships between advanced degrees and direct access models.

CDHPs provided a wide variety of services suggesting all permissible services were being delivered. CDHPs performed periodontal therapies on a weekly basis signifying that appropriate care was provided to patients with periodontal diseases. Perhaps the older adult population was receiving these types of services because of the substantial percentage of older adults who have periodontal disease.[18] A good understanding of current trends in periodontitis is important for planning services, studying workforce models and updating educational curricula.[32] In fact, previous studies have shown that 5 to 20% of any population has advanced periodontitis, and a majority of adults have early to moderate periodontitis.[33,34] It is, therefore, paramount that periodontal therapy be delivered in this practice model as well as other alternative models.

Also, CDHPs felt strongly that patients were satisfied with the services provided. Therefore, these findings parallel those of a previous study indicating patient satisfaction with direct access services.[15] Patient safety was not specifically explored in this study, however, the National Governors Association reported that innovative state programs are showing increased use of dental hygienists and evidence indicates these practices are safe and effective.[35] There were no indications in this study that safety was a concern.

Table IV: Opinions about Collaborative Practice Dental Hygiene (n=32)[a] (continued)

Opinions	New Mexico		Minnesota	
	n	(Percent)	n	(Percent)
Receiving direct reimbursement from Medicaid has been easy.				
Strongly agree	0	0.00%	2	7.70%
Moderately agree	0	0.00%	0	0.00%
Agree	0	0.00%	6	23.10%
Disagree	2	33.30%	1	3.80%
Moderately disagree	0	0.00%	0	0.00%
Strongly disagree	0	0.00%	1	3.80%
Do not receive direct reimbursement from Medicaid	4	66.70%	16	61.50%
Receiving direct reimbursement from private insurance companies has been easy.				
Strongly agree	0	0.00%	2	7.70%
Moderately agree	1	16.70%	1	3.80%
Agree	0	0.00%	5	19.20%
Disagree	0	0.00%	0	0.00%
Moderately disagree	0	0.00%	0	0.00%
Strongly disagree	1	16.70%	3	11.50%
Do not receive direct reimbursement from private insurance	4	66.70%	15	57.70%
Becoming a collaborative dental hygiene practitioner was easy.				
Strongly agree	2	33.30%	12	46.20%
Moderately agree	2	33.30%	4	15.40%
Agree	1	16.70%	9	34.60%
Disagree	0	0.00%	1	3.80%
Moderately disagree	1	16.70%	0	0.00%
Strongly disagree	0	0.00%	0	0.00%
As owner of the collaborative dental hygiene practice, the income generated exceeds expenses.				
Strongly agree	1	16.70%	0	0.00%
Moderately agree	0	0.00%	1	3.80%
Agree	2	33.30%	1	3.80%
Disagree	1	16.70%	0	0.00%
Moderately disagree	0	0.00%	0	0.00%
Strongly disagree	0	0.00%	1	3.80%
Not the owner of the collaborative practice	2	33.30%	23	88.50%

[a]Total percentages might not equal 100% due to rounding

It is important to note that oral health services were utilized by patients who had Medicaid coverage. Most CDHPs did not receive direct reimbursement from Medicaid or private insurance companies. These findings imply that receiving reimbursement from the collaborating dentists or from a public health facility is less complicated than receiving it directly from third party payers. Naughton points out that a provider nondiscrimination clause is present in New Mexico and Colorado insurance laws, however, not all third party payers are regulated by state insurance laws.[36] This clause prevents discrimination against any provider who participates in a plan offering dental benefits who is practicing within the legal scope.[36] Further research is needed to determine and overcome barriers in receiving direct reimbursement.

In regards to referrals, CDHPs preferred the collaborating dentist refer patients to other oral health care providers perhaps because of the dentist's role in supporting the collaborative practice. CDHPs "agreed" that patients followed through with referrals to collaborative dentists, however, it was recognized that patients face difficulties with referral compliance due to finances, language barriers and/or lack of transportation. Protocols for maintaining patient records are included in the written collaborative agreement for both states.[10,11] Therefore, referral records were kept and knowledge of patient compliance was assumed adequate. These findings suggest referral protocols were successful, however, future research is needed to study referrals from CDHPs to collaborative dentists in an effort to enhance this transition.

In New Mexico, most CDHPs worked in dental health provider shortage areas. In Minnesota the majority of CPDHs were uncertain if the services provided were within a shortage area. New Mexico CDHPs have the autonomy to expand services into dental health provider shortage areas as evidenced by the finding that half of New Mexico CDHPs provided services to 3 or more dental health provider shortage areas. Minnesota has restrictions on collaborative practice settings and it could be that

Table V: Themes and Representative Quotations from the Open-Ended Questions on Benefits and Obstacles to Collaborative Practice Dental Hygiene (n=28)

Benefits of Collaborative Practice Dental Hygiene		
Themes	New Mexico Responses	Minnesota Responses
Improve access to care	The ability to provide services to the underserved.	Helping a population which would otherwise find it very difficult to access dental care.
	The "feeling" I am helping discover solutions to barriers to care.	Going to schools is the best way to reach this underserved, underinsured or not insured population. It is a captive audience and it is so easy for the children to receive care because they are right there.
Autonomy	Autonomy.	Allowing me to decide if I should take a film, apply fluoride, make recommendations for referrals, etc.
	I manage my own days and hours.	Autonomy, more control over my schedule, and able to see more patients and plan for their needs more effectively.
	I manage my office totally.	-
Financial	The potential to earn more money than when employed.	Using collaborative practice hygienists allows this model of care delivery to be fiscally feasible.
Improved patient care	-	Decision making is time efficient.
		It gives the hygienist responsibilities that otherwise would have to wait until the dentist is available.
Interprofessional Practice	-	Our collaborative practice is in a medical facility. It took many years to build up trust and become integrated with the medical staff.
No benefits	-	Have not seen real benefits to collaborative practice.
Obstacles to Collaborative Dental Hygiene Practice	-	-
Themes	New Mexico Responses	Minnesota Responses
Collaborative dentists	Keeping dentists in the office is difficult.	Getting a collaborative agreement can sometimes be difficult if you do not have a working relationship with a dentist.
Direct reimbursement	Insurance companies need to recognize us as providers.	Not successful at filing the state insurance.
	Medicaid does not allow a hygienist to bill for exams.	Insurance companies not recognizing us as providers.
Employees and facility	Finding qualified employees with a good work ethic!	Finding a place that is operational and staff.
Financial	Creating a sustainable financial business model.	-
Patient Follow-Up Care	Patient compliance with follow up care with a dentist.	Difficult for patients to follow through with referrals because of finances, language barriers, and lack of transportation.
Mobile Equipment	-	The setting up of the mobile office can be heavy work and one has to be careful to not injure oneself. Working in a mobile setting can be hard on the body due to the fact the chairs are not adjustable.
No obstacles	-	I have not experienced obstacles.
		I have not found any yet.

health care facilities or institutions where respondents practiced were not located in dental health provider shortage areas. These data provide an outstanding example of how legislation lifting restrictions for direct access results in expanding services and increasing access to oral health care for unserved and underserved populations. In fact, in 2011 there were about 33.3 million underserved individuals residing in dental health provider shortage areas indicating how great this need is.[36]

Most CPDH models had been in operation for 5 or more years, in fact, nearly one third of CPDH models had been thriving for more than 8 years. These data imply this alternative practice model is financially viable and successful. If CPDH models were not efficacious, one would suspect that CDHPs would not continue to practice. However, 14 of the CDHPs contacted no longer practiced in this manner, therefore, investigating this attrition would be advantageous to the future success of direct access models.

Considering that CDHPs must refer patients to a dentist at least once a year, it is logical to have more than 1 dentist provide services within the collaborative practice model. This option allows the CDHP and the patient to have more than one choice for an oral health care team. Overall, collaborative dentists were supportive of collaborative dental hygiene services, however, one-third of CDHPs in New Mexico "strongly disagreed" that finding a dentist willing to participate was easy. Perhaps this finding relates to the practice setting. Dentists in New Mexico might not be as accepting of this delivery model due to uncertainties surrounding responsibilities, financial concerns and patient care needs. However, results indicated that once the collaborative agreement was established, the dentist was supportive. Conversely, dentists in Minnesota might be more receptive to collaborative practice because CDHPs are not providing services in a private practice setting.

Future outcomes of direct access models could be positively affected by including education about direct access, collaborative practice models, direct reimbursement, practice acts and successful legislation in entry-level dental hygiene program curricula. Direct access states could be studied, various models reviewed, and advantages and disadvantages discussed to aid new graduates in considering this type of model early in their career. In a recent study of 6 Maine Independent Practice Dental Hygienists' (IPDH) it was found they felt underprepared for this type of practice and recommended changes in the undergraduate educational curricula.[37] Changes included having more public health exposure, business skills education, communication background and exposure to alternative practice settings.[37] Also, an elective course for those interested in IPDH was suggested.[37]

Creating optimal laws and regulations determining how and by whom oral health care is provided are essential.[38] In fact, state legislatures should amend existing laws to maximize access including allowing allied dental professionals to use the full extent of their education, work in a variety of settings, while allowing technology-supported remote collaboration and supervision.[38] This charge will be fulfilled through educating the future workforce of dental hygienists in legislative advocacy in addition to the aforementioned curricula suggestions.

With changes being made in the way health care is provided in our country, in particular, the Patient Protection and Affordable Care Act, the future of delivering oral health care services will ultimately change and concerns about access to oral health care providers will become more prevalent.[39] Although there is a lack of agreement about workforce expansion to meet the needs of the underserved and vulnerable populations, advances must be made to do so.[38] Policymakers favor scope of practice expansion for low and mid-level providers as a way to improve access while lowering prices for care.[9]

The first study limitation was nonresponse error (survey fatigue) suggesting that if the participant is frustrated with the process, the survey might not be completed.[40] Selection effects were a potential threat to external validity because all CDHPs in all direct access states were not included in the sample. Also, the small sample size restricted external validity and generalization to the entire population of CDHPs.[40] Reactive effects, or the Hawthorne Effect, was a potential threat to external validity because subjects knew they were participating in a study.[40] Sources of error for online surveys include nonresponse error from people in the sample who would have provided additional answers impacting the results and measurement error where poor wording of questions effects participant's responses.[40] Lastly, potential participants could have lacked computer skills and might not have received the survey due to mislabeling as spam.

Conclusion

It is important to study innovative ways of delivering oral health care to increase access to care for unserved and underserved populations. This study provided a foundation of knowledge for future investigations related to CPDH, practice acts, underserved populations, at risk groups and direct access care. Although CDHPs in New Mexico and Minnesota were very similar in characteristics, services and opinions, due to differences in state laws regarding practice

settings, New Mexico CDHPs were able to provide needed oral health care services in health provider shortage areas. Policy makers should champion less restrictive practice laws increasing access to care for unserved and underserved populations. Results of this study indicated that concerns about collaborative care can be overcome and quality care can be delivered by CDHPs for the welfare of the populations they serve. It seems that CPDH is a viable answer to increasing access to care and is an option for patients who might otherwise go without care.

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