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The *Journal of Dental Hygiene* is the refereed, scientific publication of the American Dental Hygienists' Association. It promotes the publication of original research related to the profession, the education, and the practice of dental hygiene. The Journal supports the development and dissemination of a dental hygiene body of knowledge through scientific inquiry in basic, applied and clinical research.

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Features

EDITORIAL

The Impact of Leadership and Research on Decision Making: Doctoral Degrees in Dental Hygiene – A True Transformation for Dental Hygiene Education

JoAnn R. Gurenlian, RDH, MS, PhD

This next decade is going to be an exciting time for dental hygiene education. While there has been an emphasis on transforming dental hygiene education, the profession is about to witness change the likes of which has never occurred before. Doctoral degree programs in dental hygiene will be developed for the first time in program history in the U.S.

In 2005, the American Dental Hygienists' Association (ADHA) published a document entitled *Dental Hygiene: Focus on Advancing the Profession*.[1] Within this paper, the profession recognized that dental hygiene scholars were needed to lead the development of theory and knowledge unique to the discipline of dental hygiene and that there was a shortage of dental hygiene faculty that was expected to continue into the future. The leaders noted that doctoral preparation of dental hygienists is essential for building the dental hygiene knowledge base for advancing the professionalization process. Further, an aim recommended within this document was to create a doctoral degree program in dental hygiene. Recommendations were to:[1]

- Develop curricular models for both professional (doctor of science in dental hygiene practice) and academic (doctor of philosophy or PhD) doctoral programs in dental hygiene
- Conduct educators' workshops at professional meetings to promote the development of doctoral programs in dental hygiene
- Publish curricular models for doctorate programs

Over the next decade, discussions occurred further supporting the need for doctoral education in dental hygiene,[2-5] workshops were offered establishing interest in creating doctoral programs for dental hygiene,[6] and research has been conducted about this topic.[7] Specifically, Tumath et al surveyed graduate dental hygiene students to assess perceptions of importance in establishing dental hygiene doctoral programs and interest in applying to them.[7] Of the 159 graduate learners responding to the survey, the majority of respondents (77%) indicated that doctoral education in dental hygiene is needed and the establishment of a dental hygiene doctoral degree is important to the profession (89%). Although most respondents supported both a PhD in dental hygiene and the Doctor of Dental Hygiene Practice (DDHP), 38% preferred the PhD program while 62% preferred a DDHP program for themselves. Further, 43% expressed interest in enrolling in a doctoral program in the next one to five years.[7]

Curriculum models for both a PhD Program and entry level doctorate in dental hygiene have been proposed.[8] The PhD program is designed to prepare academicians and researchers to expand the scientific body of knowledge in the dental hygiene discipline, and develop a cadre of leaders capable of impacting health policy to improve access to dental hygiene care. The entry level doctorate concept is designed to prepare graduates to function independently and work collaboratively on inter-professional health care teams. Students will enter the program with a baccalaureate degree and complete a 4-year curriculum with practicum experiences in all 6 roles of the dental hygienist so they are prepared to function in a variety of health care settings to compliment clinical practice.[8] With modification, the entry level doctorate model could serve as the basis for a DDHP program for current dental hygienists seeking a doctoral degree.

In the near future, there are 3 viable options for doctoral education for dental hygiene. The PhD program is already undergoing institutional approval process and could start as early as Fall 2017 pending state board of education approval. Once one program begins, others, including the DDHP and entry level concepts, will follow. As this transformation of dental hygiene education occurs, the profession will change. Theory development will advance, research will broaden, new academicians will be prepared and a higher level of clinicians will be contributing to improving the oral health challenges of the nation. Equally exciting, these graduates will possess four years of education at the graduate level equivalent to other health care professionals. Thus, there no longer will be a need for clinicians to be held to unnecessary supervisory restrictions by another discipline. That is truly a long overdue transformation!

Sincerely,

JoAnn R. Gurenlian, RDH, MS, PhD

References

1. Dental Hygiene. Focus on Advancing the Profession. American Dental Hygienists' Association [Internet]. 2004 [cited 2016 June 8]. Available from: https://www.adha.org/resources-docs/7263_Focus_on_Advancing_Profession.pdf

2. Henson HA, Gurenlian JR, Boyd LD. The doctorate in dental hygiene: has its time come? *Access*. 2008;22(4):10-14.

3. Boyd LD, Henson HA, Gurenlian JR. Vision for the dental hygiene doctoral curriculum. *Access*. 2008;22(6):16-19.

4. Ortega E, Walsh MM. Doctoral dental hygiene education: Insights from a review of nursing literature and program websights. *J Dent Hyg*. 2014;88(1):5-12.

5. Gurenlian JR, Spolarich AE. Advancing the profession through doctoral education. *J Dent Hyg*. 2013;87(Suppl 1):29-32.

6. Gurenlian JR, Spolarich AE. Creating the doctoral degree in dental hygiene. Tampa, Florida: American Dental Education Association Annual Session; 2012.

7. Tumath UG, Walsh M. Perceptions of dental hygiene master's degree learners about dental hygiene doctoral education. *J Dent Hyg*. 2015;89(4):210-218.

8. Gurenlian JR, Rogo EJ, Spolarich AE. The doctoral degree in dental hygiene: Creating new oral healthcare paradigms. *J Evid Base Dent Pract*. 2016 S1:1-6.

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

This study supports the NDHRA priority area, **Health Services Research:** Investigate how alternative models of dental hygiene care delivery can reduce health care inequities.

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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References

1. U.S. Department of Health and Human Services. Oral health in America: A report of the Surgeon General. U.S. Department of Health and Human Services, National Institute of Dental and Craniofacial Research, National Institute of Health. 2000.

2. Borrell LN, Crawford ND. Social disparities in periodontitis among United States adults. *Community Dent Oral Epidemiol*. 2008;36:383-391.

3. U.S. Department of Health and Human Services. A national call to action to promote oral health. [Internet]. 2003 Apr [cited 2013 Aug 2]. Available from: http://www.surgeongeneral.gov/topics/oralhealth/nationalcalltoaction.html

4. Kelly SE, Binkley CJ, Neace WP, Gale BS. Barriers to care-seeking for children's oral health among low-income caregivers. *Am J Public Health*. 2005;95(8):1345-1351.

5. Nash DA, Nagel RJ. Confronting oral health disparities among American Indian/Alaskan native children: The pediatric oral health therapist. *Am J Public Health*. 2005;95(8):1325-1328.

6. Quandt SA, Chen H, Bell RA, Anderson AM, Savoca MR, Kohrman T, Gilbert G, Arcury T. Disparities in oral health status between older adults in a multiethnic rural community: The rural nutrition and oral health study. *J Am Geriatr Soc*. 2009;57(8):1369-1375.

7. American Dental Hygienists' Association. Access to care position paper. [Internet]. 2001 [cited 2015 Apr 21]. Available from: http://www.adha.org/resources-docs/7112_Access_to_Care_Position_Paper.pdf

8. American Dental Hygienists' Association. Direct access states. [Internet]. 2014 [cited 2015 Jan 20]. Available from: http://www.adha.org/resources-docs/7513_Direct_Access_to_Care_from_DH.pdf

9. Rhea M and Bettles C. Dental hygiene at the crossroads of change. American Dental Hygienists' Association. Environmental Scan 2011-2021. [Internet]. [cited 2015 Apr 17]. Available from: http://www.adha.org/resources-docs/7117_ ADHA_ Environmental _Scan.pdf

10. New Mexico Dental Health Care Board. Statutes, rules, and regulations. [Internet]. 2015 Jan [cited 2015 Apr 21]. Available from: http://www.rld.state.nm.us/boards/Dental_Health_Care_Rules_and_Laws.aspx

11. Minnesota Board of Dentistry. Minnesota statutes. [Internet]. 2013 [cited 2015 Apr 21]. Available from: https://www.revisor.mn.gov/statutes/?id=150A.10

12. Astroth DB, Cross-Poline GN. Pilot study of six Colorado dental hygiene independent practices. *J Dent Hyg*. 1998;72(1):13-22.

13. Freed JR, Perry DA, Kushman, JE. Aspects of quality of dental hygiene care in supervised and unsupervised practices. *J Pub Health Dent*. 1997;57(2):68-75.

14. Kushman JE, Perry DA, Freed JR. Practice characteristics of dental hygienists operating independently of dentist supervision. *J Dent Hyg*. 1996;70(5):194-205.

15. Perry DA, Freed JR, Kushman JE. Characteristics of patients seeking care from independent dental hygienist practices. *J Pub Health Dent*. 1997;57(2):76-81.

16. National Institute of Dental and Craniofacial Research. Health disparities roundtable summary. [Internet]. 2014 [cited 2015 Apr 29]. Available from: http://www.nidcr.nih.gov/NewsAndFeatures/Announcements/HealthDisparitiesRoundtable.htm

17. Kelly SE, Binkley CJ, Neace WP, Gale BS. Barriers to care-seeking for children's oral health among low-income caregivers. *Am J Public Health*. 2005;95(8):1345-135.

18. American Academy of Periodontology. Gum disease risk factors. [Internet]. 2013 [cited 2015 Apr 29]. Available from: http://perio.org/consumer/risk-factors

19. Danner V. Oral trends in the US. *Int J Dent Hyg*. 2003;1:78-83.

20. Kaye, HS, Harrington C, LaPlante MP. Long-term care, who gets it, who provides it, who pays, and how much? *Health Affairs*. 2010;29:11-21.

21. Henry J. Kaiser Family Foundation. Dental care professional shortage areas HPSAs. [Internet]. 2014 Apr 28 [cited 2015 May 1]. Available from: http:// www. http://kff.org/other/state-indicator/dental-care-health-professional-shortage-areas-hpsas/

22. Batrell A, Gadbury-Amyot C, Overman P. A qualitative study of limited access permit dental hygienists in Oregon. *J Dent Educ*. 2007;72(3):329-343.

23. American Dental Hygienists' Association. Medicaid direct reimbursement of dental hygienists. [Internet]. [cited 2015 Jan 20]. Available from: http://www.adha.org/reimbursement

24. U.S. Census Bureau. State and county quick facts. New Mexico 2013. [Internet]. 2015 [cited 2015 Apr 29]. Available from: http://quickfacts.census.gov/qfd/states/35000.html

25. New Mexico Department of Health. New Mexico strategic plan 2014-2016. [Internet]. May 2013 [cited 2015 Apr 29]. Available from: http://www.nmhealth.org/publication/view/plan/408

26. New Mexico Board of Dental Health Care. Dental hygienists in collaborative Practice. [Internet]. 2005 Oct [cited 2011 Jan 1] Available from: http://www.rld.state.nm.us/dental/PDF/FAQ/Collaborative%20Practice%20Survey%20Results%20for%20Dental%20Hygienist.pdf

27. U.S. Census Bureau. State and county quick facts. Minnesota 2013. [Internet]. 2015 [cited 2015 Apr 29]. Available from: http://quickfacts.census.gov/qfd/states/27000.html

28. American Dental Hygienists' Association. The history of introducing a new provider in Minnesota. [Internet]. 2014 [cited 2015 Apr 29]. Available from: https://www.adha.org/resources-docs/75113_Minnesota_Story.pdf

29. American Dental Hygienists' Association. The benefits of dental hygiene-based oral health provider models. [Internet]. Jan 2015 [cited 2015 Apr 29] Available from: https://www.adha.org/resources-docs/75112_Hygiene_Based_Workfrce_Models.pdf

30. Shilling L, Dixon J, Knafl K, Grey M, Ives B, Lynn M. Determining content validity of a self-report instrument for adolescents using a heterogeneous expert panel. *Nurs Res*. 2007;56(5):361-366.

31. Merriam SB. Qualitative research: a guide to design and implementation. San Francisco, CA. Jossey-Bass. 2009. 169-207 p.

32. Kassebaum NJ, Bernabe E, Dahiya M, Bhandan Bsan , Murray CJL, Marcenes W. Global burden of severe periodontitis 1990-2010: A systematic review and meta-regression. *J Dent Res*. 2014:93(11):1045-1053.

33. Dye BA. Global periodontal disease epidemiology. *Periodontol 2000*. 2012:58: 10–25.

34. Petersen PE, Ogawa H. The global burden of periodontal disease towards integration with chronic disease, prevention, and control. *Periodontol 2000*. 2012:60:15-19.

35. Dunker A, Krofah E, Isasi F. Nationals Governor Association. The role of dental hygienists in providing access to oral health care. [Internet]. 2014 Jan [cited 2015 Apr 30]. Available from: http:// www.nga.org/files/live/sites/NGA/files/pdf/2014/1401DentalHealthCare.pdf

36. Naughton DK. Expanding oral care opportunities: direct access care provided by dental hygienists in the United States. *J Evid Based Dent Pract*. 2014:14 Suppl:171-82.

37. Vannah CE, McComas M, Taverna M, Hicks B and Wright R. Educational deficiencies recognized by independent practice dental hygienists and their suggestions for change. *J Dent Hyg*. 2014:88:(6):373-379.

38. Institute of Medicine and National Research Council. Improving access to care for vulnerable and underserved populations. The National Academies Press. 1-16. [Internet]. 2013 Mar [cited 2015 Apr 17] Available from: http.// www. hrsa.gov/publichealth/clinical/oralhealth/improvingaccess.pdf

39. U.S. Department of Health and Human Services. The affordable care act, section by section. [Internet]. 2015 [cited 2015 Apr 30]. Available from: http://www.hhs.gov/healthcare/ri5hts/law/

40. Dillman D, Bowker D. The web questionnaire challenge to survey methodologists. In Reips UD, Bosnjak M, ed. Dimensions of internet science. Lengerich, Germany. Pabst Science Publishers. 2001. 159-178 p.

Assessing Dental Hygienists' Communication Techniques for Use with Low Oral Health Literacy Patients

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Abstract

Purpose: This primary aim of this study was to assess communication techniques used with low oral health literacy patients by dental hygienists in rural Wisconsin dental clinics. A secondary aim was to determine the utility of the survey instrument used in this study.

Methods: A mixed methods study consisting of a cross-sectional survey, immediately followed by focus groups, was conducted among dental hygienists in the Marshfield Clinic (Wisconsin) service area. The survey quantified the routine use of 18 communication techniques previously shown to be effective with low oral health literacy patients. Linear regression was used to analyze the association between routine use of each communication technique and several indicator variables, including geographic practice region, oral health literacy familiarity, communication skills training and demographic indicators. Qualitative analyses included code mapping to the 18 communication techniques identified in the survey, and generating new codes based on discussion content.

Results: On average, the 38 study participants routinely used 6.3 communication techniques. Dental hygienists who used an oral health literacy assessment tool reported using significantly more communication techniques compared to those who did not use an oral health literacy assessment tool. Focus group results differed from survey responses as few dental hygienists stated familiarity with the term "oral health literacy." Motivational interviewing techniques and using an integrated electronic medical-dental record were additional communication techniques identified as useful with low oral health literacy patients.

Conclusion: Dental hygienists in this study routinely used approximately one-third of the communication techniques recommended for low oral health literacy patients supporting the need for training on this topic. Based on focus group results, the survey used in this study warrants modification and psychometric testing prior to further use.

Keywords: oral health literacy, communication techniques, dental hygienists

This study supports the NDHRA priority area, **Health Promotion / Disease Prevention:** Assess strategies for effective communication between the dental hygienist and client.

Introduction

Oral diseases remain widespread despite improvements in preventive strategies, and are particularly common among individuals with low socioeconomic status.[1] While multiple factors contribute to oral disease, oral health literacy has gained increased recognition as a strong social determinant of health, reflecting multiple constructs inherent in culture/society, education, and health systems.[2] Oral health literacy is defined as "the degree to which individuals have the capacity to obtain, process, and understand basic health information and services needed to make appropriate oral health decisions."[3] Because health literacy has been identified as a more robust predictor of an individual's health status than demographic factors (e.g., age, income, employment, education, and race/ethnicity),[2] the American Dental Hygienists Association and other national organizations have identified improving patient oral health literacy as a top priority.[1-6]

Noting that oral health literacy is a multifactorial construct, the American Dental Association supports the use of a theoretical framework designed to improve oral health literacy at 3 points of intervention: culture and society, the educational system, and the health system.[4] The health system holds promise as an intervention point for dental providers as there is strong evidence that patients usually identify their dental team as their most trusted source of oral health information.[2,7] Further, recent reports purport that the oral health team bears a significant responsibility to improve oral health literacy in their patients.[8-10] This is noteworthy because effective communication skills of clinical care providers are critical to improving patient health outcomes.[1,7-16] Three recent studies, conducted at the national and state levels, measured dental teams' use of 18 communication techniques shown to be effective with low literacy patients. All 3 studies used a variation of the same survey and reported

limited use of these recommended communication techniques.[8-10]

State and national studies of dental clinicians' communication techniques are helpful in detecting broader trends, but are less relevant at regional or systems levels where, due to organizational differences that affect provider-patient interactions during clinical encounters, oral health improvement interventions are most likely to occur.[15] No published studies to date have examined dental hygienists' communication techniques within an integrated health care system. This is an important research gap to address in order to guide subsequent interventions designed to increase dental hygienists' use of effective communication techniques, particularly for low literacy patients. The primary aim of this study was to assess the routine use of communication techniques recommended for use with low oral health literacy patients by dental hygienists in the Marshfield Clinic Health System and general Marshfield area, as well as to identify indicators of routine use of these communication techniques. The results will determine the need for an intervention for dental hygienists regarding communication techniques used with low literacy patients.

The survey instrument used in this study was adapted from an instrument used in 3 previous studies measuring provider communication techniques with low oral health literacy patients.[10] Although the survey instrument was pilot tested on a large number of individuals, no psychometric test results have been reported on the survey instrument. One method of assessing the validity of a survey (i.e., to assure that the instrument measures what is intended) is to ask participants their thought processes as they answered items immediately after survey completion.[17,18] While a comprehensive psychometric analysis was beyond the scope of this research project, the face validity of questions specific to oral health literacy were of interest. A secondary aim of this study, therefore, was to determine the utility of the survey instrument. To accomplish this aim, focus groups were conducted immediately after administration of the survey.

Methods and Materials

Design and Sample

This study used a mixed methods approach that consisted of a cross-sectional survey followed by focus groups with dental hygienists. Participants were recruited from 8 of 9 dental centers within the Marshfield Clinic Health System and operated by the Family Health Center of Marshfield, Inc., as well as one independent dental center in the city of Marshfield, Wisconsin (not affiliated with Marshfield Clinic). All Marshfield Clinic Health System dental centers are Federally Qualified Health Center (FQHC) clinics that provide subsidized care based on financial need. Eligible individuals for this study were dental hygienists, part-time or full-time, from the total of 9 centers. Study procedures were reviewed and approved by the Marshfield Clinic Institutional Review Board (IRB) and deemed exempt by the University of Minnesota Institutional Review Board.

Recruitment and Procedures

An email invitation was initially sent from the study coordinator to eligible individuals that described study procedures, including the location of the focus group scheduled at each clinic. One day prior to the scheduled focus group, a reminder email invitation was sent to eligible individuals that included an electronic link to the study survey. Where reliable internet connections were unavailable, participants had the option of completing the study survey on paper prior to participating in the focus group. All study data were collected during the first quarter of 2014.

Quantitative Measures

The survey used in this study was adapted from an instrument drafted by the National Advisory Committee on Health Literacy in Dentistry and used in one national[10] and 2 state studies.[8,9] The survey included 18 communication techniques recommended by the American Medical Association as effective for communicating with low literacy patients.[19] Questions were grouped into 2 domains: interpersonal communication (5 techniques) and teach-back (2 techniques). The additional 11 items are techniques shown to be useful to enhance patient communication and were grouped into 3 additional domains: patient-friendly materials and aids (3 techniques), assistance (5 techniques), and patient-friendly practice (3 techniques).[10]

A small representative group of Minnesota and Wisconsin dental hygienists reviewed the survey instrument for face validity. When face validity of survey questions has not been evaluated, researchers cannot be certain that participants understand each item. Concern was expressed that dental hygienists in the study's geographic area may not be familiar with the term "oral health literacy" or with the assessment methods to measure patient oral health literacy referred to in the survey. A pilot survey among a convenience group of practicing dental hygienists in Minnesota and Wisconsin (n=6) confirmed that most were not familiar with these terms. As a result, one question was added that used the term "communication techniques" in place of the term "oral health literacy." In addition, the study added focus groups following survey administration to evaluate the utility of the survey. Specifically, a discussion of several survey questions was used to explore comprehension and trace the social processes that influenced participants' responses.[18] The intent was to determine if additional terms used in the survey needed further

clarification or definition, and if other communication techniques used by dental hygienists were missing from the instrument.

In addition to the communication technique questions, demographic information, questions about oral health literacy familiarity, past communication skills course participation and ascertaining interest in future intervention participation were included.[10] Response options were on a 5-point Likert scale, and each item contained a sub-question on perceived effectiveness of the technique. Based on the scoring methodology designed for the survey, the dependent variable in this study was the average number of routinely used communication techniques.[10] For a given communication technique, "routine use" was operationalized as a response of "most of the time" or "always." The number of routinely used techniques was then summed to create an index score of 0 to 18. Indicator variables included region of practice within the Marshfield Clinic service area (i.e., North, Central or South), age, number of years as a dental hygienist, familiarity with, use of oral health literacy assessment and previous participation in a communication skills course.

Qualitative Measures

The purpose of the focus groups was to determine utility of the current survey. Eight separate focus groups were held at all but one dental clinic (participants at this clinic completed the survey but declined focus group participation). The focus group discussion guide was designed by the principal investigator. Focus groups were conducted by either the principal investigator or the study coordinator, both of whom had prior focus group facilitation experience. An initial training session was held to calibrate adherence to the discussion guide, and both researchers were present at the first focus group to improve subsequent fidelity. Focus groups were 30 to 45 minutes in length and typically included 2 to 8 participating dental hygienists at each clinic. Each session included a brief introduction of procedures and participation guidelines, followed by a series of qualitative, semi-structured questions from the facilitator to guide the discussion. Participants answered freely and responses were audio-video recorded. Focus groups included discussions of the following general topics:

- Dental hygienists' understanding of the terms "oral health literacy" and "motivational interviewing"
- Methods of assessing patient oral health literacy
- Impact of oral health literacy assessment on hygienist's communication techniques
- Other recommended oral health literacy resources that might be helpful, if available

Analyses

All quantitative analytical procedures were conducted with SAS Version 9.3 (Cary, NC). Participant characteristics were reported descriptively. Given the small sample size and exploratory nature of this study, no attempts were made to impute missing variables or conduct multivariable modeling. Univariate linear regression models were created to examine the association between each indicator variable separately and the number of communication techniques used routinely. The number of communication techniques used routinely was modeled as a continuous outcome variable.

Qualitative analyses were conducted with NVivo qualitative data analysis software (QSR International Pty Ltd. Version 10, 2014). Digital audio files were transcribed by an independent firm. The content was mapped to an initial set of codes corresponding to the communication domains represented in the survey (i.e., assistance, interpersonal communication, teach-back, patient-friendly materials and patient-friendly practice).[20] Content emerging from the discussion that could not be mapped to the initial set of codes was assigned new codes with standard definitions created to assure consistency by the researchers. The study team (principal investigator and study coordinator) individually coded each of the 8 transcripts. Each coded transcript was subsequently reviewed by the study team, discrepancies were discussed, and final codes were assigned by consensus.

Results

Survey Findings

Invitations were sent to 40 eligible dental hygienists with 38 (95%) agreeing to participate in the survey and 35 (92%) attending a focus group. Sample characteristics are reported in Table I. All participants were female and the majority were non-Hispanic White with 1 American Indian/Alaskan Native and 2 Asian participants. The mean (±SD) number of communication techniques used routinely was 6.3±2.1 (range 3 to 11). The detail of responses to each item on communication techniques is reported in Table II. Limiting the number of concepts, using simple language, and speaking slowly were techniques used routinely by the majority of respondents. Communication techniques least used were asking patients if they would like a family member or friend involved in the discussion, drawing pictures or using printed illustrations including underlining key points on printed materials, and following-up with patients by telephone or asking office staff to call. The technique that was used least was asking patients how they learn best. Communication techniques that were used more routinely were also generally perceived to be more effective.

As reported in Table III, findings from the regression analyses indicated that geographic practice region and the use of oral health literacy assessments were the only significant indicators of the number of communication techniques used routinely. Specifically, dental hygienists from the Southern region of the Marshfield Clinic service area had the greatest use of communication techniques, with those in the Central and Northern regions using 1.8 (p=0.044) and 1.3 (p=0.1), respectively, fewer techniques on average. In addition, dental hygienists who reported using oral health literacy assessments also used an average of 1.6 (p=0.033) more communication techniques relative to dental hygienists who did not report using oral health literacy assessments. Other indicators had relatively weak associations with communication techniques.

Focus Group Findings

The most frequently used codes and sub-codes were those emerging from the discussions as compared to the initial set of codes mapped to the survey communication domains. Additional codes that arose from the focus group conversations were "motivational interviewing strategies" and "oral health literacy" with associated sub-codes. Motivational interviewing is defined as a "form of collaborative conversation for strengthening a person's own motivation and commitment to change."[21] Dental hygienists in all focus groups indicated routinely assessing patient receptiveness to engaging in a collaborative conversation about oral health behavioral change. These results were coded as "motivational interviewing strategies." A representative quote was, "…as you're talking to them you can find out the things that will motivate them." Participants in all focus groups discussed their reasons for providing oral health instruction to patients regardless of the patient's assessed receptiveness to behavior change. These exchanges were coded as "sense of duty" (i.e., dental hygienist delivers a message she feels is expected of her and part of her job) and "mismatched priorities" (i.e., patient and dental hygienist prioritize oral health differently). A participant quote representative of "sense of duty" was, "I've got to tell you (the patient) this. It's my job." Representative quotes of "mismatched priorities" were:

- "You still talk to them and do it over and over again, and they still come back and say 'I don't brush.' And if you ask why, they say, 'I just don't care.'"
- "And that's what a lot of people say, 'I don't want to be lectured. I don't need that lecture.'"
- "It's not a big deal to them but it's a big deal to us."

The oral health literacy code used the standard oral health literacy definition: "the capacity to obtain, process and understand basic oral health information and services needed to make appropriate health decisions."[1] None of the dental hygienists participating in a focus group expressed familiarity with the term "oral health literacy." A representative answer was, "It just seems self explanatory. I think of it as just making sure that your patients are understanding…but I've never heard…the term 'health literate' or 'oral health literacy.'" Extensive discussions occurred in all focus groups describing the multiple factors affecting patient oral health literacy. These included barriers such as time constraints for either the patient or the dental hygienist, explanations of why patients can't change, or how dental hygienists succeeded at moving patients toward behavioral change.

When asked if the dental hygienists used a health literacy instrument to measure the health literacy of their patients, a representative quote was, "I don't remember what I put (in the survey), but it was like other than questioning them, that's the only thing as far as a tool. It's just using your words."

Of the 5 initial codes representative of the survey communication domains, patient-friendly materials was coded most frequently as dental hygienists stated they routinely used radiographs or other vi-

Table I: Descriptive Characteristics of Study Participants

Characteristics	n=38
Region	
North	14 (37%)
Central	10 (26%)
South	14 (37%)
Age (y)	38.5±8.7
Race	
White	35 (92%)
Non-White	3 (8%)
Hygienist experience (y)	13.6 ±8.0
Familiarity with oral health literacy	
Familiar	18 (47%)
Not familiar	20 (53%)
Use oral health literacy assessment	
Yes	16 (42%)
No	18 (47%)
Unavailable	4 (11%)
Previous communications course	
Yes	8 (21%)
No	29 (76%)
Unavailable	1 (3%)

Values are reported as mean ± standard deviation or frequency count (percent sample).

Table II: Dental Hygienists' Communication Technique Use and Perceived Effectiveness

Domain (Communication technique) n=38	Count (Percentage)					
	Never	Rarely	Occasionally	Most of the Time	Always	Perceived Effectiveness
Interpersonal Communication*						
Present 2 to 3 concepts at a time**	0	1 (3)	2 (5)	26 (68)	8 (21)	20 (54)
Ask patients whether they would like a family member or friend involved in the discussion	5 (13)	13 (34)	17 (45)	3 (8)	0	15 (39)
Draw pictures or use printed illustrations	6 (16)	17 (45)	14 (37)	1 (3)	0	12 (32)
Speak slowly	0	0	7 (18)	26 (68)	5 (13)	26 (68)
Use simple language	0	0	0	15 (39)	23 (61)	32 (84)
Teach-Back Method*						
Ask patients to repeat information or instructions back to you	0	5 (13)	20 (53)	10 (26)	3 (8)	19 (50)
Ask patients to tell you what they will do at home to follow instructions	1 (3)	6 (16)	16 (42)	9 (24)	6 (16)	9 (24)
Patient-Friendly Materials and Aids*						
Use a video or digital video disc	0	27 (71)	4 (11)	5 (13)	2 (5)	5 (13)
Hand out printed materials	0	3 (5)	25 (66)	9 (24)	1 (3)	14 (37)
Use models or radiographs to explain	0	0	9 (24)	23 (61)	6 (16)	34 (90)
Assistance*						
Underline key points on print materials	6 (16)	16 (42)	12 (32)	4 (11)	0	10 (26)
Follow up with patients by telephone to check understanding and adherence	12 (32)	13 (34)	12 (32)	1 (3)	0	11 (26)
Read instructions out loud	1 (3)	13 (34)	6 (16)	13 (34)	5 (13)	16 (42)
Ask office staff to follow up with patients for post care instructions	17 (45)	16 (42)	3 (8)	1 (3)	1 (3)	4 (11)
Write or print out instructions	0	11 (30)	23 (61)	1 (3)	2 (5)	15 (40)
Patient-Friendly Practice*						
Ask patients how they learn best	8 (21)	21 (55)	9 (24)	0	0	10 (26)
Refer patients to the Internet or other sources for information	4 (11)	15 (39)	15 (39)	4 (11)	0	3 (8)
Use a translator or interpreter**	1 (3)	7 (19)	1 (3)	6 (16)	22 (60)	33 (87)

*Basic communication techniques
**n=37

sual materials as a routine communication strategy. The other 4 survey domains including assistance, interpersonal communication, patient-friendly practice and teach back were minimally coded in several, but not in all focus groups.

The last question in the focus group script allowed dental hygienists to comment on additional tools or strategies that they found helpful, as well as those that they would like to implement in their practice. This discussion was robust in all focus groups. One tool mentioned in the majority of focus groups as useful was the integrated electronic medical and dental record (IEMDR). Dental hygienists stated that the IEMDR provided information that supported a holistic approach to oral health education. Patients with chronic disease co-morbidities, such as diabetes and periodontal disease, appeared most receptive to this approach.

Discussion

This study found statistically significant differences in the number of communication strategies used by dental hygienists with low oral health literacy patients in 3 North Central Wisconsin geographic regions. Dental hygienists practicing in the Central region were least likely while those in the South region were most likely to use a variety of communication strategies. No difference was found in dental hygienists reporting familiarity with oral health literacy, but a statistically significant difference in those reporting use of an oral health literacy assessment tool was found. Because focus group results indicated that many dental hygienists did not understand the definitions of either oral health literacy or oral health literacy assessment tools, the researchers are not confident that the survey results accurately measured oral health literacy knowledge.

Compared to other studies using the same survey, dental hygienists in this study used fewer communication strategies compared to Maryland dental hygienists[8] and dentists across the nation.[9,10] The average number of strategies utilized in this study was 6.3 compared to 6.95 for Maryland dental hygienists,[8] 7.9 for Maryland dentists[9] and 7.1 in a national study of dentists.[10] The most frequently used technique by dentists and dental hygienists in the current study was "simple language," with 91% or more of providers reporting routine use of this technique.[14,16] Another consistent result was routine use of models or radiographs with 73 to 77% using this technique, and "reading instructions aloud," which ranged from 46 to 49% across all studies. The least used technique was "asking patients how they learned best," with 0% in this study, and 4.9% in the national study of dentists.[10]

The lower use of communication strategies in this Wisconsin sample may reflect the fact that dental hygienists in this study were less likely to have taken a communication course after graduation (21%) compared to Maryland dental hygienists (66%) and dentists (60%), as well as dentists nationally (27%).[8-10]

Table III: Univariate Linear Regression Models Depicting the Association between Each Indicator Variable and the Number of Communication Techniques Used Among Survey Respondents

Indicator variables	Number of communication techniques used	Model R^2
Region (n=36)		
North Central South	−1.29±0.76, p=0.100 **−1.77**±0.85, p=0.044 ref.	0.13
Age (n=34)	−0.06±0.04, p=0.111	0.08
Dental hygienist experience (n=35)	−0.06±0.04, p=0.199	0.05
Familiarity with oral health literacy (n=36)		
Familiar Not familiar	0.39±0.70, p=0.580 ref.	0.01
Use oral health literacy assessment (n=32)		
Yes No	**1.56**±0.70, p=0.033 ref.	0.14
Previous communications course (n=35)		
Yes No	0.48±0.84, p=0.576 ref.	0.01

Values are reported as point estimate ±standard error, p-value, R2. Positive values indicate more communication techniques used relative to the reference category (or a 1-unit increase for continuous indicators) and negative values indicate less communication techniques used relative to the reference category. Bolded values denote point estimate was significant at $p<0.05$.

Despite fewer than half of survey respondents indicating that they were familiar with the concept of oral health literacy, more detailed focus group discussions suggested that those unfamiliar with the explicit oral health literacy terminology were at least aware of the underlying challenge of low oral health literacy in their patients. Survey results indicated that the majority of hygienists did not assess the oral health literacy level of their patients. Yet focus group results showed that many dental hygienists used an informal approach of asking open-ended questions, as proposed by Schiavo.[14] This approach reflects familiarity with some elements used in motivational interviewing, a communication and counseling approach shown to be effective in helping patients change various health behaviors including oral health.[22-24] Further, the availability and use of an IEMDR that allows hygienists to use this information for targeted education for patients with chronic medical-dental co-morbidities was available to all dental

hygienists in this study. Focus group discussions consistently reflected the value and use of the IEMDR by dental hygienists. As both motivational interviewing and use of electronic medical-dental records in patient education become more widely used in clinical practice, exploring and including these elements for communication in future surveys may provide a more holistic view of contemporary dental and dental hygiene practice. In addition, further coordination and training to record educational and communication strategies used and how they are associated with oral health outcomes is also needed.[25,26] To address our primary aim, we found a lower number of routinely used communication strategies by dental hygienists by geographic region in the North Central Wisconsin service area. These results support the need to design and implement an intervention on effective communication with low oral health literacy patients. In addition, basic information on oral health literacy and oral health literacy assessment should be incorporated into the intervention.

Based on our qualitative focus group findings, survey questions referring to oral health literacy and whether patient oral health literacy is assessed likely require clarification to assure that respondents fully comprehend these terms. A more comprehensive assessment of construct validity for the survey tool would assure that oral health literacy-specific questions will be worded to improve universal understanding. Adding motivational interviewing to the survey as an additional communication strategy would be useful, as motivational interviewing has been shown to be effective with low oral health literacy patients.[27] Goal-setting is an important aspect of motivational interviewing and assessing whether dental hygienists record patient intentions for behavior change and whether stated goals are met would also be helpful in future studies.[21,22] In addition, a relatively new communication medium is using the IEMDR to educate patients about the link between oral and general health, which may be useful in dental practices where it is available. Addressing our secondary aim, the utility of the survey instrument would be improved by making these modifications followed by psychometric testing of the instrument in a representative sample of dental hygienists before further use.[25,26]

Limitations

This study was primarily limited by the small sample size and cross-sectional survey design, which limited the sensitivity to statistically detect some associations and precluded cause-and-effect conclusions. The robust survey response rate was representative of the target population, but cannot be generalized due to the homogeneity of the study setting. Comparative findings from this study suggest there may be substantial regional variation in dental hygienists' use of communication techniques. The self-reported survey tool used in this study has not been validated, thus recall and self-presentation biases are also a threat to validity. Future research should examine more objective markers of the use of oral health literacy communication techniques by dental hygienists (e.g., recording direct interactions with patients) in order to gauge their association with self-reported use of such communication techniques.

Conclusion

Dental hygienists in this study routinely used about one-third of the recommended communication techniques for oral health literacy patients. This result was less than the techniques reported in prior studies of Maryland dental hygienists and dentists nationally. Focus group results indicated that not all survey items were clear and the survey could be updated by adding recent communication techniques related to motivational interviewing and use of an integrated electronic medical-dental record. More research is needed to study the psychometric properties of the survey instrument, to assess the effectiveness of dental hygienist communication techniques on a larger scale, and to determine how communication techniques affect patient behavioral change, and in turn, oral health outcomes.

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References

1. National Institute of Dental and Craniofacial Research, National Institutes of Health, Department of Health and Human Services, U.S. Public Health Service. The invisible barrier: literacy and its relationship to oral health. *J Public Health Dent*. 2005;65(3):179-182.

2. Podschun G. National plan to improve health literacy in dentistry. *Calif Dent Assoc J*. 2012;40(4):317-320.

3. U.S. Department of Health and Human Services. Healthy People 2010: understanding and improving health. U.S. Department of Health and Human Services. 2000.

4. American Dental Association Council on Access Prevention and Interprofessional Relations. Health Literacy in Dentistry Action Plan 2010-2015. American Dental Association. 2009.

5. Horowitz AM, Kleinman DV. Oral health literacy: a pathway to reduce oral health disparities in Maryland. *J Public Health Dent*. 2011;72:S26-S30.

6. American Dental Hygienists' Association. National Dental Hygiene Research Agenda. 2007.

7. Lubalin JS, Harris-Kojetin LD. What Do Consumers Want and Need to Know in Making Health Care Choices? *Med Care Res Rev*. 1999;56(Suppl 1):67–102.

8. Horowitz AM, Clovis JC, Wang MQ, Kleinman DV. Use of recommended communication techniques by Maryland dental hygienists. *J Dent Hyg*. 2013;87(4):212-23.

9. Maybury C, Horowitz AM, Wang MQ, Kleinman DV. Use of communication techniques by Maryland dentists. *J Am Dent Assoc*. 2013;144(12):1386-96.

10. Rozier G, Horowitz A, Podschun G. Dentist-patient communication techniques used in the United States: the results of a national survey. *J Am Dent Assoc*. 2011;142(5):518-530.

11. Agency for Healthcare Research and Qualiity (US). Health literacy interventions and outcomes: an updated systematic review. March 2011.

12. Horowitz AM, Kleinman DV. Oral health literacy: the new imperative to better oral health. *Dental Clin N Am*. 2008;52:333-4.

13. Institute of Medicine Committee on Health Literacy. Health Literacy: A Prescriptio to End Confusion. National Academies Press. 2004.

14. Schiavo JH. Oral health literacy in the dental office: the unrecognized patient risk factor. *J Dent Hyg*. 2011;85(4):248-255.

15. White S, Chen J, Atchison R. Relationship of preventive health practices and health literacy: a national study. *Am J Health Behav.* 2008;32(3):227-242.

16. Lee JY, Divaris K, DeWalt DA, et al. Caregivers' health literacy and gaps in children's Medicaid enrollment: findings from the Carolina Oral Health Literacy Study. *PLoS One*. 2014;9(10):e110178.

17. Fink A. The Survey Handbook. Thousand Oaks, CA: Sage Publications, Inc. 2003.

18. O'Brien K. Improving survey questionnaires through focus groups. In: Morgan D, editor. Successful Focus Groups. Newbury Park, CA: Sage Publications. 1993. 105-136 p.

19. Schwartzberg JG, VanGeest CA, Wolf MS. Communication techniques for patients with low health literacy: a survey of physicians, nurses, pharmacists. *Am J Health Behav*. 2007;(31 Suppl 1):S96-S104.

20. Morgan D. Successful Focus Groups. Newbury Park: Sage Publications. 1993.

21. Rollnick S, Miller W, Butler C. Motivational Interviewing in Health Care: Helping Patients Chage Behavior: Guilford Press. 2007.

22. Martins R, McNeil D. Review of motivational interviewing in promoting health behaviors. *Clinical Psy Rev*. 2009;29:283-93.

23. Weinstein P, Spiekerman C, Milgrom P. Randomized Equivalence Trial of Intensive and Semiannual Applications of Fluoride Varnish in the Primary Dentition. *Caries Res*. 2009;43(6):484-490.

24. VanWormer J, Boucher J. Motivational interviewing and diet modification: a review of the evidence. *Diabetes Ed*. 2004;30:404-416.

25. Asan O, Ye H, Acharya A. Dental providers' and patients' perceptions of the impact of Health Information Technology's in the dental care setting. *J Am Dent Assoc*. 2013;144:1022-1029.

26. Schleyer T, Song M, Gilbert G, et al. Electronic dental record use and clinical information management patterns among practitioner-investigators in the Dental Practice-Based Research Network. *J Am Dent Assoc.* 2013(144):49-58.

27. Weinstein P, Harrison R, Benton T. Motivating mothers to prevent caries: Confirming the beneficial effects of counseling. *J Am Dent Assoc.* 2006;137:789-793.

Views of Dental Providers on Primary Care Coordination at Chairside: A Pilot Study

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Abstract

Purpose: There is a need for research to facilitate the widespread implementation, dissemination and sustained utilization of evidence-based primary care screening, monitoring and care coordination guidelines, thereby increasing the impact of dental hygienists' actions on patients' oral and general health. The aims of this formative study are to explore dental hygienists' and dentists' perspectives regarding the integration of primary care activities into routine dental care, and assess the needs of dental hygienists and dentists regarding primary care coordination activities and use of information technology to obtain clinical information at chairside.

Methods: This qualitative study recruited 10 dental hygienists and 6 dentists from 10 New York City area dental offices with diverse patient mixes and volumes. A New York University faculty dental hygienist conducted semi-structured, in-depth interviews, which were digitally recorded and transcribed verbatim. Data analysis consisted of multilevel coding based on the Consolidated Framework for Implementation Research, resulting in emergent themes with accompanying categories.

Results: The dental hygienists and dentists interviewed as part of this study do not use evidence-based guidelines to screen their patients for primary care sensitive conditions. Overwhelmingly, dental providers believe that tobacco use and poor diet contribute to oral disease, and report using electronic devices at chairside to obtain web-based health information.

Conclusion: Dental hygienists are well positioned to help facilitate greater integration of oral and general health care. Challenges include lack of evidence-based knowledge, coordination between dental hygienists and dentists, and systems-level support, with opportunities for improvement based upon a theory-driven framework.

Keywords: dental hygienist, primary care, interoperability, technology, evidence-based guidelines, chairside screening

This study supports the NDHRA priority area, **Health Services Research:** Evaluate strategies that position and gain recognition of dental hygienists as a primary care providers in the health care delivery system.

Introduction

U.S. national health care reform presents the dental profession with new opportunities to examine its current place and future role in the health care environment. Scope of practice concerns are at the heart of the debate.[1,2] Oral health care providers, notably dental hygienists and dentists, are poised to contribute substantially to innovative service delivery models that stress prevention and integrate primary care with oral health services.[3,4] This designation is critically important given the aging of the U.S. population. Increased numbers of patients with chronic conditions are expected that will benefit from patient-centered, evidence-based screening, monitoring and care coordination.[5] Moreover, as authoritatively documented by the Institute of Medicine, oral health and general health are inextricably linked.[6] Notably, diabetes is a risk factor for periodontal disease and, when poorly controlled, can complicate periodontal treatment outcomes.[7]

According to the U.S. Department of Labor, there were 196,520 licensed dental hygienists and 97,990 general dentists employed in the U.S. in 2014.[8] With 9,960 licensed dental hygienists in New York and 48 active dental hygienists per 100,000 population in 2011, New York is consistent with the national average of 50 dental hygienists per 100,000 population, notwithstanding wide regional variation.[9] The vast majority (95%) of dental hygienists in New York work in private dental offices, underscoring the importance of targeting this setting.[8] Thus, the potential impact of supporting dental hygienists to undertake primary care activities at chairside on the health of both New York and U.S. residents overall is substantial, especially for populations with limited access to primary care providers.

An urgent need exists to expand the primary care workforce, given the considerable increase in patient

volumes now being realized with mandatory insurance provisions that have taken effect under the Patient Protection and Affordable Care Act.[10] Evidence-based approaches to implement dental office system changes that take into account the resource, staffing and time constraints that dental hygienists and dentists face may be one potential mechanism for leveraging oral health providers to conduct primary care activities in dental offices. Evidence-based primary care guidelines are not yet a standard part of dental visits. Yet until care coordination activities between dental and medical providers are closely integrated, the potential of dentists to "scope up," as it were, to become a more active part of the primary care workforce, and "scope down" to dental hygienists certain primary care screening, monitoring and care coordination functions will remain untapped.[2]

The rationale for this study is that dental hygienists want to more actively engage with their patients around the prevention of and screening for diabetes and hypertension. They also seek to gain confidence in providing tobacco cessation services and nutrition counseling. Accordingly, they need simple, evidence-based tools that, with training and technical assistance, they can implement with the time and resources available to them during dental visits.[11-18] The development of a web-based clinical decision support tool for use by dental hygienists at chairside has the potential to augment the primary care workforce, improve screening for primary care sensitive conditions, provide decision support for evidence-based patient management, improve coordination of care through timely referrals, and ensure greater consistency in the delivery of health promotion and disease prevention in dental settings, as per findings in community health centers.[19,20] In essence, a web-based clinical decision support system is an information technology-based system designed to provide expert support to improve clinical decision-making. But to translate into improved patient care outcomes, formative studies are needed of the dental practice environment to adapt the technology to the intended setting.

This is critical, as many adults visit a dental office in a given year, but not a primary health care professional, providing an opportunity to leverage dental providers to meet general health needs.[21] The approximately 196,520 dental hygienists in the U.S. are especially well situated to serve as patient care coordinators and positively influence quality of care, notably for low-income and older adult patients who may require assistance in navigating the health care system. Often interacting with patients during long appointment sessions and over extended periods of time, dental hygienists' education in and knowledge of the oral-general health connection enables them to provide trusted, patient-centered care.[22] Their scope of practice typically involves: taking a comprehensive health history, including medications and therapies; screening for early stages of disease, e.g., taking blood pressure and pulse readings; and assuming a primary role in patients' oral-general health education.

There is a need for research to facilitate the widespread implementation, dissemination and sustained utilization of evidence-based primary care screening, monitoring and care coordination guidelines, thereby increasing the impact of dental hygienists' actions on patients' oral and general health. The aims of the formative study presented here are to explore dental hygienists' and dentists' perspectives regarding the integration of primary care activities and routine dental care, and assess the needs of dental hygienists and dentists regarding primary care coordination activities and use of information technology to obtain clinical information at chairside.

Methods and Materials

Conceptual Framework

The conceptual framework informing this research is the Consolidated Framework for Implementation Research (CFIR).[23] A CFIR technical assistance website is available for individuals considering using the CFIR to evaluate an implementation or design an implementation study.[24] The CFIR provides a menu of constructs that have been associated with effective implementation and can be used in a range of applications.[24] For instance, culture and tension for change are part of the inner setting domain; knowledge and beliefs about the intervention and self-efficacy are part of the characteristics of individuals domain.

Figure 1 presents the 5 major domains of the CFIR. Figure 2 identifies these domains for the research at hand. The figures are necessarily simplifications of complicated implementation processes and the domains involved, and are elaborated elsewhere.[23,24] We elected to be concrete to aid understanding. Hence, the domains depicted in Figure 2 and discussed next are to be interpreted as examples, rather than comprehensive renderings.

This study is centrally focused on the views of dental providers. Nonetheless, improving the health and well-being of patients is the mission of all health care entities, and patient attitudes and characteristics may influence provider behavior.[23] Hence, Figure 1 overtly depicts dental providers working hand-in-hand with patients to enhance primary care coordination at chairside.

Also explicitly included in both Figures 1 and 2 is the process of adaptation. According to Damschroder et al, absent adaptation, interventions are usu-

Figure 1: The 5 Major Domains of the CFIR for a General Implementation Science Scenario

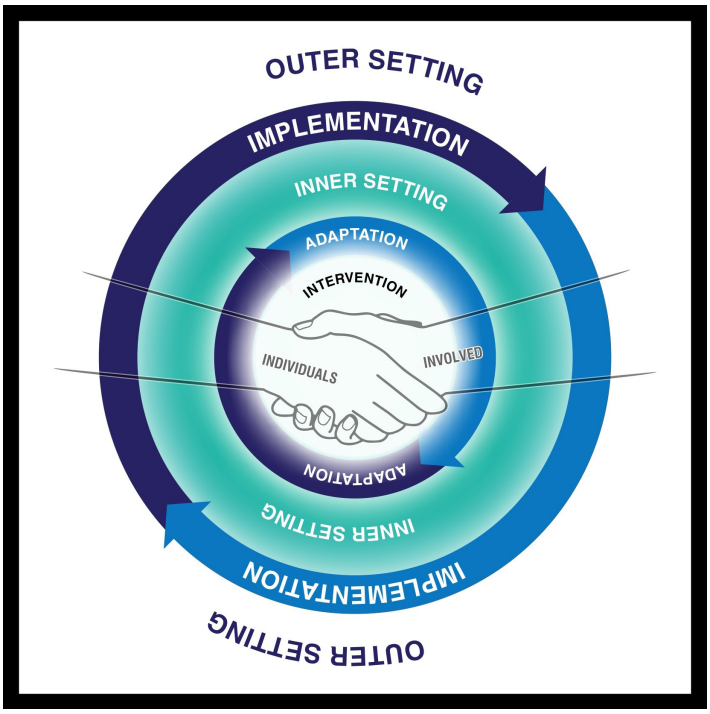
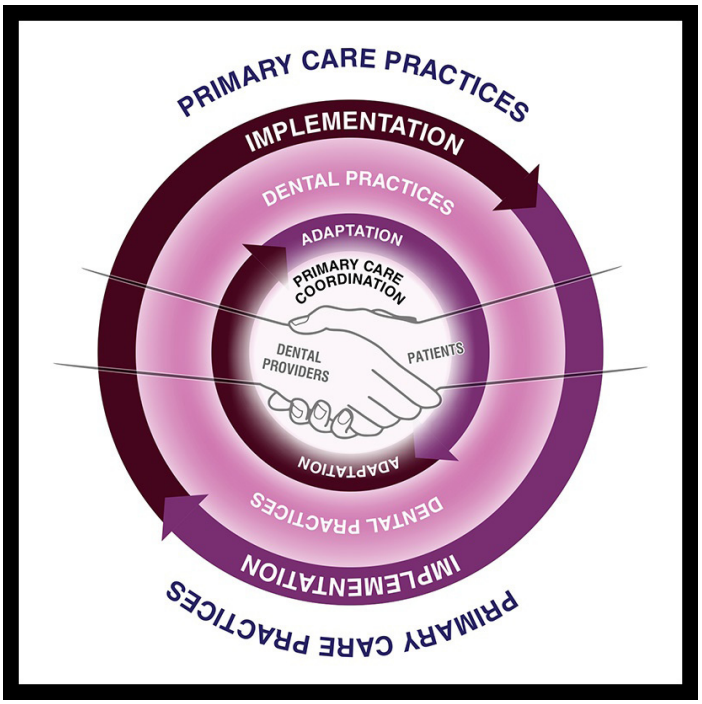


Figure 2: The 5 Major Domains of the CFIR for the Present Study



ally a poor fit for any given setting.[23] Thus, they are often resisted by the individuals who will be affected by the intervention.[23] To address this challenge, the following formative research study was conducted to gain the views of dental providers on primary care coordination at chairside before designing a clinical decision support tool with their active engagement.

Research Design and Informed Consent Procedures

This exploratory pilot study design utilized an innovative and adaptive qualitative approach. The study was descriptive in design and drew on purposive sampling of dental providers within the investigators' networks to examine the perspectives of dental hygienists and dentists regarding the integration of primary care activities into routine dental care.[25] This multi-site study employed maximum variation sampling to recruit dental hygienists (n=10) and dentists (n=6) from heterogeneous New York City area dental offices (n=10) representing diverse patient mixes and volumes, practice types, and neighborhood contexts.

Purposeful sampling of information-rich cases facilitates gaining in-depth knowledge, maximizing variation/heterogeneity of perspectives and experiences of the research topics at hand, and ensuring cross-location comparability and generalizability of the data. Participants were selected to establish a typical sample in order to gain a rich and varied description of dental hygienists' and dentists' experiences of their work environment from informants who were willing to openly discuss these issues.[25]

At the beginning of each interview session, informed consent and Health Insurance Portability and Accountability Act authorization forms were distributed and signed by the participants. These forms assured participants that the information they provided would be kept confidential and explicated the scope, aims, methods and participation conditions of the study. The participants were also informed that they were free to withdraw from the study at any time, and that they would be compensated $50 for their participation.

Key Informant Interviews

A New York University faculty dental hygienist conducted semi-structured, in-depth interviews, which were digitally recorded and transcribed verbatim. Ten interviews were conducted with dental hygienists and 6 interviews were conducted with dentists to ask them their opinions about working with their patients to identify and manage diabetes (high blood sugar), hypertension (high blood pressure), use of tobacco products such as cigarettes and cigars, and problem areas of their diets such as heavy consumption of sugary drinks, all of which may lead to oral health care problems.

The interviewer utilized a topic guide that was comprised of non-directive questions, which sought to elicit accounts or descriptions of standard care dynamics and the potential utility of an electronic clinical decision support tool. The topic guide was

based upon CFIR constructs and refined according to the expert input of the research team and senior advisory board members.[23,24] Items queried included: current practices regarding primary care screening, management, and care coordination activities for diabetes and hypertension; activities conducted and referrals made for smoking cessation and nutrition counseling; the physical environment and social context of the dental offices; patient management services and systems; structural barriers to technology adoption; and perceived and actual challenges to primary care screening at chairside. Each interview lasted from 45 to 60 minutes.

The recorded interviews were then uploaded onto a secure website and transcribed verbatim by a professional firm. Upon receipt, each transcript was read by at least 2 study personnel and every interview digital file was played back in order to increase understanding of the nuances of the research participants' language and meanings and attend more closely to respondents' feelings and views.

Qualitative Analysis

The study team has developed a method of conducting thematic content analysis of qualitative text that allows for the systematic identification of themes present, reveals the relationships among these themes while keeping them in context, and ensures that the codes and their application to the text are valid and reliable.[26-30] ATLAS.ti qualitative data software, version 7, was used as a data management tool to facilitate data retrieval, coding, thematic analysis, memos and displays as part of the analysis.[31]

First, a "start list" of a priori codes (that is, prior to beginning the analysis) was created based on questions and topics from the research instrument. Respective themes were developed by the study team members, who included dental hygienists and dentists, after conducting an in-depth literature review on relevant topics, holding discussions with other oral health professionals (including experts that served as senior advisory board members), and envisioning characteristics and dynamics related to facilitating the greater integration of oral and general health care. As part of the descriptive level of analysis, in vivo codes or indigenous categories were incorporated, which are concepts that use the actual words of the research participants rather than being named by the researchers.[32]

Following the first cycle coding method, or initial coding, focused coding was employed as a second cycle analytic process.[30] Focused coding searches for the most frequent or significant initial codes to develop the most salient categories in the data corpus and requires decisions about which initial codes make the most analytic sense.[29] Each incident in the data is compared with other incidents for similarities and differences. Incidents found to be conceptually similar are grouped together under a higher-level descriptive content. Theoretical coding then assisted in specifying the potential relationships between categories and shifting the analytic narrative toward a CFIR theoretical orientation.[30]

Emergent Themes

Data analysis consisted of multilevel coding, which resulted in emergent themes with accompanying categories. Eight to 10 generalized codes were identified that generally corresponded to the primary domains of the topic guide. Content analysis guided the development, testing and refinement of a coding scheme that enabled systematic identification and conceptual definition of the main themes and subthemes displayed in the transcripts, along with the relationships among the themes. Because the investigators were interested in similarities and differences between the views of dental hygienists and the views of dentists, the number of dental hygienists and the number of dentists who endorsed each theme were totaled separately, and quotes were selected and identified by the individuals involved (dental hygienists or dentists) to both illustrate the theme and present any alternate views.

Results

Study Participant Characteristics

The self-reported characteristics of the dental hygienists and dentists who participated in the key informant interviews, along with salient information about the dental offices where they practice, are provided in Table I. Notably, the dentists interviewed had considerably more years of professional experience than did the dental hygienists interviewed. This also speaks to the eras when these dental practitioners were trained (3 or 4 decades ago for the dentists versus less than a decade ago to 3 decades ago for the dental hygienists). Few dental providers interviewed work in offices that accept Medicaid, and only about one-half work in dental offices that accept private insurance. A range of practice types were represented in the study sample, meaning that the purposive sampling was effective in gaining input from dental providers who work in a variety of dental offices. Finally, all of the participants reported owning smartphones, meaning that they had the technological capability of accessing health information or using a clinical decision support system at chairside.

Qualitative Findings

The main findings of the key informant interviews with dental professionals are summarized in Table II,

Table I: Self-Reported Characteristics of Dental Hygienists and Dentists Who Participated In Key Informant Interviews and the Dental Offices Where They Practice, New York Metropolitan Area, 2013

Characteristic	Dental Hygienists (n=10)		Dentists (n=6)	
	Mean (SD)	Median (Range)	Mean (SD)	Median (Range)
Number of years of professional experience	10.8 (10.8)	6 (2 to 33)	32.8 (5.1)	33.5 (28 to 40)
Number of patients treated daily	11.4 (5.9)	10 (6 to 30)	8.4 (1.0)	8 (7 to 10)
Number of dental professionals per office	6 (3.8)	4 (3 to 16)	6.3 (4.3)	4.5 (4 to 16)
Minutes allotted per patient	46.2 (15.1)	47.5 (17.5 to 60)	-	-
	n (Percent)		n (Percent)	
Accepts Medicaid	2 (20%)		0 (0%)	
Accepts private dental insurance	7 (70%)		3 (50%)	
Group practice*	2 (20%)		2 (33%)	
General practice*	5 (50%)		2 (33%)	
Holistic practice*	1 (10%)		1 (17%)	
Prosthodontics practice*	5 (50%)		2 (33%)	
Owns a smartphone	10 (100%)		6 (100%)	
Owns both a smartphone and a tablet	4 (40%)		3 (50%)	

*More than one type of practice may apply

along with illustrative quotes that support the findings, and alternate view quotes, where applicable.

Screening for Diabetes and Hypertension

At the time the key informant interviews were conducted (2013), screening for diabetes and hypertension was not deemed by the participants to be especially relevant for the dental practices where they worked.

Dental Hygienist: "On a scale from 1 to 10, barely average, because most of our clientele are working professionals who tend to be a little bit more active. Any health situation that they have, they usually have taken advantage of their insurance and had it checking out, so they bring it to our attention gladly."

Nonetheless, there were many alternate views expressed.

Dental Hygienist: "I think it's very important. The patients don't see their doctors usually, so since they see us more we would make a change for them."

Further, the key informants reported that their patients were generally responsive to being offered referrals by them to primary care providers, especially the dentists.

Dentist: "If there's a problem and I see that there might be something that I don't feel comfortable with or that the patient should be address, either somehow they're not feeling good and for some reason that day it seems like it may be an issue and we took their blood pressure and we tell them they better go to see somebody today, yeah, we go ahead and usually have pretty good compliance. Oh, I didn't know that doc, thank you very much. Let me go ahead and see somebody in the next week or so or that day. Yeah, generally, I don't get hassled. Once in a while in the past, I don't know, people might follow-up, not follow-up, but in general, people take our advice. Yeah, yeah."

Other main findings were that the dental providers interviewed do not always encourage testing for patients who have not been screened for diabetes or hypertension, and infrequently see oral disease that they believe is related to diabetes or hypertension.

Dental Hygienist: "Well, I mean I don't have a lot of patients who have diabetes that I know of, but those who have it, it's very relevant. They definitely have oral conditions related to their diabetes."

Even when dental providers examine patients with blood pressures in the hypertensive range, they only counsel them insofar as referring them to see their primary care physicians. All of the dental providers interviewed failed to cite evidence-based guidelines in deciding what blood pressure reading is too high to perform dental treatment.

Dentist: "Yeah. Yes. Yes, there is, and I—but I must admit that I don't routinely screen for high blood pressure either. I would say I'd be very—I'd be concerned about anything systolic of 160 and above."

Table II: Summary of Main Findings of Key Informant Interviews with Dental Professionals, New York Metropolitan Area, 2013

Number of interviews with dental hygienists where finding was endorsed	Number of interviews with dentists where finding was endorsed	Total number of interviews where finding was endorsed
6/10	3/6	9/16
7/10	6/6	13/16
5/10	6/6	11/16
7/10	4/6	11/16
7/10	5/6	12/16
10/10	6/6	16/16
7/10	4/6	11/16
6/10	3/6	9/16
9/10	5/6	14/16
Main finding	Illustrative quotes from hygienists and dentists	Alternate view quotes from hygienists and dentists, where applicable
Screening for diabetes and hypertension is not especially relevant for the dental practices where the participating dental providers work	Dental Hygienist: On a scale from one to ten, barely average, because most of our clientele are working professionals who tend to be a little bit more active. Any health situation that they have, they usually have taken advantage of their insurance and had it checkin' out, so they bring it to our attention gladly. Dentist: I don't generally screen myself. If we were suspect—in other words, if something happened, and it had not initially been reported in a medical history, we would, therefore, maybe have them checked at that point.	Dental Hygienist: I think it's very important. The patients don't see their doctors usually, so since they see us more we would make a change for 'em. Dentist: I think it's very important to do that [screen for hypertension]. Obviously, in our profession, we can't really work on someone who is not stable. It will surface in a sense of lots of factors—stress, anxiety, bleeding, and other factors. It can affect the type of anesthesia we use, of course, in order to still perform that particular procedure that day, so I think it's important to screen for it, yes. Yeah.
Patients were generally responsive to being offered referrals to primary care providers by dental providers	Dental Hygienist: They like that they're being taken care of. Dentist: If there's a problem and I see that there might be something that I don't feel comfortable with or that the patient should be address, either somehow they're not feeling good and for some reason that day it seems like it may be an issue and we took their blood pressure and we tell them they better go to see somebody today, yeah, we go ahead and usually have pretty good compliance. Oh, I didn't know that doc, thank you very much. Let me go ahead and see somebody in the next week or so or that day. Yeah, generally, I don't get hassled. Once in a while in the past, I don't know, people might follow-up, not follow-up, but in general, people take our advice. Yeah, yeah.	Dental Hygienist: Not too happy. Because they think that we are exaggerating. They think that is irrelevant to their dental visit.
Dental providers do not always encourage testing for patients who have not been screened for diabetes or hypertension	Dental Hygienist: I have. Not on a regular basis, but I have especially if there's some kind of oral implication or I get some other kind of cues then I will, but not on a regular basis. Dentist: I guess it depends on the patient's age, sex, risk, again family history. There's a part on there. We don't necessarily encourage it unless there's—we're assuming that they're under medical care and that they're being screened for all that.	Dental Hygienist: Yes. I definitely. Even when they don't have a medical doctor listed, I encourage them to go see somebody at least once a year. If I felt like maybe they were describing some symptoms, then I would say, you know, it would be a good idea to go see your primary care physician.

Table II: Summary of Main Findings of Key Informant Interviews with Dental Professionals, New York Metropolitan Area, 2013 (continued)

Main finding	Illustrative quotes from hygienists and dentists	Alternate view quotes from hygienists and dentists, where applicable
Participating dental providers infrequently see oral disease that they believe is related to diabetes or hypertension	Dental Hygienist: Well, I mean I don't have a lot of patients who have diabetes that I know of, but those who have it, it's very relevant. They definitely have oral conditions related to their diabetes. Dentist: How often do I see hypertension issues, high blood pressure problems, tissue, anxiety, bleeding? Not too often. Not too often do I see someone that has hypertension issues. I don't know. If I threw out a number like, I don't know, I don't know. I'd say about 20, 25 percent off the top of my head. If I look in the chart and see they're hypertensive, that's probably my answer. All right?	Dental Hygienist: I would say often, but because it's related to their medication. I see dry mouth a lot, xerostomia, because of the medication that people are on for diabetes and hypertension. Dentist: Good percentage of the periodontal cases probably have some diabetes or pre-diabetic, anybody over 40, let's say.
Participating dental providers counsel patients in the hypertensive range only insofar as referring them to see their primary care physicians	Dental Hygienist: How I consult? Like I say before if I know they are taking the medication and they still have some problems I can reinforce on the going back to the doctor for changing the medication. Dentist: I don't really counsel them. No. Well again, only if they're uncontrolled. Then I definitely counsel them to see their physicians, but no. Not specific in terms of what they should be doing.	Dental Hygienist: Diet, exercise, have a physical to have it definitely checked by their physician. I counsel them that this needs to be addressed immediately. I make it a matter of urgency. Dentist: Diet. Lifestyle. Diet, lifestyle, and referral.
Participating dental providers do not cite evidence-based guidelines in deciding what blood pressure reading is too high to perform dental treatment	Dental Hygienist: I guess no matter which reading I get, if I felt like anything was over like 140 over 90, I would have to ask my doctor, and she would let me know whether what she felt was okay to treat. In my own opinion? To be honest, I guess I would say like, I mean, 90 is pretty high. I would say like maybe 155 over like 95 or something or a hundred. Something like that would make me really nervous. No. Dentist: Yeah. Yes. Yes, there is, and I—but I must admit that I don't routinely screen for high blood pressure either. I would say I'd be very—I'd be concerned about anything systolic of 160 and above.	
Participating dental providers believe that it is important for their dental colleagues to screen and treat for tobacco use	Dental Hygienist: I'd say pretty important. It's very—smoking brings about many risk factors for health in general, so it's a good idea to. Not if it makes more work for them. [Laughs] Dentist: I think it's, again, if it's any practice, group practice, and I guess we're out there as practitioners, healers, in society, we should continue to spread the word and educate the population that smoking is not good for you and do our best to try to cut it down amongst our whole population in the office that we see.	Dental Hygienist: 'Cause it seems to be something that has to happen outside of the office, and which [sighs]—there's no monetary benefit. Dentist: Some say, "I'd like to try. What do you have to offer?" Others say, "I'm still just gonna keep doing it. Give me some paperwork and stuff," and then they just walk out of the office. I think that most of 'em agree that it's not good for them, but it's difficult to motivate people to try to stop smoking, be it through mechanisms of paperwork, literature, chewing gums, or maybe giving 'em something a little stronger.

Table II: Summary of Main Findings of Key Informant Interviews with Dental Professionals, New York Metropolitan Area, 2013 (continued)

Main finding	Illustrative quotes from hygienists and dentists	Alternate view quotes from hygienists and dentists, where applicable
Participating dental providers often see dental disease that they believe is related to poor diet	Dental Hygienist: I would say often. Not all the time, but I do think that there are some patients that because of their diet they're at a higher risk for caries. If they have any health issues, it just exacerbates like the whole. They're at risk for decay. Dentist: Often. In the college age student, they go off with perfect teeth and come back with all sorts of trouble from late nights with a bottle of Coke and M&M's.	Dental Hygienist: Children will be more of an issue or place where I would see that, but we don't see that many children. Dentist: Not very often, but every once in a while.
Participating dental providers use their phones or other devices at chairside to obtain clinical information related to the care of their patients	Dental Hygienist: WebMD. WebMD and PubMed...But honestly, I use a search engine, and then I go to like a couple different ones to get what I'm looking for. Dentist: I have Hippocrates on my phone to look up drugs, but generally I don't use it much more [than] that.	Dental Hygienist: Not really. I'm a hygienist, 30 years. A hygienist. 30 years, okay? I pretty much go with what I know. [Laughing together] I'm being really honest. If I get stumped, I will Google a word or a topic, but I pretty much go with what I know. Not really, no. Dentist: You know, it's interesting. I don't necessarily go online. I come to the school since we're fortunate to work in a faculty practice I'll go to my colleagues who are oral surgeons or oral medicine. I speak to them direct. I figure I'll go to them direct. They know more than I do...

Screening and Treatment for Tobacco Use

Most of the participating dental providers believe that it is important for their dental colleagues to screen and treat for tobacco use.

Dentist: "I think it's, again, if it's any practice, group practice, and I guess we're out there as practitioners, healers, in society, we should continue to spread the word and educate the population that smoking is not good for you and do our best to try to cut it down amongst our whole population in the office that we see."

Nonetheless, alternate views were expressed, including a sense of fatalism around reimbursement.

Dental Hygienist: "Because it seems to be something that has to happen outside of the office, and which [sighs]—there's no monetary benefit."

Relevance of Diet and Use of Technology

Most of the participating dental providers often see dental disease that they believe is related to poor diet, especially among younger patients.

Dentist: "Often. In the college age student, they go off with perfect teeth and come back with all sorts of trouble from late nights with a bottle of Coke and M&M's."

Importantly, the overwhelming majority of participants use their smart phones or other devices at chairside to obtain clinical information related to the care of their patients.

Dental Hygienist: "WebMD. WebMD and PubMed. But honestly, I use a search engine, and then I go to like a couple different ones to get what I'm looking for."

Findings Relative to the CFIR

The present study focused primarily on the views of dental providers (individuals involved) around primary care coordination at chairside (the intervention), but it also touched on other domains of the CFIR. For instance, dental providers were directly queried about incentives to follow professional guidelines, part of the domain known as the outer setting that includes the construct, external policies and incentives.[23,24] While 2 dental hygienists mentioned receiving incentives for selling certain dental devices or procedures, none of the participants mentioned receiving incentives to follow professional guidelines.

Dental Hygienist: "[Laughs] Can you repeat that? There aren't incentives. It's all patient care oriented. My incentive is that my office is very patient care oriented so I don't have to worry about anything else. I know about what's best for the patient, the patient's gonna get, whether or not they can afford it."

Dentist: "Incentives? Incentives is they keep their job [laughs]. Everybody's got ethical standards. We don't. No. But we do promote wellness as a general holistic rule. But there isn't any specific financial compensation to the hygienist. I'm not averse to that idea, and we've talked about offering different products, including oral cancer screening, which I will often do myself. Right now, the oral cancer screening is usually done by the doctor, and I wouldn't say the hygienists are involved with that. Or some of the other tests."

In addition, there were many office-related challenges that were identified to conducting primary care activities in dental offices, especially by the dental hygienists, which fall under the domain of the inner setting.

Dental Hygienist: "Time is always a challenge in a hygiene appointment. It seems, especially since I'm being taped, this is my thing, that they keep adding more responsibilities in the hygiene department and less time and salary. 'Cause there's a lot that we do because we are the first line of dental health care professional. There's a lot that the doctor expects us to do before the patient gets in his chair, but our focus and specialty is cleaning teeth."

But what came across memorably in the interviews is that dental hygienists possessed values oriented toward patient-centered care, including but not limited to oral health care.

Dental Hygienist: "In my years of hygiene, my patients appreciate the fact that I seem to care. That's what I was taught in hygiene school: that we were the carers or the caregivers. They like when I seem concerned about how they feel, and how their health, and want to talk to them more about taking care of themselves, and not just their teeth."

Discussion

One of the important take-home messages from this formative study is that there are multiple and significant missed opportunities at dental offices to screen, manage and refer patients that might benefit from primary care treatment and/or tobacco use and nutrition counseling. The CFIR (Figure 1) provides a pragmatic structure for approaching the complex, multi-level, and dynamic processes necessary for successfully implementing and adapting primary care coordination at chairside in dental offices, toward improving patient care outcomes.[23]

Another major finding is that dental hygienists are not being supported to provide patient care at the level of their full scope of practice. Self-identified challenges that prohibit dental hygienists from providing their patients with the highest quality standard of care (including screening, monitoring, and care coordination of diabetes and hypertension) include resource constraints, lack of confidence in their knowledge or training, problems with patient compliance and truthfulness, lack of institutional or systems-level support, and perception of these activities as falling within the domains of other health professionals.

Finally, it is noteworthy that all of the participating dental hygienists and dentists reported using electronic devices at chairside to obtain web-based health information in caring for their patients. The use of clinical decision support at chairside is a well-documented approach to increasing provider adherence to guideline-recommended screening, treatment and referral, and may be easily integrated into an electronic dental record.[33] Unfortunately, their effectiveness in improving patient morbidity across clinical settings is only modest, at best.[34]

Still, the dental profession is embarking on a new era with regard to electronic health records.[35] The New York University College of Dentistry recently instituted electronic health records in its dental clinics. It is expected that both dental hygienists and dentists will gain confidence in expanding their scopes of practice to include primary care screening and referral in this setting, and that dissemination of these activities to dental offices will be abetted by this development.

Limitations of this formative study include the targeted recruitment strategy, which was supported by local professional contacts within the social networks of the involved study personnel. Thus, the participants were not necessarily representative of dental professionals in the New York City area overall. For instance, the dentists interviewed had all been practicing for a minimum of 28 years. Further, this pilot research prioritized in-depth qualitative data over a larger sample size, thus limiting the scope of perspectives, experiences, and demographics represented. Finally, the findings presented here represent a narrower account of the key informants' perspectives and experiences that were present in the full data corpus. Nonetheless, the study findings selected for dissemination here may constitute a basis for future systematic research.

In summary, these findings suggest that increasing the role of dental hygienists in primary care coordination at chairside and incorporating evidence-based dentistry into patient care at dental offices will require the commitment of a wide range of individuals in both the inner setting of the involved dental practices and the outer setting of the primary care practices with which they partner (Figure 1). By leveraging the existing workforce that already plays a central role in offering preventive services, patient education and care coordination, dental hygienists may yet play an even more significant role in improving the health and well-being of their patients and the public at large.

Conclusion

Dental hygienists occupy a unique and vital role in providing trusted patient-centered dental care and are well positioned to help facilitate the greater integration of oral and general health care coordination. A theory-driven approach to implementing primary care coordination at chairside holds promise for successfully adapting evidence-based technological interventions to dental offices. Building upon these findings, a web-based clinical decision support system was developed.[36] Funding is being sought to evaluate the developed clinical decision support system with the active engagement of dental hygienists and dentists. This implementation research agenda seeks to support dental hygienists in primary care coordination at chairside, with the ultimate goal of improving patient outcomes.

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References

1. Flieger SP, Doonan MT. Issue Brief. Putting the Mouth Back in the Body: Improving Oral Health Across the Commonwealth. Waltham, MA: Massachusetts Health Policy Forum, 2009.

2. Sparer M. Health reform and the future of dentistry. Am *J Public Health*. 2011;101(10):1841-1844.

3. Glick M. A home away from home: the patient-centered health home. *J Am Dent Assoc*. 2009;140(2):140-142.

4. Lamster IB, Eaves K. A model for dental practice in the 21st century. *Am J Public Health*. 2011;101(10):1825-1830.

5. Northridge ME, Glick M, Metcalf SS, Shelley D. Public health support for the health home model. *Am J Public Health*. 2011;101(10):1818-1820.

6. Institute of Medicine. Improving access to oral health care for vulnerable and underserved populations. Washington, DC: National Academies Press, 2011.

7. Mealey BL, Rose LF. Diabetes mellitus and inflammatory periodontal diseases. *Curr Opin Endocrinol Diabetes Obes*. 2008;15(2):135-141.

8. Bureau of Labor Statistics. Occupational Employment and Wages. US Department of Labor. 2014.

9. Center for Health Workforce Studies. A profile of active dental hygienists in New York. University at Albany School of Public Health. 2011.

10. Patient Protection and Affordable Care Act. Pub. L. No. 111–148, 2010.

11. Amemori M, Virtanen J, Korhonen T, Kinnunen TH, Murtomaa H. Impact of educational intervention on implementation of tobacco counseling among oral health professionals: a cluster-rendomized community trial. *Community Dent Oral Epidemiol*. 2013;41(2):120-129.

12. Bell KP, Phillips C, Paquette DW, Offenbacher S, Wilder RS. Incorporating oral-systemic evidence into patient care: practice behaviors and barriers of North Carolina dental hygienists. *J Dent Hyg*. 2011;85(2):99-113.

13. Bell KP, Phillips C, Paquette DW, Offenbacher S, Wilder RS. Dental hygienists' knowledge and opinions of oral-systemic connections: implications for education. *J Dent Educ*. 2012;76(6):682- 694.

14. Boyd LD, Hartman-Cunningham ML. Survey of diabetes knowledge and practices of dental hygienists. *J Dent Hyg*. 2008;82(5):43.

15. Efurd MG, Bray KK, Mitchell TV, Williams K. Comparing the risk identification and management behaviors between oral health providers for patients with diabetes. *J Dent Hyg*. 2012;86(2):130-140.

16. Hughes CT, Thompson AL, Browning WD. Blood pressure screening practices of a group of dental hygienists: a pilot study. *J Dent Hyg*. 2004;78(4):11.

17. Strauss SM, Singh G, Tuthill J, Brodsky A, Rosedale M, Bytyci A, Drayluk I, Llambini A, Savice K, Russell SL. Periodontal patients' knowledge about diabetes: the importance of dental hygienists' support. *J Dent Hyg*. 2013;87(2):82-99.

18. Swanson Jaecks KM. Current perceptions of the role of dental hygienists in interdisciplinary collaboration. *J Dent Hyg*. 2009;83(2):84-91.

19. Millery M, Shelley D, Wu D, Ferrari P, Tseng TY, Kopal H. Qualitative evaluation to explain success of multifaceted technology-driven hypertension intervention. *Am J Manag Care*. 2011;17(12 Spec No.):SP95-102.

20. Shelley D, Tseng TY, Matthews AG, Wu D, Ferrari P, Cohen A, Millery M, Ogedegbe O, Farrell L, Kopal H. Technology-driven intervention to improve hypertension outcomes in community health centers. *Am J Manag Care*. 2011;17(12 Spec No.):SP103-110.

21. Strauss SM, Alfano MC, Shelley D, Fulmer T. Identifying unaddressed systemic health conditions at dental visits: patients who visited dental practices but not general health care providers in 2008. *Am J Public Health*. 2012;102(2):253-255.

22. Wilder RS. Promotion of oral health: need for interprofessional collaboration. *J Dent Hyg*. 2008;82(2) 2008:13.

23. Damschroder LJ, Aron DC, Keith RE, Kirsh SR, Alexander JA, Lowery JC. Fostering implementation of health services research findings into practice: a consolidated framework for advancing implementation science. *Implement Sc*i. 2009;4:50.

24. CFIR Research Team. CFIR Technical Assistance Website. Center for Clinical Management Research [Internet]. [cited 2011 September 2015]. Available from: http://cfirguide.org/index.html

25. Polit D-F, Beck C-T. Nursing Research: Generating and Assessing Evidence for Nursing Practice, 8th ed. Philadelphia, PA: Lippincott, Williams & Wilkins; 2008.

26. Glaser BG, Strauss A. The Discovery of Grounded Theory. Strategies for Qualitative Research. Chicago, IL: Aldline; 1967.

27. Strauss A, Corbin J. Basics of Qualitative Research: Grounded Theory Procedures and Techniques. California: Sage Publications; 1990.

28. Strauss A, Corbin J. Basic of Qualitative Research: Techniques and Procedures for Developing Grounded Theory, 2nd ed. Thousand Oaks, CA: Sage Publications; 1998.

29. Charmaz K. Grounded Theory: objectivist and constructivist methods. In: Denzin NK, Lincoln YS, eds. Handbook of Qualitative Research, 2nd ed. Thousand Oaks, CA: Sage Publications, 2000, 509–536 p.

30. Charmaz K. Constructing Grounded Theory. A Practical Guide through Qualitative Analysis. London: Sage Publications; 2006.

31. ATLAS.ti, version 7. Qualitative Data Analysis. Berlin, Germany: ATLAS.ti Scientific Software Development GmbH; 2014.

32. Corbin J, Strauss A. Grounded theory research: procedures, canons, and evaluative criteria. *Qual Sociol*. 1990;13(1):3-21.

33. Forrest JL, Miller SA, Miller G. Keeping current: clinical decision support systems. *J Dent Hyg*. 2012;86(1):18-20.

34. Moja L, Kwag KH, Lytras, T, Bertizzolo L, Brandt L, Pecoraro V, Rigon G, Vaona A, Ruggiero F, Mangia M, Iorio A, Kunnamo I, Bonovas S. Effectiveness of computerized decision support systems linked to electronic health records. *Am J Public Health*. 2014;104(12):e12-22.

35. Kalenderian E, Walji M, Ramoni RB. "Meaningful use" of HER in dental school clinics: how to benefit from the U.S. HITECH Act's financial and quality improvement incentives. *J Dent Educ*. 2013;77(4):401-415.

36. Russell SL, Greenblatt AP, Gomes D, Birenz S, Golembeski CA, Shelley D, McGuirk M, Eisenberg E, Northridge ME. Toward implementing primary care at chairside: developing a clinical decision support system for dental hygienists. *J Evid Based Dent Pract.* In press.

An Evaluation of Permit L Local Anesthesia within Dental Hygiene Practice in Massachusetts

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Abstract

Purpose: The purpose of this descriptive study was to assess data pertinent to the Permit L local anesthesia license among practicing dental hygienists in Massachusetts, providing an overview of characteristics, practice behaviors, barriers for obtaining the permit and self-perceived competency.

Methods: A convenience sample of dental hygienists (n=6,167) identified through a publically available data base were invited to participate in a web-based survey. The survey consisted of demographic and Permit L specific questions. Items regarding opinions were rated using a 5-point Likert scale while frequencies and percentiles were used to evaluate demographics and practice-based information. Spearman's Rank correlation was performed to determine association between variables.

Results: A 10% (n=615) response rate was attained with (n=245) non-Permit L holders and (n=370) Permit L holders. Respondents reported significant differences in demographics and opinions between non-Permit L holders and Permit L holders ($p<0.01$) and between those certified through continuing education or curriculum based programs ($p<0.01$). Significant relationships were found in demographics ($p<0.01$) and practice ($p<0.05$) items in relation to the length of time the Permit L has been held. Themes from the data and comments indicate multiple factors influencing obtaining or not obtaining the Permit L.

Conclusion: The results of this study provide an overview of Permit L local anesthesia administration that is generally comparable to previous studies and offers new insights into why some Massachusetts dental hygienists choose not to pursue certification. This study highlights the potential to increase the prevalence of the Permit L, address barriers to pursuing the Permit L, and further evaluate self-perceived barriers.

Keywords: local anesthesia, dental hygienists, continuing education, professional delegation

This study supports the NDHRA priority area, **Professional Education and Development:** Investigate curriculum models for training and certification of competency in specialty areas (e.g., anesthesiology, developmentally disabled, forensics, geriatrics, hospital dental hygiene, oncology, pediatrics, periodontology, and public health).

Introduction

It is widely known that dental hygienists can be effectively taught expanded functions and those functions can be delivered effectively and safely.[1] During1972 to 1974, the Forsyth Experiment code named "Project Rotunda," gathered data demonstrating safety and efficacy of dental hygienist administered local anesthesia. A total of 19,173 local anesthetic administrations were given during the project with only 3 minor short-term adverse reactions and a 92% first attempt success rate.[2]

The body of literature relating to the administration of local anesthesia by dental hygienists is lacking in more recent studies. Early studies were aimed at evaluating the safety and efficacy of dental hygiene administered local anesthesia along with use, impact, and provider and dentist perceptions. In 1992, Cross-Poline et al conducted a survey of Colorado dental hygienists who completed a continuing education course in local anesthesia administration.[3] Levels of education were reported as 8% certificate, 45% Associate, and 45% Bachelor degrees with 76% in general practice and 17% in a periodontal practice. In a self-reported post course questionnaire 88% (n=96) were administering local anesthesia as needed for patient care and the remaining 12% (n=12) stated reasons for not administering including; employer resistance, patient resistance, and practice type.[3]

In 2000, DeAngelis and Goral reported the results of a quantitative survey designed to assess Arkansas dental hygienists' use of local anesthesia.[4] Certification was held by 97% for at least 1 year, and of those, 92% were in general practice and 7% in periodontal practice. Levels of education were reported as 8% certificate, 23% Associates, 67% Bachelors and 2% Master's degrees. Delegation of local anesthesia for dental hygiene procedures was reported at 94% (n=109) and 68%

(n=109) for dental procedures. When the dental hygienists were asked their opinion regarding the statement, "Local anesthesia is not needed for dental hygiene procedures," 90% (n=284) of those certified either disagreed or strongly disagreed. A significant correlation ($p<0.001$) was found when the same question was asked of those with and without certification.[4]

Anderson evaluated use of local anesthesia by dental hygienists who completed continuing education course in Minnesota during 1996.[5] The self-reported data revealed a 95% delegation rate for dental hygiene procedures and a 65% delegation rate for the dentist' patients with 89.6% (n=242) in general practice and 7.8% (n=21) in periodontal practice. Associate degrees were held by 90% (n=204) and Bachelor degrees by 9% (n=25) with no significant relationship between educational level and successful injections ($p=0.87$). The value of local anesthesia administration in practice was reported as very valuable by 58%, and 87% believed the skill would have value when seeking employment. Success was measured by achieving adequate anesthesia, and rates of 90 to 100% were reported by 76% with no significant relationship between years since graduation and level of success ($p=0.24$). The most frequently reported complication was hematoma by 5.9% (n=16) with 87.8% (n=239) reporting no complications and 86% aspirate all the time.[5]

In a 2005 survey by Schofield et al, information was requested from state licensing boards (n=26) regarding disciplinary actions against dental hygienists involving the administration of local anesthesia.[6] The number of disciplinary actions against dental hygienists involving the administration of local anesthetics reported by all participating state licensing boards (n=18) was zero.[6]

In 2011, Boynes et al conducted a randomized nationwide survey of dental hygienists (n=1,200) evaluating dental hygiene local anesthesia education and administration.[7] The results reveal 86.4% (n=431) dental hygienists perceived a need for local anesthesia for dental hygiene procedures with 76.1% in general practice, 7.8% periodontal practice and 8.4% in an academic setting. Of those administering local anesthetics, 67.3% were trained in a curriculum-based program and 32.3% in a continuing education program.[7] The study established 5 regions in the U.S. to evaluate local anesthesia use. Region 5 included the western states of Alaska, Arizona, California, Hawaii, Idaho, Nevada, Oregon, Utah and Washington. This region reported 93.8% of dental hygienists administer local anesthesia and 61% also administered anesthesia to the dentist's patients. Region 1 consisting of the northeastern states of Connecticut, Delaware, Massachusetts, Maryland, Maine, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island and Vermont reported 32.1% of dental hygienists administering and 30.4% administering for the dentists' patients.[7] The mean year of implementation of dental hygiene administered local anesthesia for region 5 is 1978 and 2003 for region 1.

Despite the findings of several studies demonstrating safety and efficacy of dental hygiene administered local anesthesia,[3-5,8] Massachusetts remained behind the majority of states in legalizing the practice. Washington State was the first to pass legislation allowing the administration of local anesthetics by a dental hygienist in 1971, followed by New Mexico in 1972 and the majority of states west of the Mississippi River by the late 1990s.[9] It was not until 2004 that Massachusetts approved dental hygiene administered local anesthesia under direct supervision via the Permit L local anesthesia license.[9] The Permit L local anesthesia license allows dental hygienists to administer local anesthesia by nerve block and infiltration and is obtained after successful completion of a continuing education or curriculum-based training course. A minimum of 35 hours of instruction including no less than 12 clinical hours are required to satisfy the requirements set forth by the Massachusetts Board of Registration in Dentistry.[10]

To date, there has not been a statewide evaluation of the Permit L except for a single local anesthesia question posed in the 2007 "A Report on the Commonwealth's Dental Hygiene Workforce."[11] This survey revealed 12% (n=381) of dental hygienists are Permit L holders. Of the non-Permit L holders (n=4,114) 64.4% (n=2,650) reported they did not intend to become certified. The main reasons cited were lack of interest (32.9%, n=871), increased liability (28.2%, n=747), no monetary compensation (14.1%, n=373), cost (13.4%, n=355) and fear (11.5%, n=304).[9] As Massachusetts is a latecomer to the national local anesthesia arena and after practicing for so long without the Permit L, an evaluation of the perceived barriers and motivating factors surrounding obtaining or not obtaining the Permit L will provide insight into its impact.

The purpose of this study was to gather data pertinent to Permit L practice among dental hygienists in Massachusetts providing an overview of the characteristics of Permit L holders and indicate self-perceived barriers to obtaining the Permit L. This study assessed 2 research questions:

1. What are the characteristics of Permit L holders in Massachusetts?
2. What are the self-perceived barriers to pursuing the Permit L?

Methods and Materials

Research Design

This cross-sectional, one point in time, descriptive web-based survey research evaluated Permit L and non-Permit L holding dental hygienists in Massachusetts. The survey was designed to include only those dental hygienists who were currently practicing in Massachusetts and residing in Massachusetts, Connecticut, New Hampshire or Rhode Island, and further identified 3 independent variables: those with and without the Permit L. Those who did have the Permit L were separated by type of Permit L training program they attended; either continuing education-based or curriculum-based. The survey administered to non-Permit L holders consisted of 6 demographic questions and 12 Permit L specific questions. Four of the 12 questions that requested opinions were rated using a 5-point Likert scale. After identifying which Permit L training program they attended the Permit L holders were asked 20 questions related to the Permit L, 5 of which were rated using a 5-point Likert scale. Based upon the literature,[12,13] content validity indexes were obtained from a panel of 6 experts to ensure content validity of the survey instrument. An S-CVI score of 0.87 was obtained for non-Permit L holder questions and 0.8 was obtained for the Permit L holder questions. The study received IRB approval with an exempt status from Human Subject Committee of MCPHS University.

Sample Inclusion/Exclusion Criteria

All dental hygienists who were registered in Massachusetts and residing in Massachusetts, Connecticut, New Hampshire or Rhode Island at the time of the survey were invited to participate (n=6,167). The mailing addresses were obtained from the Massachusetts Board of Registration in Dentistry via a publically available database. The inclusion criteria to participate were: currently practicing hygienists in Massachusetts and, if a current Permit L holder, training at an accredited program in Massachusetts. The total number of Permit L holders registered in Massachusetts and residing in the aforementioned states (n=2,180) represented 35% of the potential sample of permit L holders.

Data Collection

A postcard invitation to participate in the web-based survey was mailed to all dental hygienists (n=6,167) in September 2013. Concurrently, an invitation was posted on the Massachusetts Dental Hygienists' Association (MDHA) website and participants were recruited in-person at the MDHA annual session. A blast e-mail was delivered by MDHA with a follow-up e-mail reminder three weeks later.

Data Analyses

Data were collected on-line via SurveyMonkey®, downloaded as Excel spreadsheets and imported into STATA® version 12 statistical analysis software. Descriptive data summarized demographic characteristics and Likert-scaled questions. Spearman's Rank correlation testing was used to determine association between variables and the level of significance for all data analyses was set at <0.05.

Results

Demographics

An overall response rate of 10% (n=615) was attained with 245 non-Permit L holders and 370 Permit L holders. The non-Permit L holding responders (n=245) represented 6.1% of the 3,987 non-Permit L holders and the Permit L holding responders (n=370) represented 16.9% of the 2,180 Permit L holders currently licensed in Massachusetts and residing in Massachusetts, Connecticut, New Hampshire or Rhode Island. The majority in both categories were female (98%), the Permit L holders were generally younger with 61% (n=227) aged 45 or under and 87% (n=212) of non-Permit L holders were aged 41 or over. The number of years in practice was fairly evenly distributed except for those who had been in practice for 1 to 5 years accounting for 20% (n=121) of the respondents of which 90% (n=109) were Permit L holders. Thirty-seven percent (n=135) of Permit L holders anticipated being in practice longer than 20 years compared to 15.7% (n=39) non-Permit L holders. Associate degree holders were more prevalent in the non-Permit L holder category (70%) while Bachelor (38%) and Master (14%) degrees were more prevalent in the Permit L holder category. Most (67%) worked in general practice, and of those stating an academic work setting 93% (n=41) were Permit L holders. Other practice types reported (n=50) included multi-specialty, oral surgery, hospital/rehab, community health center, and corporate settings. Demographic data are reported in Table I.

Opinions and Descriptive Data of Non-Permit L Holders

Table II shows the descriptive data for non-Permit L holders. The vast majority (99.5%) of the non-Permit L holders reported the Permit L was not a condition of employment, and 79% (n=172) were not planning to become certified. The main reasons for not becoming certified were: not needed in type of practice (17.5%), not planning to stay in practice long enough to use (14.5%), fear of administering local anesthetics (14%), cost (12.25%) and no financial gain (13%). Employer resistance and

no value in practice ranked lowest at 2.25% (n=4) each. Dominant themes from the comments (n=21) provided in relation to not becoming certified were related to the aforementioned reasons. Of those planning to take the certification course (n=45), 53% (n=25) cited staying competitive in the job market, and 40.5% (n=19) cited self-improvement as the reason. The primary reason for not obtaining the Permit L after taking a certification course was waiting beyond the 2 year deadline (38%) and other reasons (n=6), such as not wanting the liability and letting the Permit L lapse. When asked if their employers would allow them to administer local anesthetics if they obtained the Permit L, 59.5% (n=143) strongly agreed/agreed. In regards to self-perceived ability 77% (n=188) strongly agreed/agreed with the statement, "I feel as though I would be able to complete the certification course, pass the NERB exam and obtain the Permit L." Table III shows the Likert-scaled opinions of non-Permit L holders.

Opinions and Descriptive Data of Permit L Holders

Descriptive data for Permit L holders are shown in Tables IV and V. The Permit L as a condition of employment was reported by 22% (n=80), and 42% (n=153) reported holding the Permit L longer than 5 years, of which 65% (n=100) attended a continuing education-based program. Although 72% (n=263) were administering local anesthetics, 28% (n=104)

Table I: Demographics of Dental Hygienists Practicing in Massachusetts

	Non-Permit L Holders (0)	Permit L Holders (0)	Total
	n (Percent)	n (Percent)	n (Percent)
Gender			
Female	244 (99%)	361 (97.5%)	605 (98%)
Male	1 (<1%)	9 (2.5%)	10 (2%)
Age			
<21	0 (0%)	1 (0.25%)	1 (0.25%)
21 to 25	0 (0%)	36 (9.75%)	36 (6%)
26 to 30	13 (5%)	47 (12.5%)	60 (9.75%)
31 to 35	9 (3.5%)	52 (14%)	61 (10%)
36 to 40	11 (4.5%)	40 (11%)	51 (8%)
41 to 45	25 (10%)	51 (13.75%)	76 (12%)
46 to 50	46 (19%)	50 (13.5%)	96 (15.5%)
51 to 55	55 (22.5%)	47 (12.75%)	102 (16.5%)
56 to 60	53 (22%)	26 (7%)	79 (13%)
61 to 65	26 (10.5%)	11 (3%)	37 (6%)
>66	7 (3%)	9 (2.5%)	16 (3%)
Years in practice			
<1	0 (0%)	21 (6%)	21 (3.5%)
1 to 5	12 (5%)	109 (29%)	121 (20%)
6 to 10	21 (9%)	69 (19%)	90 (15%)
11 to 15	20 (8%)	34 (9%)	54 (9%)
16 to 20	18 (7.5%)	22 (6%)	40 (6%)
21 to 25	33 (14%)	31 (8%)	64 (10.5%)
26 to 30	28 (11.5%)	28 (7.5%)	56 (9%)
31 to 35	41 (17%)	26 (7%)	67 (11%)
36 to 40	47 (19%)	20 (5.5%)	67 (11%)
>40	22 (9%)	10 (3%)	32 (5%)
Anticipated number of years remaining in practice			
<1	3 (1.25%)	3 (1%)	6 (1%)
1 to 5	49 (20%)	36 (10%)	85 (14%)
6 to 10	57 (23%)	63 (17%)	120 (19.5%)
11 to 15	63 (26%)	61 (16%)	124 (20%)
16 to 20	34 (14%)	70 (19%)	104 (17%)
21 to 25	23 (9.25%)	32 (9%)	55 (9%)
26 to 30	7 (3%)	44 (12%)	51 (8%)
31 to 35	4 (1.5%)	29 (8%)	33 (5.5%)
36 to 40	4 (1.5%)	20 (5%)	24 (4%)
>40	1 (0.5%)	10 (3%)	11 (2%)
Highest level of education			
Associates'	171 (70%)	177 (48%)	348 (57%)
Bachelors'	58 (23.5%)	139 (38%)	197 (32%)
Masters'	14 (6%)	52 (14%)	66 (10.75%)
PhD	1 (0.5%)	0 (0%)	1 (0.25%)
Type of practice			
General	173 (70.5%)	236 (64%)	409 (67%)
Academic	3 (1%)	41 (11%)	44 (7%)
Periodontal	12 (5%)	26 (7%)	38 (6%)
Public health	6 (2.5%)	18 (5%)	24 (4%)
Pedodontic	13 (5.5%)	12 (3.25%)	25 (4%)
Prosthodontic	5 (2%)	7 (2%)	12 (2%)
PHDH	7 (3%)	5 (1.25%)	12 (2%)
Other	26 (10.5%)	24 (6.5%)	50 (8%)

were not administering local anesthetics with 37% (n=38) of those reporting administration was not needed in the type of practice where they were employed. Other reasons for not administering (n=29) included: not practicing under direct supervision, working in an academic setting, lack of opportunity and practice policy. Delegation of local anesthesia by the supervising dentist was reported at 85% (n=305) for dental hygiene procedures and 42% (n=150) for operative or surgical procedures. The types of injections administered were generally distributed evenly except for the greater palatine, nasopalatine, and infraorbital. Other injection types (n=18) included anterior middle superior alveolar nerve block, Gow-Gates and papillary. A successful injection was defined as one that achieves the desired level of anesthesia on the first attempt with 68.5% (n=197) reporting success rates of 95 to 100%. No local or systemic patient complications were reported by 81% (n=241) with tachycardia the most frequently reported complication at 6% (n=18). Other complications (n=13) included patient anxiety, trismus, nausea, trauma or hematoma localized to the injection site, and numbness of the mandible after a posterior superior alveolar injection. Frequency of aspiration prior to deposition of local anesthetics was reported to be 100% by 79% (n=229). Safe needle recapping using a single hand technique or recapping device was used by 94% (n=282), and incidence of percutaneous needle sticks was zero for 87% (n=260). Needle breakage was experienced by 1% (n=4) and formal complaints to the Board of Registration in Dentistry were reported by 2.5% (n=9).

The self-perceived opinions of the Permit L holders are shown in Table VI with similar results reported between the 2 educational forums. Among the Permit L holders, 84% (n=310) strongly agreed/agreed the Permit L was valuable when seeking employment, and 88% (n=322) strongly agreed/agreed the Permit L was valuable in practice. Local anesthesia as necessary for non-surgical periodontal therapy (NSPT) was strongly agreed/agreed to by 97% (n=356), and 81% (n=290) strongly agreed/agreed they felt competent in their local anesthesia administration. The type of educational program attended for training adequately prepared most with 89% (n=322) strongly agreeing or agreeing.

Table II: Descriptive Statistics of Non-Permit L Holders

	n (Percent)
Was the Permit L a condition of employment?	
Yes	1 (0.5%)
No	242 (99.5%)
Have you taken the Permit L course?	
Yes	26 (11%)
No	219 (89%)
What type of course did you take?	
Curriculum based	14 (54%)
Continuing education based	10 (38%)
Both	2 (8%)
Have you taken the NERB exam?	
Yes	8 (34%)
No	16 (67%)
If you have taken the certification course and do not have the Permit L, what is your primary reason?	
Waited too long	10 (38%)
In application process	6 (23%)
Failed NERB exam	2 (8%)
Employer resistance	1 (4%)
Did not need	1 (4%)
Other	6 (23%)
Are you planning to take the certification course?	
Yes	45 (21%)
No	172 (79%)
If you are planning to take the certification course, what is your primary reason?	
Stay competitive in the job market	25 (53%)
Self improvement	19 (40.5%)
Current employment requirement	1 (2%)
Other	2 (4.5%)
If you are not planning to take the certification course, what is your primary reason?	
Not needed in type of practice	30 (17.5%)
Not planning to stay in practice long enough	25 (14.5%)
Fear of administering local anesthetics	24 (14%)
No financial gain	23 (13%)
Cost	21 (12.25%)
Increased liability	12 (7%)
Too long out of school	8 (5%)
Employer resistance	4 (2.25%)
No value in practice	4 (2.25%)
Other	21 (12.25%)

Correlations

Spearman's Rho correlations used to assess relationships between demographics, practices, and opinions are shown in Tables VII to IX. Significant relationships were found between demographics and opinions of non-Permit L holders and Permit L holders. The Permit L holders are likely to be: younger ($p<0.01$), have been in practice for fewer years ($p<0.01$) and have more years remaining in practice ($p<0.01$). They are also more likely to agree than disagree that local anesthesia is necessary for some dental hygiene procedures ($p<0.01$)

Table III: Opinions of Non-Permit L Holders

		SA	A	U	D	SD
	n	n (Percent)	n (Percent)	n (Percent)	n (Percent)	n (Percent)
The Permit L is valuable in practice	245	42 (17%)	98 (40%)	65 (26.5%)	33 (13.5%)	7 (3%)
Local anesthesia is necessary for some procedures such as NSPT	245	104 (42.5%)	107 (43.5%)	14 (6%)	14 (6%)	6 (2%)
My supervising dentist would allow me to administer local anesthetics if I obtained the Permit L	241	64 (26.5%)	79 (33%)	53 (22%)	30 (12.5%)	15 (6%)
I feel as though I would be able to complete the certification course, pass the NERB exam and obtain the Permit L	244	87 (36%)	101 (41%)	38 (16%)	15 (6%)	3 (1%)

Likert Scale used: 1=Strongly Agree (SA), 2=Agree (A), 3=Undecided (U), 4=Disagree (D), 5=Strongly Disagree (SD)

Table IV: Descriptive Statistics of Curriculum(1) and Continuing Education (2) Based Permit L Holders

	CU Based	CE Based	Total
	n (Percent)	n (Percent)	n (Percent)
How long have you held the Permit L?			
<1 year	18 (10%)	9 (5%)	27 (7%)
1 to 3 years	74 (41.5%)	42 (22%)	116 (31.5%)
4 to 5 years	33 (18.5%)	39 (20.5%)	72 (19.5%)
>5 years	53 (30%)	100 (52.5%)	153 (42%)
Was the Permit L a condition of employment?			
Yes	39 (22%)	41 (22%)	80 (22%)
No	138 (78%)	149 (78%)	287 (78%)
On average, how often are you administering local anesthetics?			
At least once a day	23 (13%)	20 (10.5%)	43 (12%)
1 to 3 times a week	42 (24%)	63 (33%)	105 (29%)
4 to 6 times a month	54 (30%)	61 (32.5%)	115 (31%)
Not administering	59 (33%)	45 (24%)	104 (28%)
If you are not currently administering, what is your primary reason?			
Not needed in type of practice	25 (43%)	13 (28%)	38 (37%)
Do not feel confident	8 (14%)	6 (13%)	14 (13%)
Employer resistance	13 (22%)	10 (22%)	23 (22%)
Other	12 (21%)	17 (37%)	29 (28%)
Does your supervising dentist delegate local anesthesia for dental hygiene procedures?			
Yes	143 (82%)	162 (87.5%)	305 (85%)
No	31 (18%)	23 (12.5%)	54 (15%)
Does your supervising dentist delegate local anesthesia for operative or surgical procedures?			
Yes	68 (39%)	82 (45%)	150 (42%)
No	105 (61%)	101 (55%)	206 (58%)
Have there been any formal complaints filed in relation to your administration of local anesthetics?			
Yes	6 (3.5%)	3 (1.5%)	9 (2.5%)
No	169 (96.5%)	179 (98.5%)	348 (97.5%)
How soon after obtaining the Permit L did you feel confident in your ability to safely and effectively administer local anesthetics?			
Immediately	89 (51%)	75 (41%)	164 (46%)
Within 3 months	33 (19%)	60 (33%)	93 (26%)
4 to 12 months	24 (14%)	30 (16%)	54 (15%)
Over one year	28 (16%)	18 (10%)	46 (13%)

Table V: Local Anesthesia Practice Statistics of Curriculum (1) and Continuing Education (2) Based Permit L Holders

	CU Based	CE Based	Total
	n (Percent)	n (Percent)	n (Percent)
On average, what is the success rate of your local anesthesia administration?			
95 to 100%	89 (68%)	108 (69%)	197 (68.5%)
85 to 94%	28 (21%)	35 (22%)	63 (22%)
75 to 84%	10 (8%)	9 (6%)	19 (6.5%)
51 to 74%	4 (3%)	5 (3%)	9 (3%)
<50%	0 (0%)	0 (0%)	0 (0%)
What patient complications, local or systemic, have you encountered as a result of your local anesthesia administration?			
None	110 (81%)	131 (81%)	241 (81%)
Tachycardia	6 (4%)	12 (7.5%)	18 (6%)
Extensive IA or PSA hematoma	3 (2%)	7 (4%)	10 (3%)
Syncope	5 (3.5%)	3 (2%)	8 (2.5%)
Temporary paresthesia	3 (2%)	4 (2.5%)	7 (2.5%)
Allergic reaction	1 (<0.5%)	0 (0%)	1 (<0.5%)
Local anesthetic overdose	0 (0%)	0 (0%)	0 (0%)
Vasoconstrictor overdose	0 (0%)	0 (0%)	0 (0%)
Permanent paresthesia	0 (0%)	0 (0%)	0 (0%)
Facial paralysis	0 (0%)	0 (0%)	0 (0%)
Other	8 (7%)	5 (3%)	13 (4.5%)
What types of injections do you administer?			
Infiltration	125 (70%)	148 (78%)	273 (74%)
MSA	123 (69%)	134 (70.5%)	257 (70%)
IA	119 (67%)	127 (67%)	246 (67%)
ASA	116 (65%)	127 (67%)	243 (66%)
PSA	109 (61%)	118 (62%)	227 (62%)
Long buccal	101 (57%)	119 (63%)	220 (60%)
Mental/incisive	93 (52%)	113 (59%)	206 (56%)
GP	38 (21%)	65 (34%)	103 (28%)
NP	37 (21%)	57 (30%)	94 (25%)
IO	36 (20%)	49 (25%)	85 (23%)
Not administering	42 (23%)	25 (13%)	67 (18%)
Other	5 (3%)	13 (7%)	18 (5%)
How frequently do you aspirate prior to deposition of local anesthetics?			
100%	103 (77%)	126 (82%)	229 (79%)
95 to 99%	17 (13%)	11 (7%)	28 (10%)
85 to 94%	6 (5%)	3 (2%)	9 (3%)
75 to 84%	1 (0.5%)	5 (3%)	6 (2%)
51 to 74%	2 (1%)	0 (0%)	2 (0.5%)
>50%	4 (3%)	7 (4%)	11 (1.5%)
Never	1 (0.5%)	3 (2%)	4 (1.5%)
Do you practice safe needle recapping using a one-handed technique or recapping device?			
Yes	130 (92%)	152 (95%)	282 (94%)
No	11 (8%)	8 (5%)	19 (6%)
How many times have you received a percutaneous needle stick while administering local anesthetics?			
Never	117 (84%)	143 (90%)	260 (87%)
1	18 (13%)	15 (9%)	33 (11%)
2	3 (2%)	0 (0%)	3 (1%)
3	0 (0%)	2 (1%)	2 (0.5%)
4	2 (1%)	0 (0%)	2 (0.5%)
How many times have you experienced needle breakage during deposition of local anesthetics?			
Never	137 (98%)	159 (99.5%)	296 (99%)
1	2 (1.5%)	0 (0%)	2 (0.5%)
2	1 (0.5%)	1 (0.5%)	2 (0.5%)

Table VI: Opinions of Permit L Holders

	Curriculum Based					
	n	SA	A	U	D	SD
		n (Percent)	n (Percent)	n (Percent)	n (Percent)	n (Percent)
The permit L is valuable when seeking employment	178	93 (52%)	56 (31.5%)	19 (11%)	9 (5%)	1 (0.5%)
The Permit L is valuable in practice	178	101 (57%)	51 (28%)	14 (8%)	12 (7%)	0 (0%)
Local anesthesia is necessary for some procedures such as NSPT	177	124 (70%)	47 (26%)	3 (2%)	3 (2%)	0 (0%)
I feel competent in my administration of local anesthetics	175	79 (45%)	57 (33%)	22 (12%)	10 (6%)	7 (4%)
The type of training program I attended adequately prepared me to administer local anesthetics	176	104 (59%)	50 (29%)	18 (10%)	4 (2%)	0 (0%)
	Continuing Education Based					
	n	SA	A	U	D	SD
		n (Percent)	n (Percent)	n (Percent)	n (Percent)	n (Percent)
The permit L is valuable when seeking employment	189	100 (53%)	61 (32.25%)	25 (13.25%)	2 (1%)	1 (0.5%)
The Permit L is valuable in practice	188	110 (58.5%)	60 (32%)	12 (6.5%)	4 (2%)	2 (1%)
Local anesthesia is necessary for some procedures such as NSPT	190	135 (71%)	50 (26%)	2 (1%)	2 (1%)	1 (<1%)
I feel competent in my administration of local anesthetics	182	75 (41%)	79 (43.5%)	11 (6%)	14 (8%)	3 (1.5%)
The type of training program I attended adequately prepared me to administer local anesthetics	184	107 (58%)	61 (33%)	7 (4%)	6 (3%)	3 (1%)

Likert Scale used: 1=Strongly Agree (SA), 2=Agree (A), 3=Undecided (U), 4=Disagree (D), 5=Strongly Disagree (SD)

and the Permit L is valuable in practice ($p<0.01$). Among non-Permit L holders, those who are more likely to agree than disagree that their supervising dentist would allow them to administer local anesthetics are younger ($p<0.05$), have been in practice for fewer years ($p<0.05$) and have more years remaining in practice ($p<0.05$). The non-Permit L holders who are older ($p<0.01$), have more years in practice ($p<0.01$), and fewer years remaining in practice ($p<0.01$) are more likely to disagree than agree with a positive self-perceived ability to obtain the Permit L.

The Permit L holders demonstrated no significant differences between the curriculum and continuing education-based training programs in regards to practice and opinion items. Significant correlations were found among the demographic data showing those trained in a curriculum program are likely to be younger ($p<0.01$), have fewer years in practice ($p<0.01$), have more years remaining in practice ($p<0.01$), have held the Permit L for longer ($p<0.01$) and report the Permit L was a condition of employment than those trained in a continuing education program. The length of time the Permit L has been held yielded significant correlations in several areas. Those who have held the Permit L for longer are more likely to be older ($p<0.01$), have more years in practice ($p<0.01$), have fewer years remaining in practice ($p<0.01$), hold a Bachelors' or Masters' degree, and less likely to report the Permit L as a condition of employment ($p<0.05$). They also report higher administration success rates ($p<0.05$) and higher delegation rates for operative and surgical procedures ($p<0.05$). Those who have held the Permit L for longer are more likely to agree than disagree that local anesthesia is necessary for some dental hygiene procedures ($p<0.05$) and are more likely to agree than disagree with a positive self-perceived competency in administering local anesthetics ($p<0.05$).

Discussion

The demographic characteristics of respondents in this survey were similar to the 2011 Massachusetts Department of Public Health profile of dental hygienists in regards to gender, age, years in practice and level of education.[14] At the time of this survey there were 2,345 Permit L holders representing 35.4% of all currently licensed dental hygienists in Massachusetts (n=6,616), which is similar to the

regional results of Boynes et al who reported 32.1% of dental hygienists administering in the Northeastern states.[6] Demographic and practice items such as gender, age and years in practice were similar to those reported by Anderson,[5] DeAngelis and Goral,[4] and Cross-Poline et al.[3] Practice types in this study differed from most in that 64% (n=236) worked in general practice whereas Anderson reported 89.6%,[5] Boynes et al 76.1%,[7] DeAngelis and Goral 92%,[4] and Cross-Poline et al 76%.[3] However, the greater variety of practice settings that have emerged may account for this difference. The levels of education in this study show significance among those who have held the Permit L for longer ($p<0.01$) which may be affected by the certification of faculty initially needed to teach the skill.

This study, when compared to the 2007 Massachusetts Department of Public Health survey,[11] reveals 79% (n=172) are not planning on becoming certified as compared to 64.4% (n=1,936) and finds similarity in the reasons for not becoming certified such as fear, cost and no monetary compensation. This survey also found fewer who cited increased liability (7% vs. 28.2%), with the main reasons for not becoming certified being not needed in type of practice (17.5%) and not planning to stay in practice long enough to use (14.5%). Employer resistance at 2.25% (n=4) ranks lowest along with no value in practice as reasons for not becoming certified. This study and DeAngelis and Goral[4] found significant differences in opinion regarding the necessity of local anesthesia between certified and not certified.

The primary reason for not administering reported by 28% (n=104) of the Permit L holders was not needed in type of practice (37%) and employer resistance (22%). Cross-Poline et al reported 12% of those certified were not administering due to employer or patient resistance, practice type, and patients' not needing anesthesia.[3] Anderson also reported similar reasons for not administering.[5] Delegation of local anesthesia for dental hygiene (85%) and dental (42%) procedures are below those reported by Anderson (95%, 65%)[5] and DeAngelis and Goral (94%, 68%),[4] but above the regional results of Boynes et al (32.1%, 30.4%)[7] that included states where dental hygienist administered local anesthesia was not legal. A significant relationship between delegation for dental procedures and length of time the Permit L has been held ($p<0.01$) was found by this study. Success achieving anesthesia on the first attempt 95 to 100% of the time was reported by 68.5% of the Permit L holders which is below the 92% overall first attempt success rate reported by Lobene[2] while Anderson[5] reported a success rate of 76%, 90 to 100% of the time. This study found a significant relationship between level of successful injections and length of time the Permit L has been held ($p<0.01$) but no relationship between success and educational level or years in practice which correlates with the findings of Anderson.[5] Aspiration rates of 100% were reported by 79% of Permit L holders whereas Anderson found 86% were aspirating all the time. This lower rate of aspiration may be the determining factor for tachycardia being reported as the most frequent complication.

The main differences between Permit L holders and non-Permit L holders lie within demographics of

Table VII: Selected Correlation Trend Tests Between Demographics and Opinions of Non-Permit L Holders and Permit L Holders

	Spearman's Rank Correlation Coefficient (p)
Age	-0.4**
Years In Practice	-0.45**
Years remaining in practice	0.28**
Local anesthesia is necessary for some dental hygiene procedures such as NSPT	-0.3**
The Permit L is valuable in practice	-0.45**

*p<0.05 for trend **p<0.01 for trend

Table VIII: Selected Correlation Trend Tests Between Demographics and Opinion Variables of Non-Permit L Holders

	Spearman's Rank Correlation Coefficient (p)		
	Age	Years in practice	Years remaining in practice
Local anesthesia is necessary for some dental hygiene procedures such as NSPT	0.07	0.02	-0.05
The Permit L is valuable in practice	-0.05	-0.09	-0.00
My supervising dentist would allow me to administer local anesthetics if I obtained the Permit L	0.13*	0.14*	-0.14*
I feel as though I would be able to complete the certification course, pass the NERB exam and obtain the Permit L	0.24**	0.29**	-0.3**

*p<0.05 for trend **p<0.01 for trend

Table IX: Selected Correlation Trend Tests Between Demographic, Practice, and Opinion Variables of Permit L Holders

	Spearman's Rank Correlation Coefficient (p)	
	Curriculum (1) and Continuing Education (2) Based Program	Years Permit L Held (<1 year, 1 to 3 years, 4 to 5 years, >5 years)
Age	0.61**	0.41**
Years in practice	0.78**	0.49**
Years remaining in practice	-0.37**	-0.22**
Years Permit L held	0.27**	-
Level of education	0.08	0.14**
Value of Permit L when seeking employment	-0.01	0.06
Permit L a condition of employment	0.2**	-0.13*
Frequency of administration	0.01	0.01
Delegation for DH procedures	0.08	0.00
Delegation for operative or surgical procedures	0.05	0.11*
Administration success rate	-0.02	0.14*
Frequency of aspiration	-0.04	0.01
Safe needle recapping	-0.06	-0.03
Frequency of needle stick	-0.09	0.01
Local anesthesia is necessary for some dental hygiene procedures such as NSPT	-0.01	-0.12*
The Permit L is valuable in practice	-0.03	-0.05
Self-perceived competence in administration	-0.002	-0.11*
Self-perceived efficacy of training program	-0.001	-0.01
Time to feel confident in administration	-0.04	-0.01

*p<0.05 for trend **p<0.01 for trend

age, years in practice and years remaining in practice, and differences in opinion regarding the value of the Permit L in practice and the need for local anesthesia during some dental hygiene procedures. The barriers to obtaining the Permit L also lie within demographics and opinions of value, but may be combinations of many factors as suggested by comments provided by non-Permit L holders.

The limitations of this study include the low response rate (10%) which may be primarily due to the single postcard invitation and the limitations of the MDHA email list. The accuracy of self-reported data with its potential for bias remains an issue throughout survey-based research and most likely also contributed to the limitations of this study. The use of social media for accessing the population of interest may improve the response rate in future studies and the use of social media in research studies may prove an interesting area of investigation. Areas for future research include surveying the dentists in Massachusetts to gather and evaluate opinions and practices in relation to the Permit L, its use, value, and factors influencing its low prevalence. Generating interest in local anesthesia administration with continuing education courses that directly address the reasons for not becoming certified or administering may increase the prevalence and use of the Permit L.

Conclusion

This current study of Massachusetts dental hygienists raises concern over prevalence and use of the Permit L as demonstrated by lower numbers of dental hygienists administering local anesthetics and lower delegation rates. Significant differences in opinions exist between non-Permit L holders and Permit L holders as to the value of the Permit L and the need for local anesthesia during some dental hygiene procedures.

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References

1. Nash D, Friedman J. A review of the global literature on dental therapists in the context of the movement to add dental therapists to the oral health workforce in the United States. W.K. Kellogg Foundation. 2012.

2. Lobene RR, evaluation of results. In: The Forsyth Experiment. Cambridge, MA: Harvard university press. 1979. 88-89 p.

3. Cross-Poline GN, Passon JC, Tilliss TS, Stach DJ. Effectiveness of a continuing education course in local anesthesia for dental hygienists. *J Dent Hyg*. 1992;66(3):130-136.

4. DeAngelis S, Goral V. Utilization of local anesthesia by Arkansas dental hygienists, and dentists' delegation/satisfaction relative to this function. *J Dent Hyg*. 2000;74(3):196-204.

5. Anderson JM. Use of local anesthesia by dental hygienists who completed a Minnesota CE course. *J Dent Hyg*. 2002;76(1):35-46.

6. Scofield JC, Gutmann ME, DeWald JP, Campbell PR. Disciplinary actions associated with the administration of local anesthetics against dentists and dental hygienists. *J Dent Hyg*. 2005;79(1):8.

7. Boynes SG, Zovko J, Bastin MR, Grillo MA, Shingledecker BD. Dental hygienists' evaluation of local anesthesia education and administration in the United States. *J Dent Hyg*. 2011;85(1):67-74.

8. Sisty-LePeau N, Boyer EM, Lutjen D. Dental hygiene licensure specifications on pain control procedures. *J Dent Hyg*. 1990;64(4):179-185.

9. Local anesthesia administration by dental hygienists state chart. American Dental Hygienists' Association [Internet]. 2011 [cited 2015 April 13]. Available from: https://www.adha.org/resources-ocs/7514_Local_Anesthesia_Requirements_by_State.pdf

10. Administration of anesthesia and sedation. Board of registration in dentistry. Massachusetts Department of Public Health [Internet]. 2014 [cited 2015 April 13]. Available from: http://www.mass.gov/courts/docs/lawlib/230-249cmr/234cmr6.pdf

11. A report on the commonwealth's dental hygiene workforce. Massachusetts Department of Public Health. [Internet] 2008 [cited 2015 April 13]. Available from: http://www.mass.gov/eohhs/docs/dph/com-health/dental-hygiene-workforce.pdf

12. Polit DF, Beck CT. The content validity index: Are you sure you know what's being reported? critique and recommendations. *Res Nurs Health*. 2006;29(5):489-497.

13. Polit DF, Beck CT, Owen SV. Is the CVI an acceptable indicator of content validity? appraisal and recommendations. *Res Nurs Health*. 2007;30(4):459-467.

14. Health professions data series dental hygienists 2011. Executive office of health and human services Massachusetts Department of Public Health. [Internet]. 2012 [cited 2014 March 5]. Available from: http://www.mass.gov/eohhs/docs/dph/com-health/primary-care/2011-dentalhygiene-factsheet.pdf

Assessing Cultural Competence among Florida's Allied Dental Faculty

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Abstract

Purpose: The Commission on Dental Accreditation requires that dental, dental hygiene and dental assisting schools offer educational experiences to ensure that prospective dental health care providers become culturally competent, socially responsible practitioners. To assert that these mandates are met requires that the faculty are knowledgeable and capable of providing this type of training. Currently, little is known about the cultural competence of the state of Florida allied dental faculty. The purpose of this study was to assess the cultural competence among the dental hygiene and dental assistant faculty in the state of Florida.

Methods: One hundred ninety-three faculty were invited to take the Knowledge, Efficacy and Practices Instrument (KEPI), a validated measure of cultural competence. Respondents included 77 (74%) full-time and 27 (26%) part-time faculty. Data were analyzed descriptively and reliabilities (Cronbach's alpha) were computed.

Results: Mean scores and internal estimates of reliability on the KEPI subscales were: knowledge of diversity 3.3 (α=0.88), culture-centered practice 3.6 (α=0.88) and efficacy of assessment 2.9 (α=0.74). The participant's score of 3.6 on the culture-centered practice exceeds scores among dental students and faculty who participated in previous studies suggesting the allied dental faculty have a greater awareness of sociocultural and linguistically diverse dental patients' oral health needs. Participants' score on knowledge of diversity subscales suggests a need for moderate training, while their score on the efficacy of assessment subscale indicates a need for more intense training.

Conclusion: Assessing faculty beliefs, knowledge and skills about cultural competency is critically important in ensuring that accreditation standards are being met and represents one step in the process of ensuring that faculty demonstrate the type of sensitivity and responsiveness, which characterizes behaviors associated with cultural competence.

Keywords: cultural competence, faculty development, quantitative analysis, survey researc

This study supports the NDHRA priority area, **Professional Education and Development:** Identify the factors that affect recruitment and retention of faculty.

Introduction

As individuals, worldviews are profoundly shaped by the traditions that define family and country of origin, school, religious and other experiences that characterize upbringing. Thus, cultural experiences shape understanding and perceptions of others who differ, in relation to spoken languages, race, ethnicity, religious affiliation, social and intellectual status, and sexual orientation. The beliefs that individuals hold are constructed through social interactions and are likely to remain unquestioned until individuals experience situations that cause reflection or questioning.

Faculty across all levels of schooling have observed the increasing diversity among student populations.[1] However, it is not uncommon that faculty have varying degrees of familiarity with cultural groups unlike those with whom they have been socialized. How can faculty be assured that they are teaching their students in a culturally responsive manner unless they know about their own knowledge, beliefs and skills towards others with whom they have not shared experiences with during our formative years? Ensuring the provision of educational experiences that reflect cultural sensitivity and awareness requires, as an initial step, determining one's knowledge about groups of people who are socio-culturally and linguistically unlike himself or herself.

Many researchers have reported how a lack of cultural awareness negatively impacts patient care.[2] Over the last 15 years, national health care associations have highlighted the importance of patient-centered care and reducing health care disparities.[3,4] Culturally competent practitioners have the potential to reduce racial and ethnic health disparities. They are often better positioned to speak the language of cultural diverse patients, more sensitive to cultural differences, and more likely to ensure the provision of quality of health care.[5] The Commission on Dental Accreditation (CODA) has responded to the urgency of eliminating racial/ethnic disparities by revising its competencies.[6] CODA mandates that dental, dental hygiene and dental assisting schools provide training to ensure that prospective dental health care providers become culturally competent, socially responsible practitioners. While these changes are laudable, little is known about the faculty who are providing this level of required education. A review of the recent literature revealed sys-

tematic reviews of educational interventions directed at improving cultural competency, an exploration of the different examination methods now used to evaluate cultural competence among dental students and residents and reviews of various cultural competency measures.[7-11] Studies that describe the cultural competence of dental, dental hygiene and dental assisting faculty were not apparent.

Assessing cultural competence refers to determining the level of agreement among participants in their ratings of behaviors, attitudes and knowledge about individuals who are socio-culturally and linguistically dissimilar. Currently, little is known about the cultural competence of the state of Florida allied dental faculty who educate the state's allied dental professional workforce. The purpose of this study was to assess the cultural competence among allied dental faculty, specifically the dental hygiene and dental assisting faculty in the state of Florida. The use of such an assessment is supported by the assumption that if dental hygienists and dental assistants are culturally competent, that they are more likely to work effectively with individuals who are socio-culturally and linguistically dissimilar from themselves. Additionally, this assessment could be useful in guiding instructional or curricular revisions to ensure the preparation of culturally competent dental hygienists and assistants.

The importance of needs assessment has also been underscored in the literature about faculty development.[12-23] The scope of faculty development needs range from enhancing pedagogy and assessment, to promoting scholarship, and advancing careers. However, it also includes measuring the faculty's level of cultural competency so that the potential need for enhancing knowledge, influencing beliefs and augmenting skills can be identified. Faculty development is bound to be more effective if based on the real or perceived needs of the faculty.[24] Moreover, the strategy of surveying faculty to assess their needs is a common and necessary element of faculty development programs. Dental educational literature is also relatively weak in this all-important area of responsibility. Needs assessment is valuable when responding to institutional needs that are most relevant to their mission. Findings from a needs assessment bolstered one college's menu of services and were used to develop new services to support student learning.[25] Also as noted by Valley, needs assessments findings were instrumental in developing faculty development programs for instructors working part-time, a common occurrence in allied dental educational programs.[26]

Methods and Materials

The first task in conducting this study was to build a database of potential participants. To begin that process and with the assistance of the Florida Allied Dental Educators, a list of all of the schools that teach dental hygiene and dental assisting in the state of Florida was acquired. Institutional review board approval was obtained from the University of Florida prior to beginning the study. Next, each program director was contacted via email to request a list of full-time and part-time faculty, along with their first and last name and corresponding email address. After the population participant database was complete, all participants (n=193) were invited to take the Knowledge, Efficacy and Practices Instrument (KEPI).[27] The survey was sent electronically to participants using the professional and encrypted version of Survey Monkey.

KEPI, a validated measure of cultural competency, consists of 27 items and provides mean scores for 3 subscales related to cultural competence: efficacy of assessment, knowledge of diversity and culture-centered practice. The scale measures beliefs, knowledge and skills relative to cultural competence. Items are scored using a 4-point Likert scale where 1=lowest and 4=highest. Scores on knowledge of diversity reflects an individual's understanding of sociocultural and linguistically diverse groups while culture-centered practice reflects awareness of sociocultural and linguistically diverse dental patients' oral health needs. Participants' scores on efficacy of assessment provides a measure of how capable they believe they are in determining culturally diverse patients' oral health needs. Data were analyzed descriptively. Means, standard deviations and Cronbach's alpha were computed for each subscale. The potential associations between the demographic variables and the KEPI subscale scores were explored.

Results

The population was comprised of 93 (48%) full-time and 100 (52%) part-time faculty from 31 dental hygiene and dental assisting schools across the state of Florida. Of these, 117 completed the survey, for a response rate of 61%. Of the 117 surveys, 104 were usable for the analysis. The sample was 94 (90%) female and 10 (10%) male, 82 (79%) White, 22 (21%) minority, 19 (18%) 25 to 39 years of age, 85 (82%) 40 and over, 98 (93%) married, 7 (7%) single, 77 (74%) full-time and 27 (26%) part-time faculty.

The mean scores for the KEPI subscales are: knowledge of diversity 3.3, culture-centered practice 3.6 and efficacy of assessment 2.9 (Table I).

Internal estimates of reliability on the KEPI subscales are: knowledge of diversity α=0.88, culture-centered practice α=0.88, and efficacy of assessment α=0.74. The estimates of internal reliability ranging from 0.74 to 0.88 are considered acceptable in studies that seek to promote changes in practice.

Score ranges on the KEPI subscales hold implications for practice and training. Scores from 3.5 to 3.8 suggest that faculty are moderately skilled and need minimal training. Scores between 3.0 to less than 3.5 indicate a need for moderate training. Scores between 2.5 to less than 3.0 indicate a need for more intense training. Scores below 2.5 suggest a need for the highest level of training.

Table I: Comparison of KEPI Subscale Mean Scores, Standard Deviation and Reliability by Sample

	State of Florida, Dental Hygiene and Dental Assisting Faculty	Dental Students[a] (M(SD)/α)	Dental Students[b] (M(SD)/α	Florida Dental Students (M(SD)/α)	Dental Students[c] (M(SD)/α)	Dental Students[d] (M(SD)/α)	Florida Dental Faculty (M(SD)/α
Knowledge of diversity	3.3(0.4)/ 0.88	3.2(0.5)/ 0.85	3.3(0.4)/ 0.87	3.3(0.4)/ 0.80	3.1(0.4)/ 0.84	3.4(0.4)/ 0.83	3.3(0.4)/ 0.82
Culture-centered practice	3.6(0.6)/ 0.88	2.1(0.6)/ 0.82.	2.4(0.6)/ 0.72	2.1(0.56)/ 0.76	2.1(0.5)/ 0.73	2.3(0.6)/ 0.70	2.5(0.6)/ 0.76
Efficacy of assessment	2.9(0.4)/ 0.74	2.8(0.5)/ 0.90	2.8(0.6)/ 0.92	3.0(0.5)/ 0.89	2.6(0.6)/ 0.93	.8(0.7)/ 0.92	3.0(0.5)/ 0.89

[a-d]Denotes other states where dental students have participated in similar studies. Pseudonyms have been assigned to protect the anonymity of these schools.

The results show the allied dental faculty in Florida are moderately skilled and need minimal training on the culture-centered practice subscale, may benefit from moderate training on the knowledge of diversity subscale and are less skilled on the efficacy of assessment subscale with suggesting a need for more intense training compared to the culture-centered practice and knowledge of diversity subscales.

There were no statistically significant relationships between the KEPI subscales and the exploratory variables of gender, race/ethnicity, marital status, age and employment status.

Discussion

The findings among allied dental hygiene and dental assisting faculty are similar to what has been observed among in previous studies in 2 of the KEPI subscales: knowledge of diversity and efficacy of assessment.[24,27] Compared to studies conducted with dental students in Florida, and with dental faculty in Florida, Nebraska, Tennessee, Oregon and Washington, the mean score of 3.3 on the knowledge of diversity subscale among the dental hygienist/dental assisting faculty are comparable to dental student and faculty scores which ranged from 3.2 to 3.4. Participants' mean score of 2.9 in efficacy of assessment is comparable to dental student and faculty scores that ranged from 2.6 to 3.0. The participants' score of 3.6 on the culture-centered practice exceeds scores in other studies, which ranged from 2.3 to 2.8. This finding suggests the allied dental faculty have a greater awareness of the sociocultural and linguistically diverse dental patients' oral health needs compared to dental students and dental school faculty who participated in previous studies.

The higher mean scores on the culture centered practice subscale suggests that this sample of allied faculty is more culturally competent than dental students and dental faculty. Whether the latter result is due to training or socialization into the profession is unknown. Scores for these participants on the culture-centered practice subscale suggest that faculty are moderately skilled and thus do not need as much training as individuals who score 3.0 or lower. Participants' score on knowledge of diversity subscales suggests a need for moderate training, while their score on the efficacy of assessment subscale indicates a need for more intense training. This study should be replicated across all allied dental schools in the U.S. to determine if these findings are representative.

Rarely do professional schools assess if faculty are meeting the needs of an ever-changing, diversified student body. Additionally, most academic faculties, including allied dental health providers, are relatively unprepared to navigate university culture or meet the university's expectations for success.[22,28] These problems are further exacerbated when it becomes apparent that little is known about the level of cultural competence beliefs among the workforce that is training the prospective groups of dental hygiene and dental assisting practitioners.

Many health care disciplines, such as dental and allied dental programs, face faculty shortages and may draw faculty members from private dental practice. Compounding this problem is that dental hygiene programs typically do not encourage students to seek academic careers. Programs usually do no provide formal teaching experience or opportunities for scholarship. Therefore, asking dental hygiene students to consider a career in academics often differs from their initial plan to enter clinical practice.[28] Determining the present levels of cultural competence among faculty should be considered an essential step in responding to the CODA mandate. Findings from this study can be used to guide faculty development initiatives aimed at enhancing the cultural competence of the allied dental health care faculty in Florida. This survey could also be disseminated nationally to all dental hygiene and assisting faculty to gauge baseline levels.

The findings from this study have several implications. First it is important to assess how well the curriculum is meeting the CODA standards. Second, because competence is really an assessment of beliefs, knowledge and skills, it is important to assess faculty and student beliefs,

knowledge and skills to determine what competencies need to be taught. Third, an assessment of faculty beliefs, knowledge and skills is useful when analyzing the current curriculum and while considering changes to content and teaching practice to evaluate if and how well competencies are being taught. Outcomes from a rigorous and systematic analytical process that are both credible and replicable can guide curriculum changes and faculty development initiatives. Dental educators can benefit from using standardized and valid assessment methods that are cited in the literature to evaluate curriculum.

Both societal demand and accreditation mandates require that dentistry broaden its educational mission to focus on the needs of underserved, un-served and increasingly culturally diverse populations. To ensure that resources directed towards these initiatives are being utilized and are adequate, it is advisable to begin by assessing the knowledge of faculty. Knowing that this sample has a strong awareness of socio and linguistically diverse dental patients' oral health needs suggests that this is one area will not require an additional commitment of training time. Future efforts should focus on strengthening participants' understanding of socio-cultural and linguistically diverse groups and their belief in their ability to determine culturally diverse patient oral health needs.

It is cautioned that the scores on this scale are not sufficient to guarantee cultural competence as there can be a difference between self-reported knowledge, beliefs and skills and displaying sensitivity to cultural differences. Scores on the scale provide an indication of individual's intent to demonstrate cultural sensitivity. This scale can help identify those who lack an awareness of culture and others who may be prone to making cultural assumptions that may hinder care. It is also recommend that scores on this scale be used in tandem with additional initiatives offered by Klein and Benson.[29] They recommend engaging faculty in mini-ethnographies so that they can better understand patients lives in a "local world," and appreciate what "is at stake for patients, their families, and, at times, their communities, and also … for themselves."[29] To aid in strengthening the enactment of cultural competence, the following questions are recommend when talking with culturally diverse patients:

- What do you call this problem?
- What do you believe is the cause of this problem?
- What course do you expect it to take? How serious is it?
- What do you think this problem does inside your body?
- How does it affect your body and your mind?
- What do you most fear about this condition?
- What do you most fear about the treatment?[29]

Conclusion

Allied Florida dental faculty's scores on the KEPI culture-centered practices subscale were the highest, suggesting they are moderately skilled in this area of culture competence. Their scores on the knowledge of diversity subscale suggest a need for moderate training, while scores on efficacy of assessment call for more intense training. Findings from this study demonstrate the importance of assessing faculty cultural competency beliefs, knowledge and skills and is one step in the process towards ensuring that faculty demonstrate the type of sensitivity and responsiveness, which characterizes behaviors associated with cultural competence.

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References

1. Weidman JC, Twale DJ, Stein EL. Socialization of Graduate and Professional Students. In: Higher Education: A Perilous Passage? ASHE-ERIC Higher Education Report, 2001;28:3. Jossey-Bass Higher and Adult Education Series. Jossey-Bass, Publishers, Inc., San Francisco, CA.
2. Weissman JS, Betancourt JR, Campbell EG, et al. Resident physician's preparedness to provide cross-cultural care. *JAMA*. 2005;294:1058–67.
3. Institute of Medicine. The Future of the Public's Health in the 21st Century. Washington, DC: The National Academies Press; 2002.

4. Berwick DM, Nolan TW, Whittington J. The triple aim: care, health, and cost. *Health Affair*. 2008;27(3):759-769.

5. Anderson LM, Scrimshaw SC, Fullilove MT, Fielding JE, Norman J, Task Force on Community Preventive Services. Culturally competent healthcare systems: a systematic review. *Am J Preventive Med*. 2003;24(3):68-79.

6. Standards for Dental Hygiene Education Programs. Chicago, IL: Commission on Dental Accreditation; 2013.

7. Beach MC, Price EG, T, Gary TL, Robinson KA, Gozu A, Palacio A, Smarth C. et al. Cultural competency: A systematic review of health care provider educational interventions. *Med Care*. 2005;43,(4):356.

8. Price, EG, Beach MC, Gary TL, Robinson KA, Gozu A, Palacio A, Smarth C et al. A systematic review of the methodological rigor of studies evaluating cultural competence training of health professionals. *Acad Med*. 2005;80(6):578-586.

9. Gregorczyk SM, Bailit HL. Assessing the cultural competency of dental students and residents. *J Dental Educ*. 2008;72(10):1122-1127.

10. Kumas-Tan Z, Beagan B, Loppie C, MacLeod A, Frank B. Measures of cultural competence: examining hidden assumptions. *Acad Med*. 2007;82 (6):548-557.

11. Lie D, Boker J Cleveland E. Using the tool for assessing cultural competence training (TACCT) to measure faculty and medical student perceptions of cultural competence instruction in the first three years of the curriculum. *Acad Med*. 2006;81(6):557-564.

12. Puri A, Graves D, Lowenstein A, Hsu L. New faculty's perception of faculty development initiatives at small teaching institutions. *ISRN Education*. 2012:doi: 10.5402/2012/726270.

13. Steinert Y. Faculty development: core concepts and principles. Faculty Development in the Health Professions. *Springer Netherlands*. 2014:3-25.

14. Sheets KJ, Schwenk TL. Faculty development for family medicine educators: an agenda for future activities. *Teaching Learning Med: An Inter J*. 1990;2(3):141-148.

15. Behar-Horenstein LS, Mitchell GS, Graff, RA. Faculty perceptions of a professional development seminar. *J Dent Educ.* 2008;72(4):472-483.

16. Bligh J. Faculty development. *Med Educ*. 2005;39(2):120-121.

17. Behar-Horenstein LS, Roberts KW, Zafar, MA. Factors that advance and restrict programme change and professional development in dental education. *PDIE*. 2012;39(1):65-81 doi: 101080/194152572012692701.

18. Gruppen, Larry D., et al. Educational fellowship programs: common themes and overarching issues. *Acad Med*. 2006;81(11):990-994.

19. Swanwick T. See one, do one, then what? Faculty development in postgraduate medical education. *Postgrad Med J*. 2008;84(993):339-343.

20. Good medical practice. General Medicine Council [Internet]. 2006 [cited 2015 February 9]. Available from: http://www.gmc-uk.org

21. Fink LD, Orientation programs for new faculty, in New Directions for Teaching and Learning, no. 50. In: Sorcinelli and AE Austin AE, Eds. Jossey Bass, San Francisco. 1992: 39–49 p.

22. Boice R. The new faculty member. Jossey Bass, San Francisco: 1992.

23. Lindbeck R. Darnell D. An investigation of new faculty orientation and support among mid-sized colleges. *Acad Leadership*. 2008;6(2):72-74.

24. Behar-Horenstein LS, et al. The Role of Needs Assessment for Faculty Development Initiatives. *J Fac Dev*. 2014;28(2):75-86.

25. Sorenson DL, Bothell TW. Triangulating faculty needs for the assessment of student learning. *To improve the Academy*. 2004;22:44-59.

26. Valley P. Entertaining strangers: Providing for the development needs of part-time faculty. *To Improve the Academy*. 2004;23,299.

27. Behar-Horenstein LS, et al. The Knowledge, Efficacy, and Practices Instrument for Oral Health Providers: A Validity Study with Dental Students. *J Dent Educ*. 2013;77(8):998-1005.

28. Carr E, Ennis, R, Baus L. The dental hygiene faculty shortage: causes, solutions and recruitment tactics. *J Dent Hyg*. 2010;84(4):165-169.

29. Kleinman A, Benson P. Anthropology in the clinic: the problem of cultural competency and how to fix it. *PLoS Med*. 2006: 3(10):e294.

Utilizing a Diabetes Risk Test and A1c Point-of-Care Instrument to Identify Increased Risk for Diabetes In an Educational Dental Hygiene Setting

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Abstract

Purpose: The objective of this pilot study was to demonstrate the number of patients at increased risk for type 2 diabetes development using a validated survey; and to assess the rate of compliance for A1c screening in an educational dental hygiene setting.

Methods: This was a descriptive study using a purposive sample of patients in an academic dental hygiene clinic, who were 18 years or older, not diagnosed with prediabetes or type 2 diabetes. Utilizing the American Diabetes Association adopted diabetes risk survey, patients determined to be at increased risk for type 2 diabetes were offered the opportunity for further assessment by having their A1c tested using a point of care instrument. Patients demonstrating an increased risk for prediabetes or type 2 diabetes, with either the survey or the point of care instrument, were referred to their primary physician for further evaluation.

Results: A total 179 of the 422 solicited patients agreed to participate in the American Diabetes Association adopted diabetes risk survey. According to the survey guidelines, 77 participants were considered increased risk for type 2 diabetes for an at-risk prevalence of 48% (95% Confidence Interval (CI): 40 to 56%). The at-risk participants were then asked to have an A1c test of which 45 agreed (compliance rate 58%, 95% CI: 47 to 70%). Using American Diabetes Association A1c parameters, 60.98% (n=25) indicated a prediabetes (5.7 to 6.4%) range, and 4.88% (n=2) indicated a diabetes (≥6.5%) range.

Conclusion: Utilizing the American Diabetes Association adopted diabetes risk survey in any dental setting could provide patients with invaluable health information, and potentially improve overall health outcomes.

Keywords: type 2 diabetes, prediabetes, diabetes risk, point of care instrument, A1c, diabetes risk test, dental setting

This study supports the NDHRA priority area, **Health Promotion/Disease Prevention:** Validate and test assessment instruments/strategies/mechanisms that increase health promotion and disease prevention among diverse populations.

Introduction

A systematic analysis of the global prevalence of type 2 diabetes found the number of adults with diabetes doubled over a 30 year period, increasing from 153 million in 1980 to 347 million in 2008.[1] The World Health Organization (WHO) estimates diabetes will be the seventh leading cause of death in 2030.[2] In 2012, there was an estimated 1.7 million new cases of diagnosed diabetes among U.S. adults 20 years and older.[3] Between 2009 to 2012, utilizing fasting glucose or A1c levels, 37% or 86 million Americans aged 20 years or older had prediabetes, 51% of those were aged 65 years or older.[3] In addition, the Centers for Disease Control most up-to-date scientific data estimates 8.1 million individuals or 27.8% of the U.S. population have undiagnosed diabetes.[3]

The estimated cost associated with diagnosed and undiagnosed diabetes in 2012, was over $322 billion, including $244 billion in medical costs and $78 billion in decreased productivity.[4] This cost translates to an economic burden of over a $1,000 for every American.[4]

Diabetes can lead to more serious health complications like blindness, kidney damage, cardiovascular disease and lower limb amputations.[3] The prevalence and effect of diabetes are compelling enough to stress the need for early diagnosis and treatment. Early diagnosis can alleviate many of the complications associated with diabetes and prevent disease progression.[3]

Identification of Prediabetes and Diabetes

Diabetes can be diagnosed based on A1c or fasting plasma glucose level, the fasting plasma glucose or the 2-h plasma glucose value subsequent to a

75-g oral glucose tolerance test.[5,6] There is an increased risk of developing type 2 diabetes based on older age, obesity and lack of physical exercise in individuals with hypertension and, in particular, racial/ethnic subgroups (African American, American Indian, Hispanic/Latino and Asian American).[7] Most often there is a lengthy period without symptoms prior to the diagnosis of type 2 diabetes.[7]

In Healthy People 2020, the U.S. Department of Health and Human Services includes screening for type 2 diabetes as one of the top measures to be implemented in the health care system.[8] As part of the U.S. health care system, the dental profession can play an integral role with implementation.

Diabetes and Periodontal Disease

Diabetes and periodontal disease are 2 chronic diseases considered to be biologically linked.[9,10] Periodontal disease is a chronic inflammatory disease of the supporting tissues of the teeth and the primary cause of tooth loss for older adults.[11,12] It is estimated 47% of U.S. adults 30 years and older have periodontitis, the destructive form of periodontal disease.[13] Evidence over the last 15 to 20 years supports an association between periodontal inflammation and glycemic control among individuals, with or without diabetes, and the complications associated with diabetes.[10] There is a well-established understanding that periodontal outcomes are affected by hyperglycemia.[10] Additionally, evidence increasingly supports a likely association between systemic inflammation and oral microbial agents in circulation.[10]

The Dental Office as a Gateway to Medical Screenings

Prediabetes and diabetes are 2 conditions where screening and early recognition would be beneficial to prevent public health burdens.[7] The increasing public health burden of diabetes requires a collaborative approach among health care providers, in order to identify and manage its complications.[10] A survey of 1945 practicing dentists in the U.S. suggested dentists thought medical screenings were important and were willing to incorporate screenings for medical conditions in the dental office, including diabetes mellitus at a 76.8% rate of agreement.[14]

In 2013, 61.7% of adults between the ages of 18 and 64 had a visit with their dental provider.[15] For patients who are not utilizing health care services and visit a dental office for emergency situations, health care screenings may be done at these visits.[10]

A prospective study was conducted within Columbia University College of Dental Medicine Triage Clinic to explore the development and evaluate the performance of a selective approach to identify undiagnosed prediabetes and diabetes in a dental setting.[16] Participants (n=601) were selected based on one self-reported risk factor for diabetes and subsequently evaluated utilizing a periodontal exam and an A1c point of care instrument.[16] The study findings confirmed the approach was effective in identifying individuals (n=182) with potential undiagnosed diabetes and prediabetes and referring them to a physician for evaluation.[16] The researchers conclude their model of identification should be further explored by dental professionals and validated in diverse dental populations.[16]

In a study by Genco et al, 11 general dentistry and periodontal specialty practices including a community dental clinic, utilized the American Diabetes Association Risk Test and a point of care instrument to measure hemoglobin A1c among 1,022 participants.[17] They identified individuals (n=416) with potential diabetes or prediabetes and referred them to a physician for further evaluation.[17] The study demonstrated dental screening feasibility for diabetes and prediabetes, as well as acceptance among dental staff, patients and their physicians.[17] Although the Genco et al study had notable findings, due to various barriers including lack of insurance coverage for screenings in a dental setting, and patient's lack of compliance for follow-up after screening in private dental practices, the authors were hesitant to recommend diabetes screenings in traditional dental settings.[17]

An 8 item survey of randomly selected patients from a New Jersey Dental School and several private practice clinics (n=470) was conducted regarding patient attitudes toward chairside medical screening in a dental setting.[18] The responses of the majority of the participants were favorable towards having a dentist perform screening for heart disease, high blood pressure, diabetes, human immunodeficiency virus infections and hepatitis infection.[18]

A cross-sectional study conducted by Creanor et al utilized a 1-page questionnaire among patients within 2 primary care dental clinics and 16 general practices in South-West England.[19] The survey was designed to determine attitudes toward chairside medical screenings, including diabetes, among patients attending appointments at primary care dental clinics and general dental practices.[19] A total of 626 surveys were completed from 18 sites at an 87% rate of agreement for the importance of dentists screening for medical conditions.[19]

As part of The Dental Practice-Based Research Network, a study in 28 community dental practices recruited 498 patients to test the feasibility of screening for abnormal random blood glucose levels using glucometers and finger-stick testing.[20] Among

the participants, greater than 80% liked the idea and 62% would recommend their dentist to others, if blood glucose testing was available.[20]

The purpose of this pilot study was to implement the American Diabetes Association diabetes risk test to identify patients at risk for undiagnosed type 2 diabetes in an educational dental hygiene setting and to determine the rate of compliance and results when a point-of-care A1c screening was recommended.

Methods and Materials

This descriptive study consisted of a purposive sample of patients at an academic dental hygiene clinic. Permission to utilize the validated diabetes risk test was granted by the American Diabetes Association. The American Diabetes Association diabetes risk test questionnaire included age, sex, history of gestational diabetes, family history of diabetes, physical activity and weight. A score of 5 or higher on the diabetes risk test indicated an increased risk for developing type 2 diabetes. In addition to the 7 questions, 2 yes/no response questions were included. The first question inquired of a previous diagnosis of high blood sugar, borderline diabetes, prediabetes or diabetes type 1 or 2. The second question was presented at the end of the American Diabetes Association risk test, and inquired of participant's willingness to have a finger stick to measure 2 to 3 month average blood glucose, if their risk test score indicated increased risk for type 2 diabetes (≥5). Considering health literacy levels, the term A1c was omitted from the second question, and replaced with blood sugar. Two principal investigators and 1 clinic staff member, all registered dental hygienists, administered the study informed consent forms, the A1c tests and completed follow-up referral letters. Dental hygiene students administered a National Cash Register carbonless 2-page paper version of the American Diabetes Association diabetes risk test.

Eligibility criteria for the study included all patients who presented to the clinic who were 18 years or older not previously diagnosed with prediabetes or diabetes. Exclusion criteria included participants with a preexisting diagnosis of high blood sugar, borderline diabetes, prediabetes, or diabetes mellitus type 1 or type 2. The university's institutional review board ensured the protection of the subjects engaged in this study.

During appointment check-in, study personnel provided patients an implied consent form which explained the study, and participants in agreement self-completed the American Diabetes Association diabetes risk test. Once the risk test was completed, dental hygiene students identified participants determined to be at increased risk for diabetes and alerted study personnel. Participants who scored a 5 or greater and indicated yes to having their average blood glucose measured had their A1c tested via a point of care instrument, the DCA Vantage™. The DCA Vantage™ was found to meet the acceptance criteria of the National Glycohemoglobin Standardization Program certification criteria of A1c instruments, making it equivalent to laboratory-based methods.[21,22] Participants with A1c indicative of prediabetes or diabetes based on the American Diabetes Association guidelines, 5.7% or greater, referred to their primary physician for further assessment.[5] Additionally, a copy of the completed American Diabetes Association risk test, the results of the A1c test, and an accompanying letter explaining patient's risk were mailed to the physician of record.

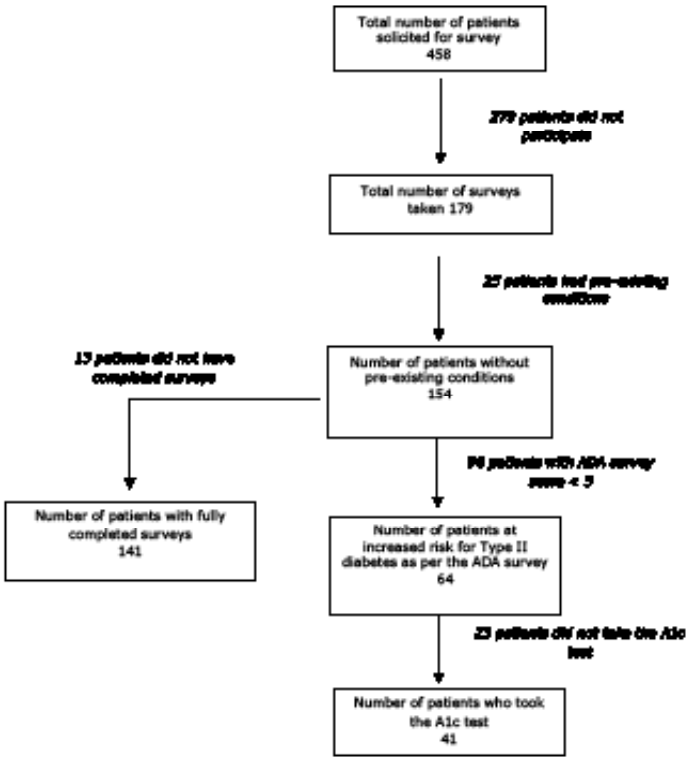
The questionnaire responses were entered into electronic format via Microsoft Excel. A quality assessment was undertaken by which a random sample of written surveys were audited for data-entry error. The analysis included descriptive statistics using frequency percentiles, with Wald and Exact Binomial 95% CI calculated for selected variables. Associations between select variables were assessed via contingency tables and Fisher's Exact Test. The main analysis used data from all patients who participated in the survey who did not have known pre-existing diabetes conditions (n=159). To assess robustness of study results to missing data, sensitivity analyses were performed via full case analysis (n=145) and mean imputation for missing values (n=159). All statistical analyses were performed in STATA® statistics/data analysis software version 11.2.

Results

The study profile of solicited study patients is shown in Figure 1. A total of 179 of 458 solicited patients agreed to participate in the study (compliance rate 39%, Binomial 95% CI: 35 to 44%), with 25 of the 179 study participants reported known pre-existing prediabetes or diabetes conditions and did not meet study criteria. As per the American Diabetes Association diabetes risk test, 64 of the 154 participants without pre-existing conditions included in the analysis were at increased risk for type 2 diabetes with an at-risk prevalence of 42% (Binomial 95% CI: 34 to 50%). Of the 64 participants who were determined at risk, 36 reported they would take the A1c, 5 reported they would not, and 23 did not report an answer. Once the 64 at-risk patients were informed of their risk score as per the American Diabetes Association diabetes risk test by research personnel, 41 patients took the A1c test offered. (Compliance rate 64%, Binomial 95% CI: 51 to 76%).

Table I shows descriptive statistics of the study population included in the analysis (n=154). The majority of patients were female (66%), 50 years

Figure 1: Associations between Demographics and Compliance for A1c Screening



of age or older (65%), reported no physical activity (79%), did not have a previous high blood pressure diagnosis (68%) and did not have a direct family member with diabetes (66%). Associations between demographics and response to take the A1c are shown in Figure 1. No statistically significant associations were found between demographic variables and patient responses to take the A1c test. Of the 41 patients who did receive the A1c test, the mean A1c was 5.82% (95% CI 5.70 to 5.96%), as shown in Table II. As per the American Diabetes Association parameters, the majority of patients (61%) scored an A1c between 5.7% and 6.5% indicating increased risk for diabetes.[5]

Table I: Demographic Characteristics of Study Population

	Total Survey Population (n=154)
Gender, n (Percent female)	101 (66%)
Age, years	
<40, n (Percent) 40 to 49, n (Percent) 50 to 59, n (Percent) ≥60, n (Percent)	43 (28%) 11 (7%) 28 (18%) 72 (47%)
Direct family member with diabetes	
yes, n (Percent) no, n (Percent) missing, n (Percent)	49 (32%) 102 (66%) 3 (2%)
Previous high blood pressure diagnosis	
yes, n (Percent) no, n (Percent) missing, n (Percent)	46 (30%) 105 (68%) 3 (2%)
Physicially activity	
yes, n (Percent) no, n (Percent) missing, n (Percent)	31 (20%) 121 (79%) 2 (1%)

Table II: A1c Test Results

	Total A1c Tests Administer (n=41)
Mean A1c, (95% Cl)*	5.82% (5.70%, 5.96%)
A1c Range distributions	
Normal (A1c<5.7%), n (Percent)	14 (34.15%)
Increased diabetes risk (5.7%≤A1c < 6.5%), n (Percent)	25 (60.98%)
Diabetes (A1c≥6.5%), n (Percent)	2 (4.88%)

Discussion

Among the undiagnosed patients who participated in the American Diabetes Association risk test, 42% were found to be at increased risk for diabetes and were then referred to their physician for further evaluation. Even without A1c testing, administering the American Diabetes Association risk test was found to be a beneficial health promotion tool for identifying patients at risk for developing diabetes.

There was a 64% rate of agreement among the high-risk group to have their A1c tested. The administration of the American Diabetes Association diabetes risk test created an opportunity for dialogue between the patient and the oral health care provider. Moreover, the utilization of the diabetes risk test in a dental setting may provide incentive for follow-up with a physician. Based on the point of care instrument, the majority (61%) had an A1c in the prediabetes or diabetes range. Although a point of care A1c assay is not recommended for a diagnosis of prediabetes or diabetes, an A1c test should be done in a laboratory using a method meeting National Glycohemoglobin Standardization Program and Diabetes Control and Complications Trial certification and standards; it may serve as a convenient screening tool and improve patient compliance for physician follow-up.[7] Patients were provided with a written referral and the principal investigators sent a copy of the American Diabetes Association diabetes risk test along with a letter to the physician of record for further patient evaluation.

The rate of participation among patients who took the American Diabetes Association diabetes risk test may be explained by the length of time it takes a patient to receive preventative dental hygiene services in an educational setting. Relying on the front office and/or dental hygiene students to administer the American Diabetes Association diabetes risk test at the start of the patient appointment was not a reliable method of administration. Incorporating the American Diabetes Association diabetes risk test along with other risk assessments conducted during the dental hygiene process of care may improve the rate of compliance and reinforce the association between diabetes and periodontitis.

National data indicate the incidence and prevalence of prediabetes and diabetes is on the rise.[1] Type 2 diabetes is a manageable disease with early diagnosis. The majority of adult patients have an annual visit with a dental provider, and implementation of the American Diabetes Association diabetes risk test can help to identify patients at increased risk for diabetes. The tool could be utilized in any dental setting to provide patients with important health information, potentially improving health promotion and disease prevention.[3] Large scale clinical trials need to be conducted to assess feasibility, acceptance and cost-effectiveness of screening in a dental as comparted to a medical setting.

Health screenings are more cost-effective than the treatment of disease and could potentially ease the economic burden of diabetes care.[4] Additionally, implementation of a health screening tool within a dental setting could provide an opportunity to increase collaboration among dental and medical providers.

A study limitation included lack of patient-physician follow up to determine confirmation of diagnosis. Additionally, the authors recognize this was a relatively small sample population in one location and therefore not generalizable.

Conclusion

Utilization of the American Diabetes Association risk test assisted in identifying type 2 diabetes at risk patients, and provided an opportunity to discuss diabetes in a dental setting. Moreover, utilization of the diabetes risk test in a dental or dental hygiene setting may provide incentive for follow-up with a physician. As healthcare providers, dental professionals have a responsibility to raise diabetes awareness. Future research regarding diabetes assessment in a dental setting must be conducted to better understand the value of screening in a dental setting, and to investigate if this form of screening leads to improved diagnosis and management of diabetes.

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References

1. Danaei G, Finucane MM, Lu Y, et al. National, regional, and global trends in fasting plasma glucose and diabetes prevalence since 1980: systematic analysis of health examination surveys and epidemiological studies with 370 country-years and 2.7 million participants. *Lancet*. 2011;378(9785):31-40.

2. World Health Organization. World Health Organization Fact Sheet No.312. 2011.

3. National Center for Chronic Disease Prevention and Health Promotion. National Diabetes Statistics Report. Centers for Disease Control. 2014.

4. Dall TM, Yang W, Halder P, et al. The economic burden of elevated blood glucose levels in 2012: diagnosed and undiagnosed diabetes, gestational diabetes mellitus, and prediabetes. *Diabetes Care*. 2014;37(12):3172-3179.

5. American Diabetes Association. Diagnosis and classification of diabetes mellitus. *Diabetes care*. 2014;37(Suppl. 1):S81-S90.

6. The International Expert Committee. International Expert Committee report on the role of the A1C assay in the diagnosis of diabetes. *Diabetes Care*. 2009;32:1327-1334.

7. American Diabetes Association. Standards of medical care in diabetes--2015. *Diabetes Care*. 2015;38 Suppl 1:S1-S94.

8. United States Department of Health and Human Services. Healthy People 2020. 2014.

9. Teeuw WJ, Gerdes VE, Loos BG. Effect of periodontal treatment on glycemic control of diabetic patients: a systematic review and meta-analysis. *Diabetes Care*. 2010;33(2):421-427.

10. Chapple IL, Genco R, working group 2 of the joint EFP/AAP workshop. Diabetes and periodontal diseases: consensus report of the Joint EFP/AAP Workshop on Periodontitis and Systemic Diseases. *J Periodontol*. 2013;84(4 Suppl):S106-12.

11. Page RC, Eke PI. Case definitions for use in population-based surveillance of periodontitis. *J Periodontol*. 2007;78(7 Suppl):1387-1399.

12. Martin JA, Page RC, Kaye EK, Hamed MT, Loeb CF. Periodontitis severity plus risk as a tooth loss predictor. *J Periodontol*. 2009;80(2):202-209.

13. Eke PI, Page RC, Wei L, Thornton-Evans G, Genco RJ. Update of the case definitions for population-based surveillance of periodontitis. *J Periodontol*. 2012;83(12):1449-1454.

14. Laurence B. Dentists consider medical screening important and are willing to incorporate screening procedures into dental practice. *J Evid Based Dent Pract*. 2012;12(3 Suppl):32-33.

15. National Center for Chronic Disease Prevention and Health Promotion. Behavioral Risk Factor Surveillance System. Prevalence and Trends Data, Oral Health. Centers for Disease Control and Prevention. 2016.

16. Lalla E, Kunzel C, Burkett S, Cheng B, Lamster IB. Identification of unrecognized diabetes and pre-diabetes in a dental setting. *J Dent Res*. 2011;90(7):855-860.

17. Genco RJ, Schifferle RE, Dunford RG, Falkner KL, Hsu WC, Balukjian J. Screening for diabetes mellitus in dental practices A field trial. *J Am Dent Assoc*. 2014;145(1):57-64.

18. Greenberg BL, Glick M. Assessing systemic disease risk in a dental setting: a public health perspective. *Dent Clin North Am*. 2012;56(4):863-874.

19. Creanor S, Millward BA, Demaine A, et al. Patients' attitudes towards screening for diabetes and other medical conditions in the dental setting. *Brit Dent J*. 2014;216(1).

20. Barasch A, Safford MM, Qvist V, et al. Random blood glucose testing in dental practice: a community-based feasibility study from The Dental Practice-Based Research Network. *J Am Dent Assoc*. 2012;143(3):262-269.

21. Lenters-Westra E, Slingerland RJ. Six of eight hemoglobin A1c point-of-care instruments do not meet the general accepted analytical performance criteria. *Clin Chem*. 2010;56(1):44-52.

22. Shephard MD, Gill JP. The analytical quality of point-of-care testing in the 'QAAMS' model for diabetes management in Australian aboriginal medical services. *Clin Biochem Rev*. 2006;27(4):185-190.

Do Waiting Times in Dental Offices Affect Patient Satisfaction and Evaluations of Patient-Provider Relationships? A Quasi-experimental Study

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Abstract

Purpose: Spending time in waiting rooms prior to dental visits is not uncommon for dental hygiene patients. The objectives were to determine if the length of a patients' waiting time affected their satisfaction with the appointment and their evaluation of their provider. In addition, the patient's level of education and whether the dental visit is a first visit will be examined to determine if these affected the outcome.

Methods: Survey data were collected from 399 adult patients who came for regularly scheduled visits to a dental school clinic. The patients ranged in age from 19 to 93 years (mean=52 years; SD=16.9). For 29% of the patients, this visit was the first visit with this provider.

Results: The patients whose providers were early (n=65) were more satisfied, more likely to plan to follow their provider's recommendation and evaluated their relationship with their provider more positively than patients whose providers were on time (n=283), while the patients in the "late" group (n=32) showed the most negative responses to all questions. Patients from higher educational backgrounds were most negative in their responses when their providers were late. Patients with a first visit whose providers were late had the most negative evaluations of the patient-provider relationship.

Conclusion: Long waiting times prior to a scheduled dental appointment have a negative effect on patients' satisfaction with their visit, the evaluations of the patient-provider relationship and the patients' intentions to return.

Keywords: dental hygienists, dentists, patients, dentist-patient relationships, patient appointment, patient satisfaction, patient schedule, patient compliance, patient cooperation

This study supports the NDHRA priority area, **Health Promotion/Disease Prevention:** Assess strategies for effective communication between the dental hygienist and client.

Introduction

Research in medical settings reports that patients' satisfaction with their provider is an important predictor of their willingness to return for follow-up visits, their cooperation with treatment recommendations and the likelihood that they recommend their provider to other patients.[1-3] Several studies in dentistry have shown similar findings. For example, Patel et al concluded that the relationship with a periodontist was related to patients' decision to accept a recommendation to have surgical treatment.[4] Inglehart et al documented that the level of satisfaction with their dentist affected whether and how long patients had used a bite splint they had received because they suffered from bruxism.[5] Numerous other studies provided additional support for the importance of dental patients' satisfaction with their provider, for reducing patients' dental fear and anxiety, for increasing their confidence in their dentist, and for achieving more positive treatment outcomes.[6-14]

One aspect of a patient visit that was identified as having a negative effect on patients' satisfaction with their provider was the length of time the patients spent in a waiting room. This relationship was documented for patients in many different medical settings, such as when seeking care in emergency rooms, receiving chemotherapy treatment, visiting a primary care provider, or a gynecologist, obstetrician or other medical specialists.[15-20] In dental offices, patients' dissatisfaction with long waiting times have been documented as well.[21-23] However, no study so far explored how the exact length of the patient's time in the waiting room would affect their satisfaction with their provider, their intentions to cooperate with treatment recommendations and their intentions to return for future dental visits. The first objective of this study is to explore if having a long waiting time versus not having to wait or having a dentist who is early affects a patient's response to their providers and their intended treatment cooperation.

In addition to exploring this relationship in gen-

eral, it is also interesting to reflect whether certain groups of patients will respond to longer waiting times more negatively than other groups of patients. One potential moderating factor could be the patient's level of education. Research found that there is a general relationship between patient satisfaction and level of education. Patients with lower levels of education were on average more satisfied with their medical care and providers than patients with higher levels of education.[24-26] In the context of exploring the effects of length of waiting time on dental patients' satisfaction, these earlier findings might not only result in the prediction that less educated patients would be more satisfied than better educated patients, but there might be a differential effect of waiting time length in these groups. The second objective is to explore whether a patient's level of formal education (more precisely, the years of schooling they had received) will differentially affect their satisfaction as a function of the length of their waiting time. It is hypothesized that patients with more formal education will be less satisfied than patients with less formal education, and that this effect would be especially large when patients had a long waiting time.

A second moderating factor might be whether a dental visit is a patient's first encounter with a provider or whether a patient has an already established relationship. At a new patient visit, dental care providers do not only need to assure that they collect all the necessary medical and dental information to provide safe and the best possible care for a patient, but they also have to develop good rapport with a patient. The question is how the length of waiting time affects a new patient versus an established patient's response to their providers.

Methods and Materials

This research was determined to be exempt from oversight by the Institutional Review Board for the Health and Behavioral Sciences at the University of Michigan in Ann Arbor.

Respondents: An a priori power analysis with the program package G*Power 3.1.2 was conducted to compute the needed sample size given alpha=0.05, the power=0.95 and a medium effect size of 0.20 when using a univariate of analysis to test for significant differences in the average responses of respondents whose provider was early, late or on time. The result showed that a sample size of 390 patients was needed. Data were collected from 399 regularly scheduled adult dental/dental hygiene patients. Table I shows that the sample was quite heterogeneous in regard to gender, age and years of education. There were approximately equal numbers of male (n=196) and female (n=203) patients. The patients ranged in age from 19 to 93 years (mean=52 years) and their years of education ranged from 6 to 30 years (mean=14 years).

Table I: Background Characteristics of Study Participants

Background characteristics	Frequencies or Mean	Percent or SD to Range
Gender		
Male Female	196 203	49% 51%
Age	Mean: 52 years	16.87 19 to 93 years
Years of education	Mean: 14 years	2.76 6 to 30 years
Dental visit information		
First visit to dental school		
Yes No	36 363	9% 91%
First visit with this student		
Yes No	117 282	29% 71%
Length of waiting time in minutes	Mean: 9	10.91 0 to 75 minutes
Waiting time - Provider was:		
Early On time Late	66 298 34	17%* 75% 9%

*Percentages might not add up to 100% due to rounding

Procedure: The patients were informed about the study when they arrived for a regularly scheduled appointment in the waiting room area of a Midwestern dental school. If they agreed to respond to a self-administered survey after their appointment, they received the survey and a voucher for free parking during the visit from the research assistant. They responded to the anonymous survey after their appointment and returned it in a sealed envelope to the research assistant. The return of the survey was seen as giving implicit consent. No written consent was required because the survey was anonymous.

Materials: A survey instrument was developed by the research team and then pilot tested with a group of 10 patients. The pilot data showed that the questions were easy to understand and that only formatting changes were needed. The final survey consisted of 4 sets of questions. The first set asked the patients about some background characteristics such as their gender, age, years of education and whether this dental visit was their first visit with this provider. Part 2 consisted of 2 questions related to the length of their waiting time. Question 1 inquired about the length of the waiting time in minutes and Question 2 asked the patients to indicate categorically if their

Table II: Patients' Satisfaction and Relationship-Related Responses

Satisfaction with appointment	1 and 2	3	4	5	Mean SD
Satisfaction with dental visit today*	2%	2%	13%	83%	4.77 0.60
I enjoyed the visit today**	3%	11%	23%	64%	4.46 0.84
I felt comfortable today**	2%	3%	20%	75%	4.68 0.65
I learned more about how to keep my teeth healthy**	3%	5%	15%	77%	4.66 0.77
Index "Satisfaction with appointment" (alpha=0.763)					4.64 0.55
Evaluations of relationship					
My provider was well prepared	1%	3%	11%	85%	4.79 0.57
My provider welcomed me in a friendly manner**	1%	1%	9%	90%	4.87 0.44
My provider explained what would be done today**	1%	1%	10%	88%	4.85 0.47
My provider took time to listen to me**	1%	1%	11%	88%	4.85 0.47
I trust my provider to give good treatment	1%	2%	11%	87%	4.84 0.48
I plan to follow my provider's recommendations**	1%	3%	13%	84%	4.78 0.58
I plan on returning to this provider**	1%	1%	10%	88%	4.85 0.46
I feel my provider values my time**	1%	3%	10%	87%	4.81 0.54
Index "Evaluation of relationship" (alpha=0.962)					4.83 0.45

*Answers ranged from 1=not at all to 5=very satisfied
**Answers ranged from 1=strongly disagree to 5=strongly agree

student provider was early, on time or late for their appointment.

The third set of questions was concerned with the patients' satisfaction with the appointment. The first of these 4 satisfaction questions asked about the patient's "Satisfaction with the dental visit today," with answers ranging from 1=Not at all to 5=Very satisfied. Three additional questions had a Likert-style answer format. They consisted of the statements "I enjoyed the visit today," "I felt comfortable today" and "I learned more about how to keep my teeth healthy." Answers ranged from 1=Strongly disagree to 5=Strongly agree. The Cronbach alpha inter-item consistency reliability coefficient for these four items was 0.763.

The final set of questions consisted of 8 Likert-type questions concerning the patients' evaluations of their relationship with their provider and their responses related to cooperating with their provider's recommendations ("I plan to follow my provider's recommendations") and their likelihood to return to the provider ("I plan to return to this provider"). These answers also ranged from 1=Strongly disagree to 5=Strongly agree. Table II provides an overview of the wording of these statements. The Cronbach alpha inter-item consistency reliability index for these 8 items was 0.962.

Statistical analyses: The data were entered into SPSS (Version 21). Descriptive statistics such as percentages, means, standard deviations and ranges were provided to give an overview of the responses. Inferential statistics were used to compare the responses of subgroups of patients. Multivariate analyses of variance (MANOVA) with the 3 independent variables "Length of waiting time" (with the 3 lev-

Table III: Average Responses of Patients whose Providers Were Early, On Time or Late

Satisfaction with appointment	Waiting time - Provider was:		
	Early	On time	Late
Satisfaction with dental visit today?#	4.96	4.80	4.21***
I enjoyed the visit today.##	4.70	4.44	4.06**
I felt comfortable today.##	4.82	4.68	4.39**
I learned more about how to keep my teeth healthy.##	4.79	4.66	4.33*
Index "Satisfaction with appointment"	4.81	4.64	4.25***
Evaluations of relationship			
My provider was well prepared for my visit.	4.89	4.81	4.47**
My provider welcomed me in a friendly manner.##	4.89	4.89	4.69*
My provider explained what would be done today.##	4.89	4.87	4.56**
My provider took time to listen to me.##	4.91	4.87	4.53***
I trust my provider to give good treatment.	4.86	4.86	4.63*
I plan to follow my provider's recommendations.##	4.88	4.81	4.50**
I plan on returning to this provider.##	4.89	4.87	4.63*
I feel my provider values my time.##	4.89	4.85	4.34***
Index "Evaluation of relationship with provider"	4.89	4.85	4.54***

*p≤0.05; **p≤0.01; *** p≤0.001
#Answers ranged from 1 = not at all to 5 = very satisfied
##Answers ranged from 1 = strongly disagree to 5 = strongly agree

els: Provider was late, on time or early), "Education" (≤12 years of education vs. >12 years of education), and "Type of visit" (first vs. repeat visit) and the dependent variables satisfaction with appointment (4 items) and evaluations or relationship with provider (8 items) were computed. An index "Satisfaction with the appointment' and an index "Evaluation of the patient-provider relationship" were calculated by averaging the responses to the single items in these 2 item sets. The inter-item consistency of these 2 scales was determined with Cronbach alpha coefficients. Univariate analyses of variance with the independent variable "Waiting time," "Level of education" and "First vs. not first visit" and the 2 indices as the dependent variables were conducted. A level of $p<0.05$ was accepted as significant.

Results

Table I shows that 196 male and 203 female patients participated in this study. The patients were on average 52 years old (range 19 to 93 years) and had an average of 14 years of education (range 6 to 30 years), with 151 patients having a high school diploma or fewer years of education and 221 having more years of education than a high school diploma. Nine percent of the patients reported that this was their first visit to the dental school, and 29% indicated that it was the first visit with this particular student provider. When the patients were asked how long they had to wait in the waiting room area, the average answer was 8.59 minutes (range 0 to 75 minutes). In response to the question whether their provider had been early, on time, or late, 17% reported that their provider was early, 75% that their provider was on time, and 9% that their provider was late (Table I).

The vast majority of patients was very satisfied with their dental visit (83%), agreed strongly that they enjoyed their visit (64%), had felt comfortable (75%), and had learned more about how to keep their teeth healthy (77%) (Table II). When a satisfaction index was constructed by averaging the responses to these 4 items, the average response was 4.64 on a 5-point scale with 5 being the most satisfied response. The responses to the 8 items that measured the patients' evaluations of their relationship with their provider and their intentions to follow treatment recommendations and return for a follow-up visit were also very positive. Again, over 80% of the respondents strongly agreed that their provider was well prepared; welcomed them in a friendly manner, explained what would be done, and took time to listen to them. Over 80% also trusted their provider, planned on following the provider's recommendations and on returning to the provider, and felt their provider valued their time. When an index was constructed based on the average of the responses to these 8 items, the average response was 4.83.

The first objective was to compare the responses of patients who had reported that their provider had been early, on time or late. Table III shows that the

Figure 1: Average Satisfaction with the Appointment of Patients whose Provider was Early, On Time or Late by Level of Education

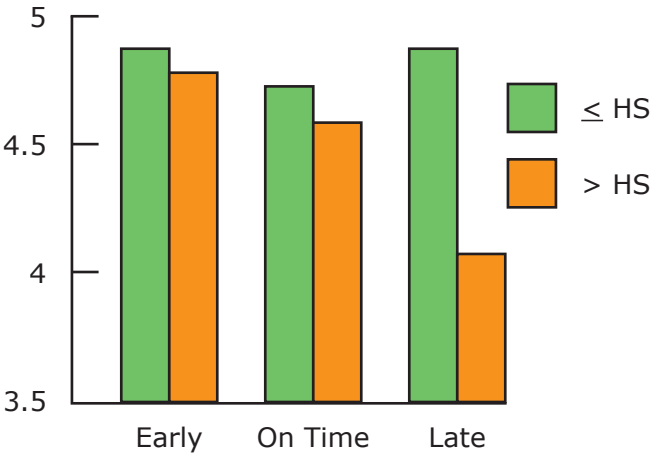
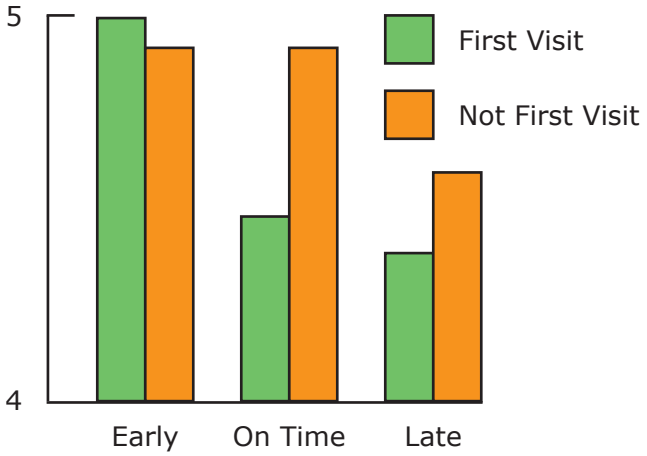


Figure 2: Average Evaluation of the Patient-Provider Relationship of Patients whose Provider Was Early, On Time or Late by First vs. Not First Visit with This Provider



patients whose provider was early were significantly more satisfied with their dental visit than the patients whose provider were on time, and that the least satisfied patients were those whose provider was late for the appointment (4.96 vs. 4.80 vs. 4.21; $p<0.001$). The same pattern of responses was also found in the answers to the statements "I enjoyed the visit today," "I felt comfortable today" and "I learned more about how to keep my teeth healthy." In each instance, patients whose provider was late were least positive in their responses, and the patients whose provider were early were most positive (MANOVA: $F(4/754)=5.15$; $p<0.001$). A univariate analysis of variance with the dependent variable "Satisfaction with appointment" index showed the same overall pattern of responses.

Table III also shows that the 3 groups of respondents whose providers were early, on time or late differed in the same way in their evaluations of their relationship with their provider. For each of the 8 statements, patients whose provider had been late were significantly less positive about their relationship than patients whose providers were early or on time (MANOVA $F(16/742)=2.51$; $p=0.001$).

In addition to comparing the responses of patients whose providers were early, on time or late, it was also explored how the patients' level of education affected the responses of these 3 groups. Figure 1 shows the average level of satisfaction of patients with lower (12 years or less) vs. higher (more than 12 years) levels of education in each of the 3 waiting time groups. This figure shows that patients with a lower level of education were more satisfied in each of the 3 groups than patients with higher levels of education (4.82 vs. 4.48; $p<0.001$). In addition, patients with a higher level of education whose provider was late were on average least satisfied with their appointment (mean: 4.07) compared to all other groups ($p<0.01$). Table IV provides the detailed information concerning the effects of level of education on satisfaction and provider evaluations of patients in the 3 groups. Patients with lower levels of education had more positive average overall evaluations of their relationship with their provider than patients with higher levels of education (4.91 vs. 4.71; $p<0.01$). While the interaction effects between the factors "Waiting time" and "Level of education" were not significant for most of the evaluation items, the average responses to the item "I feel that my provider values my time" showed again that patients with higher levels of education were least positive in response to this item compared to all other groups.

The final question was whether the fact that a patient had a first visit with a provider affected their responses to whether their provider was early, on time or late. Figure 2 shows that the average overall evaluations of patients whose provider had been late and for whom this visit was a first visit were least positive (Mean: 4.40), while the responses of patients with a first visit whose provider were early were most positive (Mean: 5.00) compared to the evaluations of all other respondents. Table V shows that the fact that a patient had a first vs. not a first visit with a provider did not affect how satisfied they were, how much they enjoyed the visit and how comfortable they felt. However, patients with a first visit agreed less strongly that they had learned more about how to keep their teeth healthy than patients for whom this visit was a repeat visit. In addition, patients who saw providers for the first time agreed less strongly that their provider was well prepared for their visit, welcomed them in a friendly manner, explained what would be done during the visit, took time to listen and valued their time than patients for whom this visit was not a first visit with this provider. Patients with a first visit whose provider was late had the least positive response to the statements

Table IV: Average Responses of Patients with High School or Fewer Years of Education vs. With More Years than High School Education whose Providers Were Early, On Time or Late

Satisfaction with appointment	≤HS vs. >HS	Waiting time			Total
		Early	On time	Late	
Satisfaction with dental visit today?#	≤HS	5.00	4.78	5.00***	4.83***
	>HS	4.91	4.80	3.95	4.74
I enjoyed the visit today.##	≤HS	4.77	4.58	4.78	4.63***
	>HS	4.63	4.35	3.86	4.34
I felt comfortable today.##	≤HS	4.80	4.78	4.78	4.78
	>HS	4.83	4.62	4.32	4.62
I learned more about how to keep my teeth healthy.##	≤HS	4.90	4.73	4.89	4.77**
	>HS	4.69	4.60	4.14	4.57
Index "Satisfaction with appointment"	≤HS	4.87	4.72	4.86**	4.82***
	>HS	4.76	4.59	4.07	4.48
Evaluations of relationship					
My provider was well prepared for my visit.	≤HS	4.93	4.82	4.88	4.85*
	>HS	4.85	4.79	4.41	4.76
My provider welcomed me in a friendly manner.##	≤HS	4.93	4.89	4.88	4.90
	>HS	4.85	4.88	4.68	4.86
My provider explained what would be done today.##	≤HS	4.93	4.90	4.88	4.91*
	>HS	4.85	4.85	4.50	4.82
My provider took time to listen to me.##	≤HS	4.97	4.89	4.88	4.91*
	>HS	4.85	4.85	4.45	4.81
I trust my provider to give good treatment.	≤HS	4.93	4.87	5.00	4.89**
	>HS	4.79	4.84	4.55	4.81
I plan to follow my provider's recommendations.##	≤HS	4.97	4.86	4.75	4.87*
	>HS	4.79	4.76	4.45	4.74
I plan on returning to this provider.##	≤HS	4.97	4.87	5.00	4.90**
	>HS	4.82	4.87	4.55	4.83
I feel my provider values my time.##	≤HS	4.97	4.90	5.00***	4.92***
	>HS	4.82	4.81	4.18	4.75
Index "Evaluation of relationship with provider"	≤HS	4.95	4.88	4.91	4.91**
	>HS	4.83	4.83	4.47	4.71

*p≤0.05; **p≤0.01; ***p≤0.001
#Answers ranged from 1=not at all to 5=very satisfied
##Answers ranged from 1=strongly disagree to 5=strongly agree

"My provider explained what would be done today" and "My provider took time to listen" compared to all other respondent groups.

Discussion

Patients' satisfaction with their medical and dental visits and their provider is crucial for their willingness to cooperate with treatment recommendations, their willingness to return for a follow-up visit and to recommend a provider to other patients.[1-5] While a lack of treatment cooperation ultimately might affect patients' health, not returning for follow-up appointments and not recommending a provider to other patients can clearly affect the success of a dental practice.[5] Avoiding situations that negatively affect patients' satisfaction is therefore crucial. The results of this study showed that letting patients wait for their appointments and not being on time affects their satisfaction negatively. Managing appointment times carefully is therefore important. However, there are times when patients might have to wait due to unforeseen events. The way these situations are being managed seem to determine ultimately how much

Table V: Average Responses of Patients with a First vs. Not a First Visit to the Dental School Clinics whose Providers Were Early, On time or Late

Satisfaction with appointment	First vs. Not First	Waiting time - Provider was:			Total
		Early	On time	Late	
Satisfaction with dental visit today?#	First	4.88	4.79	4.08	4.73
	Not First	5.00	4.80	4.37	4.80
I enjoyed the visit today.##	First	4.42	4.47	4.00	4.40
	Not First	4.86	4.43	4.21	4.48
I felt comfortable today.##	First	4.63	4.67	4.31	4.62
	Not First	4.93	4.68	4.53	4.70
I learned more about how to keep my teeth healthy.##	First	4.46	4.63	4.15	4.54*
	Not First	4.98	4.68	4.47	4.71
Index "Satisfaction with appointment"	First	4.59	4.64	4.13	4.52
	Not First	4.94	4.65	4.39	4.65
Evaluations of Relationship#					
My provider was well prepared for my visit.	First	4.70	4.77	4.38	4.71*
	Not First	5.00	4.18	4.56	4.83
My provider welcomed me in a friendly manner.	First	4.70	4.89	4.62	4.81*
	Not First	5.00	4.89	4.78	4.90
My provider explained what would be done today.	First	4.70	4.86	4.31*	4.76***
	Not First	5.00	4.88	4.78	4.89
My provider took time to listen to me.	First	4.74	4.86	4.31*	4.77**
	Not First	5.00	4.87	4.72	4.88
I trust my provider to give good treatment.	First	4.74	4.85	4.54	4.79
	Not First	4.93	4.86	4.72	4.86
I plan to follow my provider's recommendations.	First	4.74	4.77	4.46	4.73
	Not First	4.95	4.82	4.56	4.82
I plan on returning to this provider.	First	4.74	4.85	4.54	4.79*
	Not First	4.98	4.88	4.72	4.88
I feel my provider values my time.	First	4.74	4.80	4.15	4.71**
	Not First	4.98	4.86	4.56	4.86
Index "Evaluation of relationship with provider"	First	5.00	4.49	4.40*	4.61
	Not First	4.87	4.88	4.57	4.85

*p≤0.05; **p≤0.01; ***p≤0.001
#Answers ranged from 1=not at all to 5=very satisfied
##Answers ranged from 1=strongly disagree to 5=strongly agree

the length of waiting affects patients' satisfaction, at least in the short term. Research in medical settings found that when medical care providers were late for their appointment with a patient, spending more time with the patient during the appointment could moderate the negative effects of a long waiting time.[19,27,28]

The results of this study showed that patient characteristics might also affect the degree to which longer waiting times affect patients' satisfaction. While previous research clearly documented that patients' level of education was related to their treatment satisfaction,[24-26] this is the first study that documents that patients' level of education might moderate their responses to longer waiting times. In addition, there is some evidence that whether a dental visit is a new patient visit could further moderate patients' responses. Future studies could explore whether other patient characteristics such as patients' age might also affect responses to longer waiting times.[29]

In addition to considering how longer waiting times affect patients' responses, it is also noteworthy to

consider that research showed that providers' satisfaction with an appointment was also lower when they could not provide on-time care for their patients and the patients had to wait.[18] Running late for appointments might induce stress that affects patient-provider interactions and providers' professional quality of life. In summary, longer waiting times for patients are not only likely to result in reduced patient and provider satisfaction in a given situation, but might affect the success of a practice in the long run.

This study had several limitations. First, the data were collected in a dental school setting where dental care is relatively less expensive, but takes longer than in a private office. Answers to the question concerning the patients' intent to return might be affected by the fact that they were seeking dental treatment for a reduced price. In private practice settings, patients' intentions to return to a provider, especially if a dental visit is their first visit, might therefore be more affected by their level of satisfaction with an appointment. Second, given that these data were collected in a dental school, the patients might be more likely to come from a lower socio-economic background. Future research might therefore consider patients' economic situation in connection with their level of education as a factor that might determine the patients' responses to long waiting times. Third, no data were collected concerning whether these patients were treated by dental or dental hygiene students. It is therefore not possible to answer the question whether a longer waiting time for an appointment with a dental hygienist vs. a dentist would affect patients' responses differentially. Finally, all dependent variables were assessed with patients' responses to a survey. In future studies, it would be interesting to collect objective data such as whether patients actually return to a provider after having had to wait for a long time. In addition, several possible variables that might have affected the outcomes such as the procedure performed and the amount of experience of the provider were not included and should be considered in future studies. Assessing patients' responses at later points in time could also be helpful because it would clarify if the findings in this study hold up over time.

Conclusion

Based on these findings, it can be concluded that the length of time patients have to wait in a waiting room area for their dental care provider negatively affects their level of satisfaction with the appointment, their evaluations of the patient-provider relationship as well as their intentions to cooperate with the providers' recommendations. These negative effects on patients' level of appointment satisfaction are especially severe for patients with higher levels of education. In addition, if a provider is late for a first visit with a new patient, it can be expected that the patients' overall evaluations of the patient-provider relationships will be least positive compared to the evaluations of all other patient groups.

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References

1. Federman AD, Cook EF, Phillips RS, et al. Intention to Discontinue Care Among Primary Care Patients. *e J Gen Intern Med.* 2001;16:668-674.

2. Wartman SA, Morlock LL, Malitz FE, Palm EA. Patient understanding and satisfaction as predictors of compliance. *Med Care*. 1983;21(9):886-891.

3. Halfon N, Moira I, Ritesh M, Lynn MO. Satisfaction with health care for young children. *Pediatrics.* 2004;113(6):1965-1972.

4. Patel AM, Richards RS, Wang H, Inglehart MR. Surgical or non-surgical periodontal treatment? Factors affecting decision making. *J Periodontol*. 2006;77(4):678-683.

5. Inglehart MR, Widmalm SE, Syriac PJ. Occlusal splints and quality of life – does the quality of the patient-provider relationship matter? *Oral Health Prev Dent*. 2014;12(3):249-258.

6. Kim JS, Boynton JR, Inglehart MR. Parents' Presence in the Operatory During their Child's Dental Visit: A Person-Environmental Fit Analysis of Parents' Responses. *Ped Dent*. 2012;34(5):337-343.

7. Okullo, AN Astrom, Haugerjorden O. Influence of perceived provider performance on satisfaction with oral health care among adolescents. *Community Dent Oral Epidemiol*. 2004;32:447-455.

8. Shouten BC, Eijkman MA, Hoogstraten J. Dentists' and patients' communicative behavior and their satisfaction with the dental encounter. *Community Dent Health*. 2003; 20(1):11-15.

9. Sondell K, Soderfeldt B, Palmqvist S. Dentist-patient communication and patient satisfaction in prosthetic dentistry. *Int J Prosthodont*. 2002; 15(1):28-37.

10. Hottel TL, Hardigan OC. Improvement in the interpersonal communication skills of dental students. *J Dent Educ*. 2005; 69(2):281-284.

11. Corah N, O'Shea R, Bissell G. The dentist-patient relationship: Perceptions by patients of dentist behavior in relation to satisfaction and anxiety. *J Am Dent Assoc*. 1985; 111:443-446.

12. Corah N, O'Shea R, Bissell G, Thines T, Mendola P. The dentist-patient relationship: Perceived dentist behaviors that reduce patient anxiety and increase satisfaction. *J Am Dent Assoc*. 1988;116:73-76.

13. Van der Molen HT, Klaver AAM, Duyx MP. Effectiveness of a communication skills training programme for the management of dental anxiety. *Br Dent J.* 2004; 196:101-107.

14. Carey JA, Madill A, Manogue M. Communication skills in dental education: A systematic research review. *Eur J Dent Educ.* 2010;14(2):69-78.

15. Booth AJ, Harrison CJ, Gardener GJ, Gray AJ. Waiting times and patient satisfaction in the accident and emergency department. *Arch Emerg Med*. 1992;9:162-168.

16. Thompson DA, Yarnold PR. Relating patient satisfaction to waiting time perceptions and expectations: the disconfirmation paradigm. *Acad Emerg Med*. 1995;2(12):1057-1062.

17. Spaite DW, Bartholomeaux F, Guisto J, et al. Rapid process redesign in a university based emergency departmetn: decreasing waiting time intervals and improving patient satisfaction. *Ann Emerg Med*. 2002;39(2):168-177.

18. Kallen MA, Terrell JA, Lewis-Patterson P, Hwang JP. Improving wait time for chemotherapy in an outpatient clinic at a comprehensive cancer center. *J Oncol Prac.* 2012; 8(1):e1-e7.

19. Anderson RT, Camacho FT, Balkrishnan R. Willing to wait? the influence of patient wait time on satisfaction with primary care. *BMC Health Serv Res.* 2007;7(31):1-5.

20. Patel I, Chang J, Srivastava J, Feldman S, Levender M, Balkrishnan R. Patient satisfaction with obstetricians compared with other specialties: analysis of us self-reported survey data. *Patient Relat Outcome Meas.* 2011;2(21):21-26.

21. Chu CH, Lo ECM. Patients' satisfaction with dental services provided by a university in Hong Kong. *Int Den J*. 1999;49:53-59.

22. Al-Mudaf BA, Moussa MAA, Al-Terky MA, Al-Dakhil GH, El-Farargy AE, Al-Ouzairi SS. Patient satisfaction with three dental specialty services: a centre-based study. *Med Princ Pract*. 2003;12:39-43.

23. Tuominem R, Eriksson AL. Patient experiences during waiting time for dental treatment. *Acta Odontol Scand*. 2012;70:21-26.

24. Hall JA, Dornana MC. Patient sociodemographic characteristics as predictors of satisfaction with medical care. *Soc Sci Med*. 1990;30:811-18.

25. Anderson LA, Zimmerman MA. Patient and physician perceptions of their relationship and patient satisfaction: a study of chronic disease management. *Patient Educ Couns*. 1993;20:27-36.

26. Schutz SM, Lee JG, Schmitt CM, Almon M, Baillie J. Clues to patient dissatisfaction with conscious sedation for colonoscopy. *Am J Gastroenterol*. 1994;89:1476-1479.

27. Camacho F, Anderson RT, Safrit A, Jones AS, Hoffmann P. The relationship between patient's perceived waiting time and office-based practice satisfaction. *NC Med J*. 2006;67(6):409-413.

28. Feddock CA, Hoellein AR, Griffith III CH, Wilson JF, Bowerman JL, Becker NS, Caudill TS.Can physician improve patient satisfaction with long waiting times? *Eval Health Prof*. 2005;28(40):40-52.

29. Kong MC, Camacho FT, Feldman SR, Anderson RT, Balkrishnan R. Correlates of patient satisfaction with physician visit: differences between elderly and non-elderly survey respondents. *Health Qual Life Outcomes*. 2007;5(62):1-6.