



American
Dental
Hygienists'
Association

JOURNAL OF DENTAL HYGIENE

THE AMERICAN DENTAL HYGIENISTS' ASSOCIATION

FEBRUARY 2017 • VOLUME 91 • NUMBER 1

- Access to Oral Health Care: A National Crisis and Call for Reform
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STATEMENT OF PURPOSE

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

SUBSCRIPTIONS

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Growth, Change...and Gratitude!

Rebecca S. Wilder, RDH, BS, MS

Being grateful is important! Here at the American Dental Hygienists' Association, we are extremely grateful for everyone who supports the Journal of Dental Hygiene — from the authors and their submissions of cutting edge manuscripts to our many volunteer peer reviewers who provide their time and expertise to write thorough and thoughtful reviews. In addition, we have many individuals who are not formally on our Editorial Review Board who contribute their time and expertise when needed. This month's editorial is dedicated to all of who provide continuous support for the production of our profession's scholarly, peer-reviewed Journal.

The Journal of Dental Hygiene editorial review board is composed of a wide ranging group of professionals - dental hygienists, dentists, educators, physical therapists, nurses and other specialists in health care — all with the highest level of expertise in their field. As the profession of dental hygiene continues to grow and expand, it is even more important to collaborate with our professional colleagues so that we advance the profession while providing the best, evidence-based patient care possible. The philosophy of interprofessional collaboration is reflected in the Journal of Dental Hygiene.

The past year has brought a number of changes to the JDH. The Journal has a new home at ADHA in the Professional Development and Membership Engagement Division, under the division's Co-Director, Sue Bessner. I am thrilled with the JDH's new home, as Sue has been directly involved with all the scientific and research endeavors at ADHA. Sue has a great understanding and appreciation for our scholarly journal. I am also excited that we have a new managing editor, Cathy Draper! Many of you know Cathy from

her various roles in dental hygiene over the years. As the managing editor, Cathy is responsible as the primary contact between our authors and reviewers and takes the manuscripts from submission all the way through to publication. She has been a wonderful addition to the JDH team.



I would also like to gratefully acknowledge the ongoing financial support and valuable contributions of the American Dental Hygienists' Association and their unwavering commitment to the Journal of Dental Hygiene. The JDH is an outstanding example of ADHA's recognition of the value of scholarship to the growth of the profession.

The members of the 2016 Journal of Dental Hygiene Editorial Review Board are listed on following page along with our guest reviewers from last year. Thank you again for your time, your unique knowledge and commitment to the growth of the dental hygiene profession.

All of us here at the Journal of Dental Hygiene look forward to working with each of you as readers, researchers, authors and reviewers, to continuously improve OUR Journal and advance OUR profession!

Sincerely,
Rebecca Wilder, RDH, BS, MS
Editor-in-Chief, Journal of Dental Hygiene

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CRITICAL ISSUES IN DENTAL HYGIENE

Access to Oral Health Care: A National Crisis and Call for Reform

Catherine H. Bersell, RDH, BASDH

ABSTRACT

Purpose: According to the report Healthy People 2020, oral health is integral to overall health and access to dental services is essential to promoting and maintaining good oral health. Yet, those who need dental care the most are often the least likely to receive it. The dental hygiene profession is poised to play a pivotal role in the resolution of oral health disparities. The purpose of this manuscript is to examine the critical issue of access to oral health care in the United States from various perspectives and consider potential implications for dental professionals and the oral health care system. This report focuses on major underserved and vulnerable populations and highlights several barriers that significantly affect the ability to access and navigate the oral health care system. These include low socioeconomic status; the shortage and maldistribution of dentists; a lack of professional training regarding current evidence-based oral health guidelines; deficient continuity of care due to inadequate interdisciplinary collaboration; low oral health literacy; and patient perceptions and misconceptions about preventive dental care. This report also contains an update on provider participation in Medicaid; the state of children's oral health; and emerging workforce models, state initiatives, and legislative reforms. Recommendations increasing access to care require local, state, and federal stakeholders to combine forces that take advantage of the existing dental hygiene workforce, utilize innovative delivery models, improve license reciprocity, reduce prohibitive supervision, and expand the dental hygiene scope of practice. The major focus of future research will be on the implementation of mid-level oral health care providers. Dental hygienists are an integral part of the access to care solution and have a great opportunity to lead the call to action and fulfill the American Dental Hygienists' Association's mandate that oral health care is the right of all people.

Keywords: oral health, overall health, access to care, vulnerable populations, oral health literacy, interdisciplinary collaboration, emerging workforce models

This manuscript supports the NDHRA priority area, **Population level: Access to care** (vulnerable populations).

Introduction

Access to dental care is a critical and complex problem in America. The position of the American Dental Hygienists' Association (ADHA) is that oral health care is a right of all people and dental hygienists must play a vital role in the solution to eliminate the barriers associated with access to care.¹ There are many vulnerable and underserved populations in the United States(US).² According to statistics compiled by the US Senate Subcommittee on Primary Health and Aging (USPHA), groups that have the most difficulty accessing oral health care include young children, pregnant women, and older adults.² Many factors influence the ability to access dental care; they form a complex, multidimensional matrix in which multiple barriers may occur simultaneously.² There are external barriers which include the prohibitive costs associated with dental care; inability to obtain dental insurance; shortage and maldistribution of dentists; low rate of Medicaid provider participation; insufficient professional training regarding evidence-based guidelines; lack of interdisciplinary collaboration; inadequate dental safety nets, and a complex oral health system that can be difficult to navigate.² There are also internal

barriers to oral health care related to low oral health literacy; fear and anxiety associated with dental care; and perceptions and misconceptions about preventive oral health care. Both the external and internal barriers are further complicated by problems with transportation, child care, work release, scheduling, and personal mobility.² This report explores the major challenges and current solutions, such as direct access, increased scope of practice, and various state and federal legislative responses to incorporate dental therapists as mid-level oral health providers as a means to increase access for underserved populations.

Poverty

Low-income populations of all ages experience the lowest access to oral health care.² A 2012 large-scale Senate investigation revealed that 17 million children from low-income families did not receive any preventive dental care and 130 million Americans lacked dental insurance coverage in 2009.² While Medicaid dental coverage assists children up to the age of 21, it is very limited for adults and Medicare does not provide any dental coverage for older citizens.³ The working poor live from paycheck

to paycheck and face maximum difficulties when attempting to obtain dental care.^{2,4} They work hard, often holding multiple jobs, yet are unable to buy dental insurance or self-pay for the actual care.² They contribute into the system as taxpayers, yet don't qualify for government-assisted programs.² A dental emergency means loss of wages and can present a significant financial burden.

Shortage and Maldistribution of Dentists

A disproportionate number of those living in poverty and the working poor reside in geographically isolated areas with a maldistribution of dentists and a limited number of Medicaid providers.⁴ Rural areas often have inadequate public transportation systems, making it very difficult to access dentists outside the proximal area.^{4,6} When compared to metropolitan populations, rural populations have a higher prevalence of caries and tooth loss and a lower degree of private dental insurance combined with limited access to public dental services.^{5,7} As a result, those who need dental care the most are often the least likely to receive it.²

More than 49 million Americans live in places that are dentally underserved.⁶ According to the Health Resources and Service Administration and the Kaiser Family Foundation, approximately 5,000 areas in the United States are designated as Dental Health Professional Shortage Areas (DHPSAs) based on a population to provider ratio of 5,000 to 1 and 4,000 to 1 in geographic and geographic high need areas.^{8,9} They are also designated DHPSA based on population; Native American tribes and American Indian/Alaska Native (AI/AN) are automatically included.^{8,9} Approximately 75% of the DHPSAs in the United States are located in rural areas.⁵ Additional factors include an overall reduction in the number of new graduates entering the workforce; dentists retiring at a faster pace than graduates entering the workforce; increased trends toward dental specialization; and gravitation to densely populated areas.^{7,10}

It is estimated that over 7,200 dentists will be needed to provide the necessary oral health care services as older dentists retire.^{8,9} Graduates often gravitate to more densely populated areas because of heavy student debt; in 2014, the average debt burden for a dental school graduate was about \$250,000.¹¹ A 15-year fixed rate student loan with 6% interest adds \$130,000, making a total loan debt of \$380,000. Recently, government programs have been developed to help balance the debt.⁶ The National Health Service Corps offers a loan repayment program for both dentists and registered dental hygienists with an initial award of \$50,000 in exchange for a two-year commitment to a DHPSA.⁶

Increasing the workforce is not the only solution; strategic placement is equally important.¹⁰ Graduates must be interested and willing to go to underserved areas to reach vulnerable populations. The Dental Pipeline Program, a five-year initiative, studied altruism in dental students and its relationship to the willingness to work in underserved areas.¹⁰ The results

indicate that financial and professional expectations often take precedence over selfless concern and the welfare of others.¹⁰ A dental workforce that is able to respond to the needs of the community requires the engagement of dental educators in identifying candidates who are predisposed to altruism during the interviewing process. The institution must be able to provide a wide variety of opportunities for student engagement with vulnerable and underserved populations during their education experience.

Oral Health Literacy

Increasing the workforce, strategic placement to DHPSAs, and program acceptance initiatives are all important steps addressing external barriers. However, there are also internal influences surrounding access to care. Oral health literacy (OHL) has been identified as a major internal barrier.¹² It is vital to understand how OHL affects an individual's ability to access and navigate the oral health care system and implement preventive oral health practices.¹² The term OHL refers to the capacity to acquire, process, comprehend, and act upon basic oral health information.¹² Only 12 % of the general population and 3% of Medicaid or Medicare recipients are considered to be health literate, meaning that most people have literacy challenges somewhere within the defined spectrum.¹² Translated to activities of daily living implications, approximately 50% of Americans can't read or understand a prescription label.¹² Low OHL is also associated with decreased utilization of preventive dental services and increased utilization of emergency department services.¹³ Higher OHL levels are associated with better patient-dentist/dental hygienist communication, cooperative relationships, improved patterns of dental care, and patient appreciation for preventive measures.¹³ The relationship between OHL and oral health behaviors is complex; while it seems clear that there is a correlation, a direct causal relationship has not yet been established.¹³ In addition, there are significant dental public health implications in the area of OHL. Populations that are unable to access to care must be able to obtain educational materials regarding preventive dental care that are easy to process, comprehend, and utilize.¹³ Communication and advocacy are essential elements of OHL promotion and utilization; information must be user friendly, focus on all life stages, be culturally competent, widely accessible, and incorporate all forms of media and technology.¹³ Oral Health Literacy is an important area of research with potential for expanded professional school curricula, development of community and school-based programs, professional continuing education requirements and interdisciplinary training. Improved OHL may also decrease the strain on safety nets, such as hospital emergency departments, which are often limited to delivering palliative dental care.¹³

Safety Net

Untreated oral disease, such as caries, worsens with time and eventually requires more serious

and expensive treatment.¹⁴ Individuals without a personal dentist often seek emergency care at a hospital.¹⁴ According to the Nationwide Emergency Department Sample (NEDS), the number of dental-related emergency visits is increasing.¹⁴ In 2012, the U.S. health care system spent \$1.6 billion on dental-related visits with an average cost of \$745 per visit.¹⁴ Medicaid paid approximately 62% of these charges for children between the ages of 0-18 and 33% for adults between the ages of 18-64.¹⁴ The majority of dental-related emergencies are nontraumatic in nature.¹⁴

Emergency department (ED) physicians are not equipped to provide comprehensive dental care; they are more likely to prescribe pain medication and/or antibiotics and refer patients to a dentist.¹⁴ Many patients are unable to seek follow-up care, because they lack a consistent relationship with a dentist, which in turn creates a vicious cycle with many people falling between the cracks.^{2,14} Such was the case for 24-year-old Kyle Willis of Cincinnati, who died as the result of an infection from an untreated dental abscess spreading to his brain.¹⁵ Mr Willis had visited an ED and received prescriptions for antibiotics and pain medication. Unable to afford both drugs, he only filled the pain medication prescription. A few weeks later, after becoming delirious, he was rushed to a local hospital where he subsequently died.¹⁵ Sadly, this particular hospital housed a dental clinic that served vulnerable populations but there were no advocates to help Mr. Willis navigate the system.¹⁵ Opportunities to reduce dental-related ED visits and areas of future study include developing targeted programs to connect patients to dental homes; diverting ED Medicaid funds to increase reimbursement rates to primary providers; establishment of hospital-based dental clinics; and extending private dental office hours.¹⁴

Vulnerable and Underserved Populations:

Children

Children, because they are dependent upon a caregiver for dental care appointments, daily oral hygiene, and nutritional health, are particularly vulnerable. Dental caries, the most common chronic disease of childhood, affects 60% of children ages 5 to 17 and 25% of children under the age of 5 experience Early Childhood Caries (ECC).^{16,17} A higher prevalence of dental caries is associated with children living in poverty.¹⁷ Children with untreated dental caries experience adverse outcomes impacting their overall health and quality of life extending into adulthood.¹⁷ Short-term effects may include pain, tooth loss, chewing difficulty, speech impediment, sleep disruption, inability to concentrate, school absence, behavioral problems, compromised self-esteem and social development, emergency visits, and extensive treatment requiring general anesthesia.¹⁷ Long-term effects may include a higher risk of new carious lesions, malocclusion due to premature tooth loss, nutritional problems, diminished physical growth, dental anxiety or fear, and poor oral health.¹⁷

Dental caries is almost completely preventable, but access to preventive care is out of reach for many families.² The Affordable Care Act mandated Medicaid dental enrollment for children; unfortunately, this has not necessarily correlated with an increase in access to care.² The national average of practicing dentists who accept Medicaid is 20%; only a fraction of those commit a substantial share of their practice to serving the poor, chronically ill, or residents of rural communities.^{2,3} Reasons cited for the limited involvement with Medicaid include low reimbursement rates, cumbersome administrative processes, high rates of appointment no-shows, and low compliance with recommended treatment.¹⁸ In looking at the financial barriers and the variations in reimbursement rates, in 2013 the average Medicaid fee-for-service reimbursement was about 50% of commercial insurance rates; Minnesota had the lowest reimbursement rate at 27% and Delaware had the highest at 81%.¹⁹ Medicaid dentist participation ranges from a low 10% in Florida to a high 95% in Vermont.³ However, this does not mean that 95% of the Medicaid recipients in Vermont have the ability to access care. While the utilization in Vermont is about 57%, this is still better than the national average of 35%.³ The difficulty with this type of data is that dentists who file even one Medicaid claim are counted as provider participants.³

A well-known example of the pediatric access to care crisis is the case of twelve-year-old Deamonte Driver from Maryland. In 2007, Driver, among the unfortunate two-thirds of the population unable to access a Medicaid dentist, died from complications of an untreated dental abscess.²⁰ This tragedy made national headlines and exposed a fragmented dental-care system, prompting representatives from across the country to address the state of children's dental care. As a result of Driver's death, the state established the Maryland Dental Action Coalition and now a leader in oral health reform initiatives.²⁰

In 2011, the Pew Children's Dental Campaign assessed the level of care for children in the United States and graded all 50 states based on eight benchmarks related to sealants, fluoridation, Medicaid, and expanded care delivery models.^{21,23} While no state accomplished all eight goals, Maryland led the nation, meeting seven of the eight benchmarks.²¹ Hawaii accomplished only one of the benchmarks, reflecting the lowest performance.²¹ Florida, Hawaii, and New Jersey received two consecutive "F" grades.²¹

Dental sealants are one of the most vital weapons in the arsenal to combat caries.^{21,23} Sealants are 30% the cost of a filling; they provide 80% caries reduction during the two years after placement and 60% over a five-year period.^{22,23} In spite of the caries reduction and cost effectiveness of sealants, approximately 80% of states lack school sealant programs for high-risk populations and only eleven states have implemented sealant programs in 50% or more of the schools with high-risk populations.^{22,23} Alaska, Oregon, New Hampshire, Maine, and Maryland achieved at least 75% implementation.²² The most

successful school-based sealant programs maintain stakeholder support and cooperation on local, state, and federal levels; adhere to evidence-based best practices; and permit a hygienist to place sealants without requiring a dentist's prior examination.^{22,23}

Pregnant Women

Pregnant women, especially those of low socioeconomic status, are a vulnerable population.^{2,24-26} Access to dental services during pregnancy benefits maternal oral health and provides teachable moments that may impact birth outcomes as well as the oral health of future generations.²⁴⁻²⁶ During the perinatal period, women are particularly motivated to learn infant care, so it is vital to reach them early to prevent possible adverse birth outcomes associated with periodontal disease along with strategies to prevent ECC.²⁴⁻²⁶ Opportunities during pregnancy include addressing current dental needs; discussing oral health changes during pregnancy; providing dental hygiene instructions; discussing prenatal nutritional requirements; reviewing feeding practices contributing to ECC; teaching infant oral hygiene techniques; and educating on the importance of the primary teeth.²⁴⁻²⁶ Yet, most women do not access dental care during pregnancy and only 25-50% of those who perceive that they have a dental problem actually seek treatment.²⁴⁻²⁶ This is an unfortunate statistic, since many low-income pregnant women are eligible for dental care through Medicaid during the prenatal period.²⁵

Maternal oral health is integrally connected to pediatric oral health in a variety of ways. First, an estimated 30-40% of pregnant women have some form of periodontal disease and current research indicates an association between periodontal disease and adverse birth outcomes including low birth weight, preterm birth, preeclampsia, and gestational diabetes.²⁴⁻²⁶ Secondly, pregnant women with poor oral health often have high levels of streptococcus mutans and carry the risk of vertically transmitting this cariogenic bacteria to their infants. Children are five times more likely to experience oral health problems if their mothers have poor oral health.²⁶ Misconceptions and wives tales, such as gain a baby, lose a tooth, pregnancy depletes calcium from teeth and gingivitis is normal during pregnancy, result in a decreased understanding of the importance of dental care during pregnancy.

Many women are concerned that dental treatment during pregnancy will somehow harm their unborn child.²⁶ This is a fallacy that most health professionals do little to assuage even though evidence-based best practices support and encourage regular dental care during pregnancy.^{25,26} While a variety of professional associations have issued policy statements and consensus statements on the importance of oral care, over 80% of obstetricians do not include oral health screening questions as part of their intake health history and as many as 94% do not routinely provide dental referrals.²⁵ Medical and dental schools do not adequately address dental care delivery

during pregnancy; the majority of medical residents only receive a few hours of oral health training.²⁴ Likewise, many dentists are hesitant to provide care during pregnancy due to concerns about liability, misconceptions about maternal or fetal safety, lack of knowledge about current evidence-based guidelines, and lack of training for this population.^{24,25} Change must include interdisciplinary collaboration ensuring that the public receives consistent information from many access points and the incorporation of oral health screening questionnaires during the initial prenatal appointment.²⁵ Current scientific, evidence-based treatment guidelines require curricular revisions and continuing education requirements so that the workforce is equipped to serve people in all stages of life. Two innovative programs to directly reach pregnant women include Text4baby, an education campaign of the National Healthy Mothers, Healthy Babies Coalition, and New York state's Maternal Oral Health project.²⁴ Text4baby offers a texting service that promotes maternal and child health; messages are in English and Spanish and focus on a variety of topics, including oral health.²⁴ More than 35,000 users have registered and numerous health plans have become official outreach partners.²⁴ The Maternal Oral Health project is an education, referral, and dental care system established by a public-private partnership between two hospitals and a private periodontal practice for low-income pregnant women in New York.²⁴

Older Adults

Older adults are particularly vulnerable because many of their dental perceptions and oral hygiene habits originate in childhood and continue to influence them throughout life.¹⁷ In addition, Medicare does not include dental coverage and many older adults live on fixed incomes with a limited ability to pay the high costs associated with dental care.^{2,3} In the United States, 25% of adults, aged 65 and older, are edentulous.² Dental caries and periodontal disease represent increased risks for this age group, and active decay has been demonstrated to be more prevalent than in the pediatric population.²⁷ There are numerous misconceptions concerning oral health within the geriatric community.²⁷ One study focusing on the older adults revealed that while many believe oral health is important, they do not receive regular dental care. Major influences include outdated dental health information; diminished dental perceptions; fear; lack of a relationship with a dentist; and mobility difficulties.²⁷ While there is a predominant belief among older adults that a strong relationship exists between oral health and general health, many equate the lack of perceived pain with good health.²⁷ Systemic diseases and medications often impact oral health; 80% of older adults have one chronic condition; 50% have two or more health conditions.²⁸ Poor oral health also adds additional burdens for those already afflicted with multiple chronic health conditions, such as diabetes or heart disease.

Social Reforms for the Delivery of Oral Health Care

Disparities in the delivery of services have reached a critical level requiring social reform and legislative changes. Access to oral health care is a not only a health issue; it reflects the ability of a profession to respond to the needs of the public and exhibit the principles of social justice and moral responsibility.²⁹ While the American Dental Association (ADA) and the American Dental Hygienists' Association (ADHA) agree that the dental profession has a responsibility to improve the oral health status of all Americans, they do not necessarily agree on how best to answer this call to action to solve the disparities in the oral health care system.²⁹

The position of the ADA concerning oral health care reform cites that underfunding and bureaucracy within the Medicaid system are principle barriers to access.¹⁸ They supported the Essential Oral Health Care Act of 2009, which ensured that dentists participating in the Medicaid program get paid market rate fees and eliminate administrative barriers.¹⁸ In addition, the ADA has advocated for the development of Community Dental Health Coordinators to focus on prevention and education.³⁰ The ADA officially opposes the development of the Advanced Dental Hygiene Practitioner and proposed the legislation for a Dental Therapist, mid-level provider.¹⁸

The ADHA supports the Comprehensive Dental Reform Act, which extends dental coverage and expands the workforce by including a mid-level oral health care provider.³¹ The ADHA supports the Advanced Dental Hygiene Practitioner (ADHP) mid-level provider model and maintains that individuals who graduate from accredited dental hygiene programs are competent to provide care without supervision, should qualify to participate in loan forgiveness programs and the National Health Service Corps Scholarship, and be recognized as Medicaid providers by federal and state governments.³¹

Mid-Level Providers

Mid-level oral health providers were introduced as an oral health care delivery model designed to increase access to populations with critical oral health care needs.³² The mid-level provider is not a new concept; dental therapists are utilized in 52 countries around the world and are especially trained to focus on the needs of children.³² Some of the largest countries exclusively employ this delivery model to reach millions of children who would otherwise go untreated.³² Many programs are based on the Dental Therapy curriculum at the University of Otago, a well-respected international dental school in New Zealand with 88 years of experience training dental therapists.³²

One of the most outspoken proponents for the mid-level provider is David Nash, DMD, MS, EdD, Professor of Dental Education and Pediatric Dentistry for the College of Dentistry at the University of Kentucky.³² Nash conducted an exhaustive literature

review involving 1,100 worldwide documents that support the assertion that dental therapists provide valuable, safe, high-quality care.³² The curriculum is easily accessible, flexible, economical, and could be implemented expeditiously utilizing existing dental hygiene programs and faculty.³² There are multiple mid-level provider models with varying levels of supervision and scopes of practice. These literature reviews focused predominately on the oral health care of children. The expansion of mid-level oral health care providers to serve other populations presents a significant area for future study.

Alaska was the first state to establish a mid-level practitioner, the Dental Health Aide Therapist (DHAT), to address severe dental disease and failed efforts to recruit dentists to practice in rural Alaskan villages.³² In 2005, the first Alaskan graduates from the University of Otago in New Zealand, were certified to practice in remote areas regulated by the Indian Health Service and the Indian Health Care Improvement Act Amendments of 2005.³³ Shortly after DHATs began to practice, the ADA initiated a lawsuit contending the illegal practice of dentistry. However, the case was unsuccessful because DHATs practice under a federal mandate.^{32,34} In 2007, the University of Washington, in collaboration with the Alaska Native Tribal Health Consortium, established the DENTEX program to educate Alaska's DHATs in Anchorage and Bethel, Alaska.³⁴ In 2008, the first pilot study assessing 640 procedures performed by DHATs demonstrated that the irreversible dental treatment provided by DHATs was comparable to similar treatments provided by dentists.³⁴ While DHATs are not dental hygienists, they work in discrete, high-need populations and are permitted to perform many dental hygiene scope of practice duties including periodontal probing, scaling, and root planing.³⁴ Non-reversible DHAT procedures include: fillings, stainless steel crowns, pulpotomies, and simple extractions.³⁴ DHATs have increased access to more than 40,000 patients in 81 remote villages who were previously unable to obtain dental care.³⁵ Other states are beginning to respond to the access to care crisis with their own mid-level provider initiatives as a result of successes with the Indian Health Service in Alaska.

Minnesota became the first state to pass landmark oral health reforms that permitted mid-level oral health providers to work with all underserved populations in the general public in 2009.³⁶ The Minnesota Legislature approved two delivery models; the Advanced Dental Therapist (ADT) and the Dental Therapist (DT).³⁶ Minnesota's Metropolitan State University established the first ADT master's degree program modeled after the ADHA's Advanced Dental Hygiene Practitioner (ADHP) curriculum that had been adopted by the ADHA in 2008.³⁶ Registered dental hygienists who have attained a bachelor's degree and two years of experience are qualified to apply for the Metropolitan State University program.³⁶ Advantages of the ADT provider model include the ability to directly address the critical needs of children who are not receiving care; the utilization of an existing dental hygiene workforce that has greatly surpassed the number of

actively practicing dentists; and the opportunity to build on the skills of practitioners who are already highly trained.³² At the same time, the University of Minnesota School of Dentistry adopted the Minnesota Dental Association's (MDA) model to develop curricula for the Dental Therapist. Dental Therapy students are not required to be dental hygienists. As practitioners, they are limited to performing basic preventive procedures that do not include probing, scaling, or root planing and will have limited restorative procedures in their scope of practice.³⁶ In 2015, the Commission on Dental Accreditation (CODA), the national accrediting body for dental, allied health, and advanced dental programs, adopted educational standards for mid-level dental providers.³⁵ This major advancement confirms mid-level dental providers as a qualified and necessary workforce model.³⁵

State Initiatives

While organized dentistry effects change in policies and positions, a number of states over the years have developed solutions superseding the political posturing of organized dentistry. Colorado has been a pioneer in the expansion of practice opportunities for dental hygienists with the ability to work independently since 1987. California established the Registered Dental Hygienist in Alternative Practice (RDHAP) workforce model in 1998, allowing for specially licensed hygienists to work in a variety of independent settings via a dentist prescription.³⁷ Many other state legislators have introduced bills based on innovative programs and alternative workforce models that decrease levels of supervision; expand dental hygiene scope of practice; increase access to vulnerable and underserved populations; or expand the strategic placement of the workforce to high-need locations.³⁵ Currently, thirty-nine states have laws allowing for various levels of direct access to patients and permitting dental hygienists to initiate treatment based on their assessment of need(s) without the specific authorization or presence of a dentist and maintain a provider/client relationship.¹ Hygienists may receive direct Medicaid reimbursements for procedures performed in 18 states, and all but six states allow dental hygienists to administer local anesthetics.^{38,39}

The W. K. Kellogg Foundation, in partnership with Community Catalyst, a broad-based, nonprofit health care advocacy organization, created the Dental Therapist Project in 2011 to affect changes to increase access to oral healthcare services.³⁵ This joint initiative empowers consumers and community leaders to raise awareness and facilitate dialogue regarding oral health care access disparities; educate stakeholders about dental therapists; and promote innovative workforce models.³⁵ The Dental Therapist Project began with five pilot states; Kansas, New Mexico, Ohio, Vermont, and Washington.³⁵ The project's efforts are gaining momentum as nineteen more states have indicated an interest in the addition of mid-level providers and many stakeholders begin to work together to strengthen the dental care delivery system.^{35,39} Since the Dental Therapist

Project began, the pilot states as well as others have introduced bills that have advanced to varying levels in the legislative process.^{39,40}

Mid-level provider legislation has had challenges as well as successes. Among the five Dental Therapist Project pilot states, New Mexico, actively pursued the dental therapy workforce model with two bills that were introduced and while they did not move forward in the legislative process, the possibility another bill for a mid-level provider may be proposed in the near future.^{39,40} In Kansas, the Kansas Action for Children, a lead organization in the Kansas Dental Project, has supported initiatives facilitating statewide dialogue regarding increased access to oral health care and expanded dental hygiene scope of practice along with the addition of a mid-level provider, Registered Dental Practitioners, to the dental team.^{40,41} As a result of this collaboration, two Registered Dental Practitioner bills were introduced in the legislature, HB 2079 and SB 49. Both bills progressed to the hearing stage before being tabled.⁴⁰ However, in 2012, the Kansas Expanded Care Permit III was enacted into law allowing dental hygienists to work in community settings and perform expanded function procedures, such as temporary relines and fillings, denture adjustments, and extractions of primary teeth.³⁵ In 2015, Washington State made a bold move to follow Alaska's DHAT delivery model and practice pursuant to the Indian Health Care Improvement Act Amendments of 2005.^{33,35,40} The decision to exercise sovereignty was reached due to a growing sense of urgency regarding the critical dental needs of the Swinomish Indian Tribal Community in Washington State and as a result of multiple failed attempts to move a mid-level provider model through the state legislature.^{39,40}

Maine became the third state, following Alaska and Minnesota, to successfully establish a Dental Hygiene Therapist (DHT) mid-level provider when LD 1230 was signed into law in 2014.³⁵ Maine's DHT is a dental hygienist who must graduate from an accredited dental hygiene therapy program, pass a state licensing board exam, and complete 2,000 hours of supervised clinical practice.³⁹ Maine's DHTs provide preventive, restorative, and therapeutic services for children under direct supervision and with a written practice agreement with a licensed dentist.³⁹

Vermont became the most recent state to have their mid-level provider legislation adopted when SB20 was signed into law in 2016. The Vermont Dental Therapist (DT) received strong support from the Vermont Oral Health Care for All coalition in addition to other grassroots organizations and allows for a registered dental hygienist, upon successful completion of a dental therapy education program, to perform preventive and restorative procedures under general supervision of a dentist with a collaborative agreement. In addition to the new mid-level provider, dental benefits for pregnant and nursing mothers in the state of Vermont have been expanded to 60 days postpartum.⁴¹

Mid-level providers are successfully increasing access to oral health care for vulnerable and underserved populations. As states begin to implement

their own versions of a mid-level workforce model, surveillance of the program outcomes will be a critical area for future research. Key areas of additional focus will include the implementation of CODA guidelines in the various education programs and the preparation of additional faculty.

Conclusion

America is in the middle of a dental access crisis for which there is no single solution. Disparities impacting access to care require local, state, and federal stakeholders to join forces to take advantage of the existing dental hygiene workforce, utilize innovative delivery models, improve license reciprocity, reduce prohibitive supervision, and expand the dental hygiene scope of practice. It is essential for states to focus resources on more cost effective preventive services instead of providing expensive palliative emergency services; establish school-based fluoride and sealant programs; integrate oral health education with prenatal care; reduce the complexities of the Medicaid system; and increase reimbursement fees so more providers will participate. Oral health is an essential component of overall health of individuals, communities, and the nation. It is not enough to increase access alone without also promoting strategies that will increase oral health literacy and affect meaningful changes in attitudes and beliefs that will lead to behavioral changes. The dental profession has the responsibility to promote oral health for all people, empower individuals to maintain optimum oral health, and advocate for those most vulnerable. Dental hygienists play an integral role in the solution and have the opportunity to lead the call to action and fulfill the American Dental Hygienists' Association's mandate that oral health care is the right of all people.

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References

1. American Dental Hygienists' Association: advocacy [Internet]. Chicago: American Dental Hygienists' Association; c2012-2017. Direct access; Updated 2017 Jan [cited 2017 Jan 30]; [1 screen]. Available from: <http://www.adha.org/direct-access>
2. U.S. Senate Committee on Health, Education, Labor & Pensions, Subcommittee on Primary Health and Aging [Internet]. Washington, DC: Government Printing Office; 2012 Feb 29. Dental crisis in America: The need to expand access. [cited 2015 Jul 18]; [14 screens]. Available from: <http://www.sanders.senate.gov/imo/media/doc/DENTALCRISIS.REPORT.pdf>
3. Bailit H, D'Adamo J. State case studies: improving access to dental care for the underserved. J Public Health Dent [Internet]. 2012 Jul 2 [cited 2015 Jul 18]; 72(3):221-234.
4. Skillman SM, Doescher MP, Mouradian, WE, Brunson DK. The challenge to delivering oral health services in rural America. J Public Health Dent [Internet]. 2010 Jun 23 [cited 2015 Jul 18]; 70(Suppl):S49-S57.
5. U.S. Department of Health and Human Services, Health Resources and Service Administration [Internet]. Washington DC: Government Printing Office; 2014 Jun 19. Shortage designation: health professional shortage areas & medically underserved areas/populations. [cited 2015 Aug 25]; [1 screen]. Available from: <http://www.hrsa.gov/shortage/>
6. National Organization of State Offices of Rural Health [Internet]. Michigan: National Organization of State Offices of Rural Health; c2006-2015. Oral health in rural America. [cited 2015 Aug 27]; [4 screens]. Available from: <https://nosorh.org/wp-content/uploads/2013/08/Oral-Health-Fact-Sheet-and-Resources.pdf>
7. U.S. Department of Health and Human Services, Health Resources and Service Administration [Internet]. Washington DC: Government Printing Office. Oral health workforce. [cited 2015 Aug 25]; [1 screen]. Available from: <http://www.hrsa.gov/publichealth/clinical/oralhealth/workforce.html>
8. Rural Assistance Center [Internet]. Grand Forks, ND: Rural Assistance Center; c2002-2015. Oral health in rural communities; [cited 2015 Aug 25]. Available from Rural Assistance Center
9. Henry J. Kaiser Family Foundation [Internet]. California; Kaiser Family Foundation; c2015. Dental care health professional shortage areas; Updated 2014 Apr 28; [cited 2015 Aug 25]; [1 screen]. Available from: <http://kff.org/other/state-indicator/dental-care-health-professional-shortage-areas-hpsas/>
10. American Student Dental Association. Chicago: American Student Dental Association; c2015. Dental student debt; [cited 2015 Sep 11]; [1 screen]. Available from: <http://www.asdanet.org/debt.aspx>
11. Carreon D, Davidson P, Andersen R, Nakazono T. Altruism in dental students. J Health Care Poor Underserved [Internet]. 2011 Feb [cited 2015 Sep 11]; 22(1):56-70.
12. U.S. Department of Health and Human Services, Office of Disease Prevention and Health Promotion [Internet]. Washington DC: Government Printing Office; 2008; America's health literacy: why we need accessible health information [Issue Brief]; [cited

2015 Sep 2]; [1 screen]. Available from: <http://health.gov/communication/literacy/issuebrief/>

02-15/local/35444526_1_maryland-dental-action-coalition-dental-care-deamonte-driver

13. Guo Y, Logan HL, Dodd VJ, Muller KE, Marks JG, Riley JL. Health literacy: a pathway to better oral health [Internet]. *Am J Public Health*. 2014 Jul [cited 2015 Sep 2]; 104(7):e85-e91.
14. Wall T, Vujicic M. Emergency department use for dental conditions continues to increase. Health Policy Institute Research Brief [Internet]. Chicago: American Dental Association; 2015 Apr [cited 2015 Sep 4]; [12 screens]. Available from: http://www.ada.org/~media/ADA/Science%20and%20Research/HPI/Files/HPIBrief_0415_2.ashx
15. Gavett G. Tragic results when dental care is out of reach [Internet]. Boston: WGBH Educational Foundation; c1995-2015 [revised 2012 June 26; cited 2015 Sep 4]. Available from: <http://www.pbs.org/wgbh/pages/frontline/health-science-technology/dollars-and-dentists/tragic-results-when-dental-care-is-out-of-reach/>
16. National Institute of Dental and Craniofacial Research, National Institutes of Health [Internet]. Bethesda, MD: National Institute of Dental and Craniofacial Research, National Institutes of Health; Dental caries (tooth decay); [Updated 2014 May; cited 2015 Jun 18]. Available from: <http://www.nidcr.nih.gov/datastatistics/Finddatabytopic/dentalcaries/>
17. Çolak H, Dülgergil ÇT, Dalli M, Hamidi MM. Early childhood caries update: a review of causes, diagnoses, and treatments. *J Nat Sci Biol Med* [Internet]. 2013 Jan [cited 2015 Jun 18]; 4(1):29-38.
18. American Dental Association [Internet]. Washington DC: American Dental Association; HR 2220 Essential Oral Health Care Act of 2009 [Position Paper]; 2009 [cited 2015 Jul 20]; [1 screen]. Available from: http://www.ada.org/~media/ADA/Advocacy/Files/hcr_hr2220_position_paper.ashx
19. Nasseh K, Vujicic M, Yarbrough C. A ten-year, state-by-state, analysis of Medicaid fee-for-service reimbursement rates for dental care services [Research Brief]. Chicago: American Dental Association Health Policy Institute [Internet]; 2014 Oct [cited 2015 Jul 20]. Available from: http://www.ada.org/~media/ADA/Science%20and%20Research/HPI/Files/HPIBrief_1014_3.ashx
20. Driessen, K. 5 years after boy dies from toothache, Maryland Medicaid dental care is on mend. *The Washington Post* (Maryland Ed); [Internet]. 2012 Feb 15 [cited 2015 Jul 20]; Local: [1 page]. Available from: http://articles.washingtonpost.com/2012-02-15/local/35444526_1_maryland-dental-action-coalition-dental-care-deamonte-driver
21. The Pew Charitable Trusts [Internet]. Washington DC: The Pew Charitable Trusts; c1996-2015. The state of children's dental health: making coverage matter; Updated 2011 May 24 [cited 2015 Jul 20]; [1 screen]. Available from: <http://www.pewtrusts.org/en/research-and-analysis/reports/0001/01/01/the-state-of-childrens-dental-health>
22. The Pew Charitable Trusts [Internet]. Washington DC: The Pew Charitable Trusts. c1996-2015. States stalled on dental sealant programs; 2015 Apr 23 [cited 2015 Jul 20]; [25 screens]. Available from: http://www.pewtrusts.org/~media/Assets/2015/04/Dental_SealantReport_Final.pdf
23. The Pew Charitable Trusts [Internet]. Washington DC: The Pew Charitable Trusts; c1996-2015. Grades and benchmarks; Updated 2011 May; [cited 2015 Jul 20]; [7 screens]. Available from: http://www.pewtrusts.org/~media/legacy/uploadedfiles/pes_assets/2011/dentalpolicybenchmarks2011pdf.pdf
24. National Institute for Health Care Management, Children's Dental Health Project [Internet]. Washington DC: National Institute for Health Care Management Foundation; c2015. Improving access to perinatal oral health: strategies and considerations for health plans; 2010 Jul [cited 2015 Sep 5]; [16 screens]. Available from <http://www.nihcm.org/pdf/NIHCM-OralHealth-Final.pdf>
25. American Congress of Obstetricians and Gynecologists [Internet]. Washington DC: American Congress of Obstetricians and Gynecologists; c2015. Oral health care during pregnancy and through the lifespan [Committee Opinion #569]; 2013 Aug [cited 2015 Sep 5]. Available from: <http://www.acog.org/Resources-And-Publications/Committee-Opinions/Committee-on-Health-Care-for-Underserved-Women/Oral-Health-Care-During-Pregnancy-and-Through-the-Lifespan#32>
26. National Maternal and Child Oral Health Policy Center [Internet]. Washington DC: National Maternal and Child Oral Health Policy Center; c2015. Improving the oral health of pregnant women and young children: opportunities for policymakers; 2012 Aug 30 [cited 2015 Sep 5]. Available from: <http://www.astdd.org/docs/improving-the-oral-health-of-pregnant-and-young-children-aug-2012.pdf>
27. Slack-Smith L, Lange A, Paley G, O'Grady M, French D, Short L. Oral health and access to dental care: a qualitative investigation among older people in the community. *Gerodontology* [Internet]. 2010 Jun [cited 2015 Sep 13]; 27(2):104-113.

28. Center for Disease Control and Prevention [Internet]. Atlanta: National Center for Chronic Disease Prevention and Health Promotion; c2015. Healthy aging: helping people to live long lives and enjoy a good quality of life. 2011 Jun 13 [cited 2015 Sep 13]. Available from: <http://stacks.cdc.gov/view/cdc/6114/>
29. Beemsterboer PL, Catalanotto F. Social responsibility and justice. In: Beemsterboer, P, editor. Ethics and the law in dental hygiene. 2nd ed. St. Louis, MO: Saunders Elsevier; 2010. Chapter 4; p. 58-60.
30. American Dental Association [Internet]. Chicago: American Dental Association; c2015. American Dental Association comment on the Kellogg Foundation report: a review of the global literature on dental therapists. 2012 Apr 10 [cited 2015 Sep 15]. Available from: <http://www.ada.org/en/press-room/news-releases/2012-archive/april/american-dental-association-comment-on-the-kellogg>
31. American Dental Hygienists' Association: news [Internet]. Chicago: American Dental Hygienists' Association; c2012-2015. ADHA supports comprehensive dental reform act of 2012; Updated 2012 Jun 6 [cited 2015 Sep 14]; [1 screen]. Available from: <http://www.adha.org/adha-supports-comprehensive-dental-reform-act-of-2012>
32. Nash D. Adding dental therapists to the health care team to improve access to oral health care for children. Acad Pediatr [Internet]. 2009 Oct 23; 9(6): 446-451.
33. U.S. Senate Committee on Health, Education, Labor & Pensions, Subcommittee on Indian Affairs. Indian Health Care Improvement Act Amendments of 2005, S. Rep. No. 109-122 (Mar. 16, 2006). Available from: <http://www.gpo.gov/fdsys/pkg/CRPT-109srpt222/pdf/CRPT-109srpt222.pdf>
34. Bolin KA. Assessment of treatment provided by dental health aide therapists in Alaska: a pilot study. J Am Dental Assoc [Internet]. 2008 Nov 3; 139(11), 1530-1535.
35. Community Catalyst [Internet]. Boston, MA: Community Catalyst; c2015. Dental access project; 2015 [cited 2015 Sep 11]. Available from: <http://www.communitycatalyst.org/initiatives-and-issues/initiatives/dental-access-project>
36. Gadbury-Amyot C, Brickle, C. Legislative initiatives of the developing advanced dental hygiene practitioner. J Dent Hyg [Internet]. 2010 Summer; 84(3): 110-113.
37. Hovliaras C. Career planning and professional development. In: Darby M, Walsh M, editors. Dental Hygiene theory and practice. 3rd ed. St. Louis, MO: Saunders Elsevier; 2010. Chapter 61; p. 1179-1180.
38. American Dental Hygienists' Association: advocacy [Internet]. Chicago: American Dental Hygienists' Association; c2012-2017. Reimbursement; Updated 2017 Jan [cited 2017 Jan 30]; [1 screen]. Available from: <http://www.adha.org/reimbursement>
39. American Dental Education Association [Internet]. Washington, D.C.: American Dental Education Association; c2017. ADEA state update. Updated 2017 [cited 2017 Jan 30]; [1 screen]. Available from: <http://www.adea.org/Blog.aspx?id=23932&blogid=20132>
40. American Dental Education Association [Internet]. Washington, D.C.: American Dental Education Association; c2016. United States interactive legislative tracking map. [cited 2016 Jan 28]; [1 screen]. Available from: <http://www.adea.org/legislativemap/>
41. Kansas Dental Project. [Internet]. Topeka, KS. Kansas Dental Project; c2011. Kansas dental project; Joint venture. [cited 2016 Jan 29]; [8 screens]. Available from <http://reachhealth.org/wp-content/uploads/2011/06/Kansas-Dental-ProjectCombined.pdf>
42. Voices for Vermont's Children [Internet]. Montpelier, VT.: Voices for Vermont's Children; c2016. Pregnant women on dr. dynasaur to get comprehensive dental coverage. [cited 2016 Jan 29]; [1 screen]. Available from: <http://www.voicesforvorkids.org/pregnant-women-on-dr-dynasaur-to-get-comprehensive-dental-coverage/>

Dental Hygiene Students' Perceptions of Importance and Confidence in Applying Motivational Interviewing During Patient Care

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Abstract

Purpose: Motivational Interviewing (MI) is an evidence-based, patient-centered counseling approach for eliciting behavior change. In 2012, the University of Michigan (U-M) Dental Hygiene Program significantly enhanced their behavior change curriculum by reinforcing and building upon the Motivational Interviewing segment. The purpose of this study was to examine students' perceptions of the importance of MI and their confidence in applying it during patient care.

Methods: A convenience sample of 22 U-M Class of 2015 dental hygiene students who had received an enhanced curriculum participated in this study, utilizing a retrospective, pre-test/post-test design.

Results: A Wilcoxon signed rank test was used to compare the differences in average ranks between T1 (Retrospective Pre-Test) and T4 (Post-Test 3) for the importance and confidence questions at each time point for the Class of 2015. Students' perceptions of importance increased with statistical significance in five out of eight MI strategies. Perceptions in confidence increased in seven out of eight strategies. Effect size ranged from .00 to .55. Assessment of qualitative data provided additional insight on student experiences.

Conclusion: Student perceptions of importance of using MI and their confidence in applying MI increased in a majority of the strategy categories. Successes with patient health behavior change and challenges with time to integrate this in practice were noted. Research on the longitudinal impact and faculty feedback calibration is recommended.

Keywords: Motivational Interviewing, health behavior, dental hygiene education, communication, importance, confidence

This manuscript supports the NDHRA priority area, **Client level: Oral Health Care** (new therapies and modalities).

Introduction

Oral health has a significant impact on overall health.¹⁻⁴ Major oral diseases include dental caries, periodontal diseases, and oral and pharyngeal cancers.¹⁻⁵ While the majority are preventable, millions of Americans suffer from these debilitating conditions.²⁻⁵ Patient adherence to recommended treatments and healthy behavior changes are essential in preventing and treating oral diseases.

The U.S. Department of Health and Human Services developed the Healthy People 2020 initiative to create science-based objectives for improving the health of Americans.³ One of the objectives focuses on promoting quality of life by encouraging healthy behaviors and motivating individuals toward making educated health decisions.³ Significantly, Healthy People 2020 recognizes the need for primary care practitioners to provide health counseling for their patients.³ However, many providers counsel patients

using methods of persuasion and confrontation and these methods have been shown to be ineffective.⁶ According to DiMatteo et al., traditional health behavior recommendations by the clinician are generally not followed and can lead to disappointment for the clinician and a setback for the patient.⁷

For the purposes of this study, Motivational Interviewing (MI) is defined as an evidence-based, patient-centered counseling approach for eliciting behavior change.⁸⁻¹⁰ Using a non-authoritative approach focusing on interpersonal communication, MI enables the patient to naturally break through uncertain thoughts, feelings, and attitudes to achieve a positive health behavior change.^{9,10} Studies incorporating MI into health care curricula demonstrate positive effects on students' abilities to discuss health behavior change with patients.¹¹

In 2012, the University of Michigan (U-M) Dental Hygiene (DH) program embarked on a project

to enhance their health behavior curriculum with a special focus on MI. The desired outcome was for students to translate content learned in the classroom to clinical application during patient care. The purpose of this study was to examine U-M dental hygiene students exposed to the enhanced MI curriculum and to assess both their perceptions of the importance of using MI and their confidence in applying it.

Motivational Interviewing

MI is different from traditional methods of behavior change counseling because it focuses on collaboration, not compliance. It empowers the patient and reinforces a positive relationship with the practitioner while offering an individual the autonomy of making their own decisions in an encouraging environment.^{9,10} In addition, MI application increases the likelihood that patients will adhere to health recommendations.^{9,10} Positive patient behavior outcomes have been demonstrated to result when health care providers use MI techniques with patients.¹³⁻¹⁶

The spirit of MI was influenced by the client-centered counseling theory of Carl Rogers, developed in 1953.¹⁶ Miller and Rollnick describe this spirit as collaborative, evocative, and autonomous.⁸ Collaboration between clinician and patient evokes patients' personal motivation, channeling their own values, good reasons, and resources to make lifestyle changes.⁸ The four main principles of MI are expressing empathy, developing discrepancy, rolling with resistance, and supporting self-efficacy.^{8,10} In addition, applying MI strategies such as asking open-ended questions, providing affirmation, reflective listening, and summarizing help, elicit change talk, where the patient verbalizes a desire to change.^{8,10}

Application to Oral Health

Most chronic oral diseases are preventable and related to lifestyle choices.² Oral healthcare practitioners treat acute conditions and also deal with chronic conditions for which the patient is responsible through continued self-management.¹⁰ Behaviors contributing to chronic oral diseases such as biofilm removal, poor diet, stress, and tobacco use, can be reshaped with the assistance of an oral health care practitioner.² These professionals, especially dental hygienists, have repeated interactions allowing the patient and the clinician to build a collaborative relationship.¹⁷

A study by Jonsson et al. showed application of MI techniques increased patient compliance with home care and enhanced oral hygiene in those undergoing periodontal therapy.¹⁸ Studies by Weinstein et al. revealed children whose mothers received MI counseling related to the child's oral health had fewer carious lesions over time, than children whose parents were not provided with MI counseling.^{13,14}

Brief motivational interviewing has also shown to be effective in health promotion. Brief interventions, between 5-15 minutes long, encourage patient problem solving, elicit change talk, and provide a set of options

for planning the next steps of the change.¹⁰ Rubak et al. found brief MI to be effective over traditional methods of health behavior change education even when delivered as 15-minute exchanges.¹⁹

Incorporating MI into Health Professions Curricula

The complex dynamics of health behavior change is an important concept for practitioners to understand.^{6,9} With a much greater emphasis on management and prevention of disease, patients are more likely to adhere to treatment when health care practitioners formulate action plans using a patient-centered counseling approach.²⁰ Thus, formal, rigorous training in behavior change counseling is needed for health care practitioners.¹² Incorporating MI into health care curriculum has demonstrated positive effects on practitioners' abilities to discuss health behavior change with patients.²¹

A rigorous curriculum enabling students to have the opportunity to develop these skills is important.⁹ Knowledge, practice, and experience are also necessary for success.⁹ Students perform better when they understand the material, have a positive attitude, and have an array of skills gained by practicing.²² Teaching effective interviewing and communication strategies, such as MI, is attained by connecting theory to practice. In order for these strategies to be assimilated, appropriate training and education are needed to give students time to attain skills and develop confidence in applying them.⁹ Educational activities need to include clinical instruction along with repeated practice, assessment and feedback.^{22,23}

Croffoot et al. studied the effects of coaching dental hygiene students taught to use MI strategies.¹¹ The results indicated that education, in combination with faculty coaching/feedback, provided achievement of core MI skills and increased MI adherence by the students.¹¹ In order to be proficient with MI and develop confidence in its application, exposure is needed early in the curriculum along with continuous reinforcement integrated throughout the entire curriculum.¹¹ Real skill and confidence grow through rigorous practice, feedback, and coaching from a knowledgeable guide.²⁰ MI skills were developed throughout the dental hygiene program as students were developing clinical skills.

Perceptions of Importance and Confidence

Positive student perceptions directly influence learning outcomes and achievement.²⁴ A pilot study by Wiley et al. measured health care practitioners' perceptions of MI training. Practitioners in this study included dietitians, pharmacists, nurses, and social workers.²⁵ Before MI training, their perceptions of health behavior change consisted of low levels of perceived confidence and competence in the ability to help others with feelings of frustration.²⁵ After a 7.5 hour workshop on MI, practitioners' perceptions were assessed and resulted in a renewed inspiration

and motivation to facilitate behavior change. Also noted was a desire to partner with patients with less focus on advice giving, a feeling that behavior change is easier and less stressful than anticipated, higher levels of competence and confidence, and greater mindfulness of practitioner impact.²⁵

Students need to value what they are learning, feel it is important, and have the confidence to apply concepts learned. Humair et al. used a self-administered questionnaire to assess students' perceptions of a MI curriculum related to smoking cessation counseling techniques.²⁶ The students participated in two four-hour sessions of smoking cessation training two weeks apart, allowing students time to practice MI and reflect between sessions.²⁶ The results revealed that the students valued the importance of this curriculum and the skills they attained and they also enjoyed their involvement in learning activities.²⁶ White et al. delivered an evaluation to 112 students after the introduction of a MI curriculum consisting of a lecture series and small group discussion, role playing activities, and evaluation of MI video recordings.²⁷ Eighty-three percent of the students felt that the MI curriculum helped them in discussing behavior change with patients and 98% felt it was an important skill for physicians to have.²⁷

Perry et al. assessed the role confidence plays in nursing students' learning.²⁸ This study found that a decrease in confidence unfavorably impacts meeting learning objectives and goals.²⁸ Bell et al. assessed medical students' success with promoting health behavior change through a newly implemented MI curriculum.²⁹ Medical student confidence in utilizing MI was measured after participating in four two-hour training sessions and the student participants were found to be more confident.²⁹ Student confidence has been demonstrated to increase by actually performing skills rather than merely observing them.³⁰

Importance and confidence play important roles in the likelihood that students will incorporate MI into their professional practice.³⁰ The purpose of this study was to examine U-M dental hygiene students exposed to the enhanced MI curriculum and to assess their perceptions of the importance of using MI and their confidence in applying it to patient care.

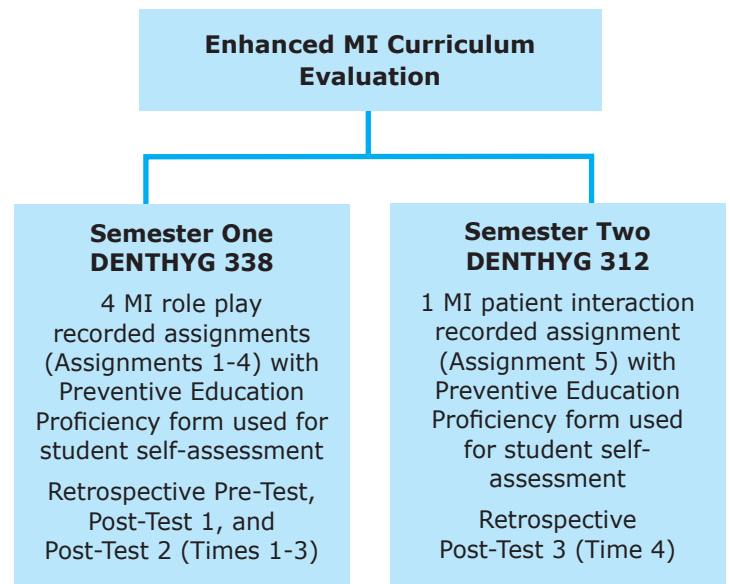
Materials and Methods

This study was presented to the Institutional Review Board at the University of Michigan. It was approved as "exempt." A convenience sample of 22 first-year University of Michigan (U-M) dental hygiene students from the Class of 2015 participated in this study that ran for two semesters.

In the winter of 2013, the enhanced MI curriculum was launched. Prior to this, the students' exposure to MI consisted of a didactic session during the Health Education Methods course that also focused on the Stages of Change and Health Belief Models. There were no assignments integrating the application of MI. Figure 1 provides an overview of the enhanced

MI curriculum evaluation timeline. During the first semester of the study, the students were enrolled in DENTHYG 338-Health Education Methods, a course that takes place during the second semester of the six semester dental hygiene program. The second semester of this study focused on the application of MI during patient care and was facilitated in DENTHYG 312-Clinical Dental Hygiene Seminar, a course that takes place during the third semester of the six semester dental hygiene program.

Figure 1. Enhanced MI Curriculum Evaluation Timeline



Semester One of the Study

During the 10 consecutive fifty-minute sessions of enhanced MI education and skill instruction presented in Health Education Methods, students were assigned to read MI literature, watch videos depicting scenarios of a MI counselor with a patient followed by group assessments of the interactions. Students were also required to complete four audio-recorded role-play assignments applying MI skills (Figure 1) The four evaluation instruments used in semester one of this study were adapted from those used by the University of Missouri-Kansas City Dental Hygiene Program during the assessment phase of their Motivational Interviewing curriculum. Modifications were completed in consultation with U-M's Center for Research on Learning and Teaching (CRLT). The modified instruments were then pilot-tested and the recommendations were incorporated.

In addition, the "Preventive Education Proficiency" form was utilized throughout this study. Both students and faculty used this proficiency form to assess audio-recorded MI role-playing interactions. Ten of the criteria focused on application of specific MI strategies such as asking permission, use of open-ended questions, reflection, affirmation, and summary. Two criteria asked students to self-assess their perceptions of the importance of using MI and confidence in applying MI techniques.

Students were required to complete four audio recordings. Assignment #1 focused on the students' application of open-ended questions, affirmations, reflective listening, and summarizing (OARS) principles. Assignments #2 and #3 were combined assessing additional MI strategies of complex reflection and eliciting change talk. Assignment #4 asked the dental hygiene student to assimilate and apply all MI strategies during a recorded interaction with an acquaintance.

A Retrospective Pre-Test was delivered to the Class of 2015 at the end of the 10 MI class sessions in DENTHYG 338 - Health Education Methods. This assessed the students' perceptions of how important they believed utilizing the MI counseling strategies were before the start of the course. This also assessed student confidence with using MI prior to DENTHYG 338. The MI strategies evaluated included: using open-ended questions, listening reflectively, making affirmations, summarizing, eliciting change talk, using the importance ruler, asking for elaboration, and enhancing self-efficacy. The Retrospective Pre-Test collected both importance and confidence responses using a Likert scale. Demographic information was also gathered.

Post-Test 1 was delivered to the Class of 2015 at the end of the 10 MI sessions in DENTHYG 338. Post-Test 1 assessed the students' perceptions of the importance of MI and their confidence in using it after completing the educational training. It utilized the same questions and Likert scale response options as the Retrospective Pre-Test as Post-Test 2. Post-Test 2 was delivered to the Class of 2015 on the last day of class, in order to measure the students' perceptions five weeks after the completion of the MI content in the course.

Table I: Demographic Information: Class of 2015 (n=22)

	Frequency (%)
Gender	
Male	2 (9.1%)
Female	20 (90.9%)
Years College	
1	4 (18.2%)
2	2 (9.1%)
3	2 (9.1%)
4	7 (31.8%)
5	4 (18.2%)
6	1 (4.5%)
Mean Age (years)	23.05

Semester Two of the Study

In the fall of 2013 during DENTHYG 312 - Clinical Dental Hygiene Seminar, the Class of 2015 completed a worksheet asking for a critical analysis of the change talk and commitment strategies as demonstrated in a video shown during class. In addition, the students participated in a 110-minute class session delivered by an expert in the area of MI. This presentation focused on eliciting change talk and setting the agenda for change with patients. During the second semester, students were also required to audio record an educational interaction with a patient in clinic (Assignment 5). Using the Preventive Education Proficiency form, students self-assessed their interaction, including their perceptions of importance of MI and their confidence in applying MI techniques. The team of faculty members also used this proficiency form to assess the students' recorded interactions and provide feedback.

Post-Test 3 was administered to the Class of 2015 at the end of the fall 2013 semester. The Post-Test 3

Table II: Motivational Interviewing Definitions

<input type="checkbox"/> Open ended questions	<input type="checkbox"/> A question that offers broad latitude and choice in how to respond
<input type="checkbox"/> Reflective listening	<input type="checkbox"/> Skill of "active" listening, seeking to understand a person's subjective experience, offering reflections as guesses about the person's meaning
<input type="checkbox"/> Affirmation	<input type="checkbox"/> Accentuating the positive, seeking and acknowledging a person's strengths and efforts
<input type="checkbox"/> Summarize	<input type="checkbox"/> Reflection that draws together content from two or more prior statements
<input type="checkbox"/> Change talk	<input type="checkbox"/> Speech that favors movement toward a particular change goal
<input type="checkbox"/> Importance ruler	<input type="checkbox"/> A scale (typically 0-10) on which persons are asked to rate the importance of making a particular change
<input type="checkbox"/> Elaboration	<input type="checkbox"/> An response to change talk, asking for additional detail, clarification, or example
<input type="checkbox"/> Self-efficacy	<input type="checkbox"/> Perceived ability to successfully achieve a particular goal or perform a particular task

was used to again measure students' perceptions of the importance of MI and their confidence in using MI in delivering health education, with additional open-ended questions included.

Results

SPSS version 21 was utilized for data analysis. Descriptive statistics for the Class of 2015 are provided in Table I. Definitions of MI skills assessed in this study adapted from Miller et al⁶ are summarized in Table II.

A Wilcoxon Signed Rank Test was used to compare the differences in average ranks between T1 (Retrospective Pre-Test) and T4 (Post-Test 3) for the importance and confidence questions at each of the designated time points for the Class of 2015 (Table III). Significance was set at ($p < 0.05$). Statistically significant increases of importance were found between Time 1 and Time 4 in "open ended questions," "making affirmations," "summarizing,"

"eliciting change talk," and "enhancing self-efficacy." No significant difference was found between Time 1 and Time 4 for "listening reflectively," "using the importance ruler," and "asking for elaboration."

Confidence in "open ended questions," "making affirmations," "summarizing," eliciting change talk," "using the importance ruler," "asking for elaboration," and "enhancing self-efficacy" was found to be significant ($p < 0.05$) over time. No significant changes were found for "listening reflectively." Effect size was calculated using r-squared and ranged from .00 to .55.

Using the Preventive Education Proficiency form, self-perception of the importance of MI and confidence in applying MI skills was evaluated for the Class of 2015 using a Wilcoxon Signed Rank Test (Table IV). Change in students' importance and confidence scores over time was not statistically significant. Effect size was calculated using r-squared and ranged from .01 to .07.

Table III: Wilcoxon Signed Rank Test comparing T1 and T4 to assess mean differences in the Class of 2015

Variable	T1 Retrospective Pre-Test Mean (SD)	T2 Post-Test 1 Mean (SD)	T3 Post-Test 2 Mean (SD)	T4 Post-Test 3 Mean (SD)	Z Statistic	Wilcoxon Signed Rank Test T1 and T4
Importance+						
Use open ended questions	3.86 (1)	4.59 (0.67)	4.59 (0.67)	4.52 (0.98)	-2.63	0.01*
Listen reflectively	3.95 (1.36)	4.36 (1)	4.41 (0.91)	4.43 (1.08)	-1.71	0.09
Make affirmations	3.27 (1.32)	4.14 (0.77)	4.05 (0.72)	4.19 (0.98)	-3.20	0.01*
Summarize	3.05 (1.13)	3.91 (1.27)	4.09 (0.87)	4.05 (1.07)	-2.94	0.01*
Elicit change talk	3.14 (1.06)	4.23 (0.87)	4.00 (0.98)	4.29 (0.9)	-3.10	0.01*
Use the importance ruler	2.53 (0.94)	3.09 (1.06)	3.27 (1.49)	2.9 (1.48)	-1.65	0.10
Ask for elaboration	3.70 (1.08)	4.09 (0.97)	4.23 (0.92)	3.76 (0.94)	-0.05	0.96
Enhance self-efficacy	3.59 (1.14)	4.32 (0.84)	4.41 (0.8)	4.38 (1.16)	-2.38	0.02*
Confidence++						
Use open ended questions	3.55 (1.34)	4.95 (0.67)	4.95 (0.80)	4.43 (1.03)	-2.33	0.02*
Listen reflectively	3.82 (1.22)	4.23 (0.92)	4.95 (0.67)	4.33 (1.20)	-1.48	0.14
Make affirmations	3.00 (1.11)	4.05 (0.95)	4.27 (0.94)	4.24 (1.14)	-2.98	0.01*
Summarize	3.14 (0.99)	3.91 (0.92)	4.32 (0.65)	4.29 (0.85)	-3.43	0.01*
Elicit change talk	2.35 (0.88)	3.41 (0.96)	4.00 (1.02)	3.52 (1.03)	-2.95	0.01*
Use the importance ruler	2.21 (1.03)	3.55 (1.14)	4.09 (1.27)	4.00 (1.14)	-3.06	0.01*
Ask for elaboration	3.24 (1.09)	3.82 (1.05)	4.41 (0.85)	4.05 (1.12)	-2.09	0.04*
Enhance self-efficacy	3.05 (1.25)	3.91 (1.02)	4.27 (0.83)	4.33 (0.97)	-2.89	0.01*

*Statistically significant at $p < 0.05$ (two tailed)

+ 0= unable to answer, 1= not very important, 2= of little importance, 3= neutral, 4= somewhat important, 5= very important.

++0=unable to answer, 1= not at all confident, 2= little confidence, 3=neutral, 4=somewhat confident, 5= very confident.

In Post-Test 3, in addition to the importance and confidence assessment, open ended questions were presented to the Class of 2015. Participants were questioned about successes using MI in patient care (Table V). Of the 22 study participants, 36% (n=8) found successes with "patient changes," 27% (n=6) identified "improved communication" with patients with 14% (n=3) reporting "no patient behavior change."

For the open-ended question related to MI challenges (Table VI), "patient issues" were identified as a challenge by 45% (n=10). Forty-one percent (n=9) perceived "time" as a challenge and 14% (n=3) of the responses fell into the theme labeled "other."

Discussion

The Class of 2015 identified an increased perception of the importance of MI from Time 1 (Retrospective Pre-Test) to Time 4 (Post-Test 3) in five of the eight MI strategies. By Time 4 students had participated in four graded MI recording assignments in which faculty feedback was provided. In addition, they had two semesters in which MI had been integrated within didactic course work. Lastly, they had been providing clinical care to patients in both semesters. This increase in perception of importance associated with the majority of MI strategies may be attributed to students' involvement with the enhanced MI curriculum. This is similar to the results documented by DiMatteo et al., finding rigorous MI training was essential for skill development and requires practice and time.¹² This finding is also consistent with studies documenting increased perception of importance of MI after students participated in curricula consisting of lectures, role-play activities, recordings including patient interactions, and faculty feedback.^{25-27,31}

It is also important to note that from Time 1 to Time 4, student perceptions of the importance of using MI strategies did not always increase incrementally as noted in Table III. Time 4 was after an actual patient interaction recording. Actual application of MI strategies with patients appears to play a crucial role in training and education.

Similar results were documented in a study by White et al., who found 83% of students reported that having MI in the curriculum had a positive impact on patient interactions and helped students be more comfortable discussing health behavior change with their patients.²⁷

When the Class of 2015 was assessed on their perceptions of confidence in applying MI techniques, in seven of the eight MI techniques students identified a statistically significant increase from Time 1 to Time 4. Students gained valuable MI experience through classroom content, literature, watching videos depicting scenarios of a MI counselor with a patient, and recording role-play assignments along with a patient interaction. In all five assignments, students participated in self-assessment and were provided faculty feedback. This is consistent with previous studies indicating coaching with feedback had positive results in students' perceptions in their abilities to deliver healthcare education and counseling.^{25,27,30}

The Class of 2015 used the Preventive Education Proficiency form to self-assess their perception of the importance of MI and their confidence in applying it at the completion of each of the five MI recording assignments over the two semesters. Overall importance and confidence increased however, the increase was not statistically significant. This could be due to the small, three point scale used, not allowing for enough variance in responses. Consideration should be given to revising the proficiency assessment to include a broader response scale.

In one of the open-ended data collection questions, students were asked about successes they had experienced using MI. Both improved communication and health behavior changes achieved by patients were identified as successes. This affirmed the ability for the students to utilize MI effectively with their patients, an important desired outcome of the enhanced MI curriculum. Miller and Rollnick documented those experiencing a positive perceived impact on patients achieved higher levels of competence and confidence.²¹

Table IV: Wilcoxon Signed Rank Test comparing the mean differences in the Class of 2015's self-assessment of importance and confidence between T1 and T4 and T1 and T5, using the Preventive Education Proficiency form

Variable	Assignment 1 Recorded Role Play Mean (SD)	Assignment 4 Recorded Role Play Mean (SD)	Assignment 5 Patient Recording Mean (SD)	Z statistic T1 & T4	Wilcoxon Signed Rank Test T1 & T4	Z statistic T1 & T5	Wilcoxon Signed Rank Test T1 & T5
Importance	1.16 (0.37)	1. (0.3)	1.21 (0.42)	0.578	0.56	-0.45	0.65
Confidence	1.42 (0.61)	1.29 (0.46)	1.47 (0.51)	1.134	0.26	-0.33	0.74

*Statistically significant at p<0.05 (two tailed)

Table V: MI Successes

Consensus Themes	Selected Responses from Students Related to Themes	Total Study Participants Class of 2015 n=22
<input type="checkbox"/> Patient Changes	<input type="checkbox"/> Building confidence to change. <input type="checkbox"/> I have gotten patients to develop their own plans for change, which I believe will help them to be more successful in actually making the change. <input type="checkbox"/> It has identified the changing key for the patient- so (they) can realize what (they) can do! <input type="checkbox"/> Patient understood what they need to improve for a better oral health.	36% (8/22)
<input type="checkbox"/> Improved Communication	<input type="checkbox"/> Gaining more information from patients <input type="checkbox"/> Opened relationships with patients and was told I listened better than their doctor. <input type="checkbox"/> Patients appreciate being noticed and praised. <input type="checkbox"/> Patients opened up to me and seem to be willing to make a change.	27% (6/22)
<input type="checkbox"/> None	<input type="checkbox"/> I do not know since I have only seen my patients once. <input type="checkbox"/> I don't know, haven't seen those patients again to assess their progress.	14% (3/22)

Table VI: MI Challenges

Consensus Themes	Selected Responses from Students Related to Themes	Total Study Participants Class of 2015 n=22
<input type="checkbox"/> Patient Issues	<input type="checkbox"/> Having patients be resistant. <input type="checkbox"/> Not everyone reacts well to MI. <input type="checkbox"/> Patients not wanting to talk, patients thinking me "summarizing" what they have said is weird. <input type="checkbox"/> Patients want no part in discussing their feelings or issues.	45% (10/22)
<input type="checkbox"/> Time	<input type="checkbox"/> In clinic it is time however in real life (not in school) I could see less challenges since patients are seen more often. <input type="checkbox"/> Time is an issue. <input type="checkbox"/> No time to record this. <input type="checkbox"/> Time management <input type="checkbox"/> Time to incorporate it all	41% (9/22)
<input type="checkbox"/> Other	<input type="checkbox"/> It always seems so awkward. <input type="checkbox"/> Not talking more than the pt.	14% (3/22)

Challenges reported with MI included not having enough time in clinic to complete the proficiency recording with a patient, which aligns with similar feelings of health practitioners working in the field.³² Given that the utilization of multiple MI strategies in one sitting can take a significant amount of time, utilizing brief motivational interviewing may be more appropriate with previous studies demonstrating this to be successful in health care settings.^{13,14,33}

This study had limitations; the small sample size and the lack of a control group. Development of interpersonal communication skills should involve practice and be closely evaluated.^{9,10} Training research indicates that proficiency in MI is not readily developed through self-study or by attending a workshop, but typically requires practice with feedback and coaching over time.^{11,20} It is recommended that the U-M Dental Hygiene Program continue this study longitudinally so the outcomes from the Class of 2015 can be determined following three full years of the enhanced MI curriculum.

Conclusion

This study found students' perceptions of the importance of MI and their confidence in applying MI strategies increased over time. Students identified important successes when applying MI and also identified realistic challenges in the process. These findings supported that the enhanced curriculum had a positive outcome on students' ability to learn important MI concepts and apply these in health behavior change interactions. Future research should focus on measuring student performance related to patient health behavior change outcomes longitudinally. In addition, additional studies should concentrate on faculty feedback and coaching calibration.

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Acknowledgements

The authors wish to thank Kimberly Bray, RDH, MS and Delwyn Catley, PhD, from the University of Missouri-Kansas City, for their guidance during this project. Gratitude is also extended to Dina Korte, RDH, MS and Giselle Kolenic, BA, MA, from the University of Michigan, for direction, dedication, and support.

References

1. U.S. Department of Health and Human Services. A national call to action to promote oral health. Rockville, MD: U.S. Department of Health and Human Services, public health service, Centers for Disease Control and Prevention, and the National Institutes of Health, National Institute of Dental and Craniofacial Research. NIH Publication No. 03-5303, May 2003.
2. CDC: chronic disease prevention and health promotion [Internet]. Atlanta: Centers for Disease Control and Prevention. Division of oral health; [updated 2011 July 29; cited 2013 Feb 15]; [about 2 screens]. Available from: <http://www.cdc.gov/chronicdisease/resources/publications/AAG/doh.htm>
3. Healthy People 2020: topics and objectives-oral health [Internet]. Washington, DC: U.S. Department of Health and Human Services. Oral health; [updated 2012 Sept 6; cited 2012 Feb 10]. Available from: <http://www.healthypeople.gov/2020/topicsobjectives2020/overview.aspx?topicid=32>
4. AAP: CDC-half of American adults have periodontal disease [Internet]. Chicago: American Academy of Periodontology [cited 2013 Feb 16]. Available from: <http://perio.org/consumer/cdc-study.htm>
5. CDC: chronic disease prevention and health promotion [Internet]. Atlanta: Centers for Disease Control and Prevention. Division of oral health-oral cancer; [updated 2011 Dec 20; cited 2013 Feb 15]; [about 1 screen]. Available from: <http://www.cdc.gov/oralhealth/topics/cancer.htm>
6. Miller WR, Rollnick S, Butler BC. Motivational interviewing in healthcare. New York: Guilford; 2008. 210 p.
7. DiMatteo MR, Giordani PJ, Lepper HS, Croghan TW. Patient adherence and medical treatment outcomes: a meta-analysis. *Med Care* 2002 Sep;40(9):794-811.
8. Rollnick S, Miller R. What is motivational interviewing? *Behav Cogn Psychother*. 1995 Mar;23(4):325-334.
9. Emmons KM, Rollnick S. Motivational interviewing in health care settings: opportunities and limitations. *Am J Prev*. 2001 Jan;20(1):68-74

10. Ramseier CA, Suvan JE. Health behavior change in the dental practice. Ames (IA): Wiley-Blackwell; 2010. 177 p.
11. Croffoot C, Krust-Bray K, Black MA, Koerber A. Evaluating the effects of coaching to improve motivational interviewing skills of dental hygiene students. *J Dent Hyg.* 2010 Spring;84(2):57-64.
12. Miller WR, Rose GS. Toward a theory of motivational interviewing. *Am Psychol.* 2009 Sep;64(6):527-537.
13. Weinstein P, Harrison R, Benton T. Motivating mothers to prevent caries: confirming the beneficial effects of counseling. *J Am Dent Assoc.* 2006 Jun;137(6):789-793.
14. Weinstein P, Harrison R, Benton T. Motivating parents to prevent caries in their young children: one-year findings. *J Am Dent Assoc.* 2004 Jun;135(6):731-738.
15. Miller NH, Hill M, Kottke T, Ockene IS. The multilevel compliance challenge: recommendations for a call to action. *Circulation.* 1997 Feb;95(4):1085-1090.
16. Miller WR. Motivational interviewing with problem drinkers. *Behav Psychother.* 1983 Feb;11(2):147-172.
17. DHA: ADHA fact sheet [Internet]. Chicago (IL): American Dental Hygienists' Association; c2012. Oral health fast facts add a few to your next health story; [cited 2013 Feb 1]. Available from: http://www.adha.org/resources-docs/72210_Oral_Health_Fast_Facts_&_Stats.pdf
18. Jonsson B, Ohrn K, Oscarson N, Lindberg P. An individually tailored treatment program for improved oral hygiene: introduction of a new course of action in health education for patients with periodontitis. *Int J Dent Hyg.* 2009 Aug;7(3):166-175.
19. Rubak S, Sandbaek A, Lauritzen T, Christensen B. Motivational interviewing: a systematic review and meta-analysis. *Br J Gen Pract.* 2005 Jun;55(513):305-312.
20. Zolnieriek KB, DiMatteo MR. Physician communication and patient adherence to treatment: a meta-analysis. *Med Care.* 2009 Aug;47(8):826-834.
21. Miller WR, Rollnick S. Ten things that motivational interviewing is not. *Behav Cogn Psychother.* 2009 Mar;37(2):129-140.
22. Haeseler F, Fortin AH, Pfeiffer C, Walters C, Martino S. Assessment of a motivational interviewing curriculum for year 3 medical students using a standardized patient case. *Med Educ.* 2010 Jul;84(1):27-30.
23. Brand VS, Bray KK, MacNeill S, Catley D, Williams K. motivational interviewing on clinical outcomes following periodontal maintenance therapy. *Int J Dent Hyg.* 2012 May;11(2):134-141.
24. Miller WR, Yahne CE, Moyers TB, Martinez J, Pirritano M. A randomized trial of methods to help clinicians learn motivational interviewing. *J Consult Clin Psych.* 2004 Dec;72(6):1050-1062.
25. Wiley EJ, Irwin JD, Morrow D. Healthcare practitioners' perceptions of motivational interviewing training for facilitating behavior change among patients. *J Allied Health.* 2012 Fall;41(3):131-139.
26. Humair JP, Cornuz J. A new curriculum using active learning methods and standardized patients to train residents in smoking cessation. *J Gen Intern Med.* 2003 Dec;18(12):1023-1027.
27. White LL, Gazewood JD, Mounsey AL. Teaching students' behavior change skills: description and assessment of a new motivational interviewing curriculum. *Med Teach.* 2007 May;29(4):e67-71.
28. Perry P. Concept analysis: confidence/self-confidence. *Nurs Forum.* 2011 Oct-Dec;46(4):218-230.
29. Bell K, Cole BA. Improving medical students' success in promoting health behavior change: a curriculum evaluation. *J Gen Intern Med.* 2008 Sep;23(9):1503-1506.
30. Kaufman DM, Laidlaw TA, Macleod H. Communication skills in medical school: exposure, confidence, and performance. *Acad Med.* 2000 Oct;75(10 Suppl):S90-92
31. Krust Bray K, Catley D, Voelker MA, Liston R, Williams KB. Motivational interviewing in dental hygiene education: curriculum modification and evaluation. *J Dent Educ.* 2013 Dec;77(12):1662-1669.
32. Kushner RF. Barriers to providing nutrition counseling by physicians: a survey of primary care practitioners. *Prev Med.* 1995 Nov;24(6):546-552.
33. López-Jornet P, Fabio CA, Consuelo RA, Paz AM. Effectiveness of a motivational-behavioural skills protocol for oral hygiene among patients with hyposalivation. *Gerodontology.* 2014 Dec;31(4):28-95.

Admissions Criteria that Influence Dental Hygiene Students' Performance on Board Examinations

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Abstract

Purpose: The purpose of the study is to assess which dental hygiene program admission variables contribute to the selection of students who are successful in passing the National Board Dental Hygiene Examination (NBDHE) and a clinical dental hygiene board examination.

Methods: A retrospective study was conducted by investigating 121 educational records and application forms from graduates through the years 2008 to 2011 from one educational institution. Predictor variables included re-application status, student GPA, age, race/ethnicity, type of school attended for pre-requisite coursework, number of times the pre-requisite courses needed to be retaken, course load while taking the pre-requisites, previous degrees obtained, American College Test (ACT) scores and student participation in the university's lower division (LD) or upper pre-placement (UPP) program. Graduate success is defined by NBDHE scores and clinical board scores.

Results: The data was analyzed using univariate analyses and multivariate regression statistical techniques. Univariate analyses did not identify any predictor variables to be significantly associated with the dental hygiene student's clinical board score. However, the variables of ACT scores and type of student, specifically the UPP students, demonstrated a significant relationship with NBDHE scores.

Conclusion: ACT scores are a variable that is positively associated with higher NBDHE results. Results indicate that UPP students benefit from participating in supportive educational services while fulfilling requirements for admissions in the dental hygiene program. Results also indicate that there were no significant variables identified to predict clinical board scores.

Keywords: dental hygiene education, admissions criteria, student success, clinical board examination, National Dental Hygiene Board Examination

This manuscript supports the NDHRA priority area, **Professional development: Education** (evaluation).

Introduction

Dental hygiene schools are faced with an ongoing challenge of selecting the most qualified students to fill a limited number of openings each year.¹⁻⁵ If a program selects less qualified applicants, lower standardized clinical scores and an increased number of failures on the National Board Dental Hygiene (NBDHE) written board exam may result, ultimately leading to licensing barriers for the student.^{1,3-5} This problem may be prevented if the selection criteria utilized in the admissions process was able to predict future student success. While previous studies have investigated the admissions process and the success of dental hygiene students enrolled in the program,³⁻⁷ the majority of the literature focuses on the admissions processes utilized in dental schools.⁸⁻¹⁶ Dental hygiene programs cannot automatically assume that the successful admissions predictors of dental student performance correlate to the admission variables associated with dental hygiene student success. Entry-level dental hygiene students are undergraduates and the factors predicting success may be different for dental students

enrolled in a graduate degree program. Thus, there may be inherent differences between these two sets of students.

There is evidence demonstrating that overall college grade point averages (GPA), as well as the science GPA, are the best predictors of success in dental school.^{8,12-15,17-19} However, college and science GPAs do not necessarily indicate dental student success in terms of clinical performance on regional examinations.^{16,19} Also, some researchers interested in admission variables as predictors for dental school success, investigated the role of the student interview as part of the admissions process.^{15,20,21} There is conflicting data regarding the role interviews play in predicting dental student success.^{15, 20,21} Some studies demonstrate that interviews are not beneficial predictors of success,²⁰ while other studies demonstrate a significant relationship between admissions interviews and success in dental school.^{15,21}

While previous literature highlights useful predictors for success in dental school, it is not certain

that these variables apply to success in undergraduate degree programs. Dental hygiene programs either culminate with a baccalaureate degree or an associate degree, which differs from the post-baccalaureate degrees conferred in dental science or dental medicine. Also, dental hygiene student applicants are not required to take a standardized admissions test, such as the Dental Admissions Test (DAT), to assess scientific knowledge and aptitude. Thus, unlike dental school admissions committees who utilize scores from the Dental Admissions Test (DAT) to help rank candidates, dental hygiene program admissions committees must rely on other assessment variables to select the most qualified students. Currently, there has been limited research published on the specific variables pertaining to the dental hygiene admissions processes and student success.^{1,3-6,22}

Grade point average has been a popular variable of interest in the literature as a predictor for success in dental school and could also play a role in the success of dental hygiene students.^{8,15,19,23} Previous studies regarding the dental hygiene admissions processes have investigated whether the GPA at the time of program entry had an effect on predicting dental hygiene student success.^{1, 4, 5, 7, 22} Ward et al. found that dental hygiene students' GPA at the end of the first year in the dental hygiene program was actually a better predictor of passing the National Board Dental Hygiene Examination (NBDHE) when compared to the GPA from prerequisite courses at time of program entry.¹ However, Ward et al. also noted that the GPA at entrance to the program along with the combined Scholastic Aptitude Test (SAT) scores were useful in predicting student success.² Austin found a weak, but positive correlation between college GPA specific to a microbiology prerequisite course and subsequent NBDHE results.⁵ Alzahrani et al. report in their research that while there was not a significant relationship between incoming college GPAs and GPAs in prerequisite college science courses with graduation and NBDHE success, student performance in specific dental hygiene courses had a positive correlation.⁴ Alzahrani et al. found that final course grades in oral pathology, oral anatomy, and histology as well as an admissions criteria points program predicted graduation and NBDHE success for the students in their study.⁴

Several studies refer to student scores on the American College Testing (ACT) examination as a predictor for student success. Kissell et al. found that ACT scores below the national and state averages, combined with whether a student failed a pre-requisite course, had a significant correlation with future course failures in the dental hygiene curriculum and ultimate failure on the NBDHE.³ Austin's research demonstrated that scores specific to the reading portion of the ACT correlated to success on the NBDHE.⁵

Bauchmoyer et al found that student GPAs for three prerequisite science courses had a positive correlation with the overall GPA in the dental hygiene program.² A specific correlation was also identified between passing the human nutrition course given

during the formal dental hygiene curriculum and student GPAs in the prerequisite science courses.² Sustained enrollment at a single institution may also factor into the success of a dental hygiene student. Bauchmoyer et al reported that students who completed the science prerequisite courses in multiple institutions had lower mean cumulative dental hygiene GPAs as compared to students who completed their science prerequisite course work solely at one institution.²

In a more recent study, Sanderson and Lorentzen identified the overall college GPA, college science GPA, followed by standardized ACT test scores, as the most commonly used admission criteria for dental hygiene programs across the United States.⁶ However, their findings also revealed that none of these variables were statistically significant in predicting a student's success in passing NBDHE or clinical examinations.⁶

This study gathered student data from the baccalaureate degree dental hygiene program at the University of Louisville, School of Dentistry, in Louisville, Kentucky, to determine if there were any reliable predictors of student success in taking a clinical board examination or the NBDHE.

Methods

A retrospective study was conducted of educational records and application forms of students who graduated from the dental hygiene program at the University of Louisville School of Dentistry, a traditional four-year university, between the years 2008 and 2011 (N=121). The researchers intentionally chose this four year range for the data collection since the NBDHE numeric scores were distributed during that period rather than the current NBDHE pass/fail reporting system. The study proposal was approved by the University of Louisville School of Dentistry Institutional Review Board.

Predictor variables included both continuous covariates (age entering the program, overall GPA, science GPA, curriculum GPA, and ACT score) and categorical covariates (year of graduation, re-applicant status to the upper division program, race, previous higher education, course load, previous degrees, any retakes of dental hygiene pre-requisites, and type of student). Curriculum GPA consists of the GPA of all of the specific pre-requisite courses needed before applying to the upper division dental hygiene program. Categories of previous higher education were operationalized by specifying how much pre-requisite course work was done in a community college setting, a four-year university setting or a mixture between the two settings before applying to the upper division dental hygiene program. Students were classified according to how they entered the program by the following student types: an "outsider" was a student who transferred to the program from another institution or was a University of Louisville student who declared another major before applying to the upper division dental hygiene program; a lower division (LD) student was one who had attended the University of Louisville to obtain general education and program prerequisites;

and an upper pre-placement (UPP) student was one who met the program acceptance criteria prior to the application deadline. To further clarify, LD students are students who have come to the university and declared dental hygiene as their major in their first or second year of college and UPP students are those who applied for early admission into the upper division dental hygiene program during their senior year in high school or following their first semester in college. To be eligible for UPP, students must have a minimum score of 25 on the ACT and must have a high school cumulative GPA of 3.3 or higher or have completed their first college semester with a cumulative 3.3 GPA and a 3.0 GPA average in specific sciences. All UPP students must successfully complete specific coursework to maintain admission into the upper division dental hygiene program.

All statistical analyses were performed using the SPSS program, version 22. Descriptive summary statistics were generated for all variables and inferential statistics included univariate analyses and a multiple regression analysis. The alpha level was set at 0.05 to determine statistical significance. Admissions predictor variables that were significant or close to significant were entered into a multiple regression model to determine a relationship to the dependent variable (dental hygiene clinical board examination pass rates and NBDHE scores). Only the scores of the first attempt at a regional clinical board examination and NBDHE were included in the statistical analysis.

Results

The study sample (N = 121) consisted of dental hygiene graduates who averaged 23 years of age (SD = 5.1 years). Student performance based on the overall, science, and curriculum GPAs was shown to be above a 3.0 on a 4.0 point scale (3.4 ± 0.32 , 3.3 ± 0.41 , and 3.5 ± 0.28 , respectively). The average ACT score was 22 (SD = 3.19). The number of graduates per year ranged between 29-32

students. The majority of students were first time applicants to the program; Caucasian; were students with previous higher education experience at a four-year university; had maintained a full time (FT) course load prior to applying to the dental hygiene program; did not hold other degrees; did not need to re-take dental hygiene pre-requisites for program admission; and were considered "outsiders" to the program by either completing the necessary pre-requisites at another institution of higher learning or coming from another department at the same university. (Table I)

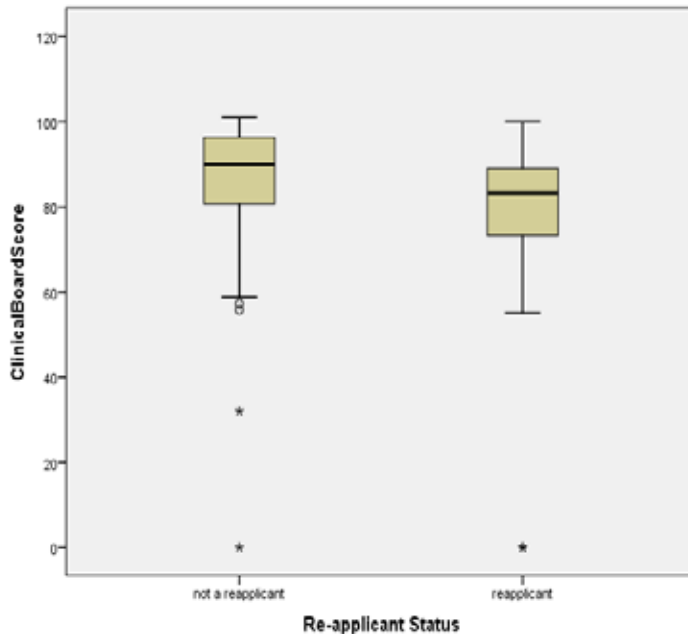
Table I: Descriptive Information for Independent and Demographic Variables

Admissions Variable	N	Range for Continuous variables	Means for Continuous Variables	Standard Deviation
Reapplicants:				
Not a Re-applicant	96			.43
Re-applicant	25			
Overall GPA	121	2.62 – 4.0	3.40	.33
Science GPA	121	2.51 – 4.0	3.32	.41
Curriculum GPA	121	2.77 – 4.0	3.45	.28
Age	121	19 – 45	23.10	5.11
Race:				
Caucasian	109			.78
Other Races	12			
Type of University previously attended:				
4 year university	81			
Community College	30			
Mixture of both	10			.86
Course load:				
Full Time	97			.64
Part Time	12			
Mixture of Both	12			
Previous Degrees?				
None	103			.59
Associates	10			
Bachelors or higher	8			
Retook Pre-requisites?				
None	88			
Yes, due to Failure	22			1.01
Yes, due to boosting grade	10			
ACT scores	83	15 - 30	21.92	3.19
Type of Student:				
Outsider	99			.60
Lower Division	12			
UPP	10			

Clinical Board Examination Scores

In the univariate analysis, none of the predictor variables were significant for clinical board examination scores. This suggests that variables used in the admissions process are not indicators for passing clinical board examinations. However, there was one interesting result in the t-tests for the variables of re-applicant status and clinical board score. Boxplots (Figure 1) illustrate that re-applicants to the program tend to have lower clinical board scores than students accepted into the program on their first application. There was also a wider range of scores for the re-applicants as opposed to the first time applicants. The Wilcoxon test evaluated the difference of the means of clinical board scores for re-applicants and students who gained entry into the program on the first application, and was found to be significant ($z = -2.356$, $p = .018$). This indicates that the distribution of clinical board scores is different between re-applicants and first time applicants. However, univariate analysis did not indicate a significant finding for re-applicant status and clinical board examination scores.

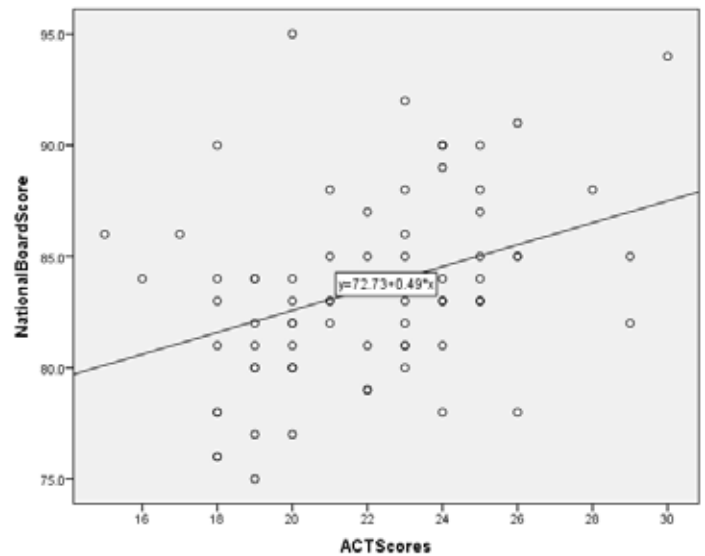
Figure 1: Boxplot for Re-applicant status and Clinical Board Exam Scores



NBDHE Scores

Univariate analysis of ACT scores ($F = 11.749$, $p = 0.001$) and curriculum GPA ($t = 2.104$, $p = 0.038$) was found to be statistically significant. However, ACT score submission was not a program requirement for applicants during the time period that the data was collected. Further t-tests revealed that there was not a significant difference on student NBDHE scores ($t = -.102$, $p = 0.920$) between applicants who reported ACT scores on their official transcripts ($n = 83$) versus applicants who did not include their ACT scores ($n = 38$). The scatterplot (Figure 2) illustrates that for every point increase in ACT scores, there is a half point gain in NBDHE scores.

Figure 2: ACT scatterplot



A multivariate regression was performed to see which predictor variables impacted NBDHE scores. The r^2 results suggest that approximately 22% of the total variance of NBDHE scores can be explained by the admissions and demographic variables gathered in this study. The overall regression analysis was statistically significant ($F = 4.096$, $p = 0.003$) indicating that there are some predictor variables related to NBDHE outcomes. Specifically, ACT scores ($b = 0.512$, $p < .001$) and the UPP student status ($b = -3.654$, $p < .01$) had a significant relationship to the NBDHE scores (Table II). Applicants with higher ACT scores demonstrated better performance on the NBDHE. UPP students performed slightly worse than LD students or students described as "outsiders" to the program.

Discussion

The purpose of this study was to determine whether any admissions variables or student demographic variables have a significant relationship on clinical board examination scores and/or NBDHE scores for dental hygiene students in one particular program. Overall, the univariate analyses were not statistically significant in predicting dental hygiene clinical board examination results, which was similar to the findings in the research conducted by Sanderson and Lorentzen.⁶ Univariate analyses indicated that ACT scores and curriculum GPA from college coursework had an effect on NBDHE exams when those variables were isolated. As indicated by previous studies regarding admissions into dental and dental hygiene schools and ACT scores,^{3,5} the multiple regression analysis using NBDHE scores as a dependent variable in this study, found that the ACT score has a significant positive relationship with the NBDHE scores. Therefore, students with higher ACT scores are more likely to perform well on the NBDHE. Scatterplots and regression equations indicate that for every point higher on the ACT, students are likely to do about a half a point better on the NBDHE. Therefore, this finding suggests that there may be a 5 point difference on NBDHE scores between those

Table II: Multiple Regression Analysis for NDHBE Scores

Admissions Variables	Unstandardized Beta	p-value
ACT Scores	.512	.001
Curriculum GPA	.900	.609
Race:		
Caucasian vs. Other	.636	.683
Type of Student:		
Lower Division vs. Outsider	-1.549	.224
Upper Pre-Placement vs. Outsider	-.3654	.010

students who scored a 20 and those students who scored a 30 on their ACT. Curriculum GPA was not statistically significant in the multivariate analysis.

Another finding is that the type of student impacted NBDHE scores. The University of Louisville has developed specific programs and services to help acclimate students to the university setting with the intent of assisting a successful transition to their selected majors and ultimately graduation from their chosen discipline. These services include academic support for LD dental hygiene majors and UPP students with pre-requisite courses prior to application to the upper division dental hygiene program. Participation in the academic support services was optional for the LD and UPP students. Recently, a living learning community has been added to provide additional structure and student support. However, any impact of this added service is not reflected in our data.

These findings also suggest that “outside” students, coming from another institution or another major within our university, who did not have the option to participate in these support services, performed better overall on the NBDHE when compared to the UPP students. The difference between the “outsiders” and the LD student NBDHE scores or between the LD students and UPP students was not statistically significant.

However, caution needs to be taken when interpreting these results due to the fact that the LD and UPP programs were relatively new during the time period studied and students were not required to participate in the academic support services. Thus, there could be a bias between the LD or UPP students who received additional academic supportive services and those who choose not to participate. Since the UPP students traditionally performed well academically in high school, one can speculate that they may have declined the additional support services due to confidence in their academic abilities and knowledge of their early acceptance in the upper division dental hygiene program. Unfortunately, data had not been collected to track students who accessed services

and those who did not during the time period studied. Since these programs were initiated, new mandatory support services have been developed and there is potential for future research on the impact of these required student support services.

There are several limitations in this study that may have influenced the results. First, this is a single institution study and therefore the results cannot be generalized to other dental hygiene programs due to variations in admissions criteria, curriculum sequence, program length, and terminal degree granted. Findings from this study suggest value in further research at other universities or schools. Secondly, the date range in this retrospective study is also limited due to the fact that students no longer receive numeric score on the NBDHE. As such, it is harder to determine which admissions variables are better predictors of student success. There are a limited number of studies examining other potential variables, such as race, previous higher education, course load, and type of student, which may also influence dental hygiene student success. This is an area for potential future research.

Additional research is needed to identify potential predictors of student success on clinical board examinations; as programs with high clinical board examination scores and subsequent pass rates, may elevate the program’s prestige in the surrounding dental community. Future research also needs to investigate the impact of reapplying to dental hygiene programs on future success in the program, as this was an interesting trend observed in this particular study. The role of the student support services prior to program admission and their impact on student performance and board examination outcomes is another area of interest for future research.

Conclusion

Students who are better prepared academically, as indicated by their performance on the ACT standardized test prior to admission in the dental hygiene program, will more likely score higher and pass a written board examination (NBDHE). However, it is not evident whether any variable currently in use is a reliable predictor of future success on a clinical board examination.

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References

1. Ward ST, Downey MC, Thompson AL, Collins MA Predictors of success in dental hygiene education: a follow-up study. *J Dent Hyg.* 2010 Winter;84(1):24-28.
2. Bauchmoyer SM, Carr MP, Clutter JE, Hoberty PD Predicting academic and National Board Dental Hygiene Examination performance based on academic factors. *J Dent Hyg.* 2004 Winter;78(1):39-45.
3. Kissell D, Moore WJ, Carr MP Admission indicators of failure on the National Board Dental Hygiene Examination. *J Dent Educ.* 2008;72(5)210.
4. Alzahrani MJ, Thomson EM, Bauman DB Predictors of student success in an entry-level baccalaureate dental hygiene program. *J Dent Hyg.* 2007 Spring;81(2):13p.
5. Austin LD Predicting national dental hygiene board examination success based on specific admission factors. *J Dent Hyg.* 2011 Fall;85(4):335-339.
6. Sanderson TR, Lorentzen MH Exploring Preadmission Criteria as Predictors for Dental Hygiene Licensure Examinations Pass Rates. *J Dent Hyg.* 2015 Apr;89(2):101-108.
7. DeWald J, Gutmann M, Solomon E Effect of grade point average and enrollment in a dental hygiene national board review course on student performance on the National Board Examination. *J Dent Educ.* 2004 Jan;68(1):77-80.
8. Curtis DA, Lind SL, Plesh O, Finzen FC Correlation of admissions criteria with academic performance in dental students. *J Dent Educ.* 2007 Oct;71(10):1314-1321.
9. Staat RH, Yancey JM The admission index in the dental school admissions process. *J Dent Educ.* 1982 Aug;46(8):500-503.
10. Itaya LE, Chambers DW, King PA Analyzing the influence of admissions criteria and cultural norms on success in an international dental studies program. *J Dent Educ.* 2008 Mar;72(3):317-328.
11. Kingsley K, Sewell J, Ditmyer M, O'Malley S, Galbraith GM Creating an evidence-based admissions formula for a new dental school: university of Nevada, Las Vegas, school of dental medicine. *J Dent Educ.* 2007 Apr;71(4):492-500.
12. Kreit LH, McDonald RE Preprofessional grades and the dental aptitude test as predictors of student performance in dental school. *J Dent Educ.* 1968 Dec;32(4):452-457.
13. Phipps GT, Fishman R, Scott RH Prediction of success in dental school. *J Dent Educ.* 1968 Jun;32(2):161-170.
14. Wood WW Grade averages and DAT scores as predictors of performance in dental school. *J Dent Educ.* 1979 Nov;43(12):630-632.
15. Sandow P, Jones A, Peek C, Courts F, Watson R Correlation of admission criteria with dental school performance and attrition. *J Dent Educ.* 2002 Mar;66(3):385-392.
16. Poole A, Catano VM, Cunningham DP Predicting performance in Canadian dental schools: the new CDA structured interview, a new personality assessment, and the DAT. *J Dent Educ.* 2007 May;71(5):664-676.
17. Hood AB Predicting achievement in dental school. *J Dent Educ.* 1963 Aug;27:148-155.
18. Hutton JG, Jr Aptitude and personality correlates of dental school performance. *J Dent Educ.* 1969 Dec;33(4):474-486.
19. Holmes DC, Doering JV, Spector M Associations among predental credentials and measures of dental school achievement. *J Dent Educ.* 2008 Feb ;72(2):142-152.
20. Stacey DG, Whittaker JM Predicting academic performance and clinical competency for international dental Students: seeking the most efficient and effective measures. *J Dent Educ.* 2005 Feb;69(2):270-280.
21. Heintze U, Radeborg K, Bengtsson H, Stenlås A Assessment and evaluation of individual prerequisites for dental education. *Eur J Dent Educ.* 2004 Nov ;8(4):152-160.
22. Helm DM, Grabarek ES, Reveal M Increasing dental hygiene student diversity: life-performance questions as alternative admissions criteria. *J Allied Health* 2003 Winter;32(4):279-284.
23. Kim M, Lee JI Variables predicting students' first semester achievement in a graduate-entry dental school in Korea. *J Dent Educ.* 2007 Apr;71(4):550-556.

The Prevalence of Dental Anxiety in Dental Practice Settings

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Abstract

Purpose: The purpose of this study was to assess the prevalence of dental anxiety and missed dental appointments due to dental anxiety among patients within three types of private dental offices.

Methods: This descriptive, cross-sectional study utilized the Modified Dental Anxiety Scale (MDAS). The MDAS consists of five questions to assess dental anxiety. Demographics and an open-ended question about missed dental appointments due to dental anxiety were included. Linear and logistic regression models were used to analyze anxiety scores as related to gender and age. Participants' responses to the open-ended question were compiled according to themes.

Results: Three hundred and eight (n=308) dental patients participated in the study. Using the MDAS cut-off scores of 15 and 19, the prevalence estimates of moderate to high and high dental anxiety within the total study population was 19% and 6.82% respectively. Females had an MDAS score 2.12 times higher than males ($p < 0.05$). For every one unit increase in age, the MDAS score was 0.08 units lower ($p < 0.05$). Out of the 308 participants, 26 (8.4%) responded to missing a dental appointment due to dental anxiety. Five common themes were coded as the source of dental anxiety: fear of dental experience, previous negative dental experience, cost of treatment, gag reflex, and fear of bad news.

Conclusions: Moderate to high dental anxiety was present in 19% of the population sampled. Awareness of patients' dental anxiety level and the utilization of anxiety reducing measures during treatment may encourage routine care.

Keywords: dental anxiety, prevalence dental anxiety, dental anxiety survey, modified dental anxiety scale

This manuscript supports the NDRHA priority area, **Client level: Oral health care** (new therapies and prevention modalities).

Introduction

Dental anxiety is characterized by a physical and/or emotional response to a perceived threat.¹ This threat does not always have to be physically present, as the mere idea of an uncomfortable situation can provoke feelings of uneasiness and apprehension.¹ In the dental office setting, this perceived threat could be a painful injection or procedure, the discomfort of keeping one's mouth open for an extended period of time, or a lengthy and costly treatment plan. It is important to differentiate dental anxiety from fear and a phobia: fear is an emotional and/or physical response to what is perceived as a more distinct and immediate threat; phobia is associated with overwhelming feelings of fear that can cause a severe hindrance to daily activities.¹ A study of 1,959 individuals comparing the prevalence of fears and phobias, such as snakes and physical injuries, identified dental fear present among 24.3% of the participants, fear of snakes was 34.8%, and fear of physical injuries was 27.2%.²

According to researchers, anywhere between 50 and 80% of adults in the United States have some degree of dental anxiety, ranging from mild to severe.¹ More than 20% of dentally anxious patients do not see a dentist regularly, and anywhere from 9 to 15% of anxious patients avoid care altogether.¹ A patient's perceptions may influence their level of anxiety.³ For example, if a patient expects pain during a scaling procedure, they are more likely to report higher anxiety levels.⁴ Additionally, there is an association between frequent gagging and higher anxiety levels.³ Research has also shown possible correlations between dental anxiety, missed appointments, avoidance of care, and a greater need for more extensive treatment.⁵⁻⁷ Avoidance of care refers to a refusal to seek care or to follow recommended treatment plans and can often result in a greater need for treatment.^{4,6}

Dental Anxiety

In terms of high dental anxiety, research has shown the prevalence to range anywhere from 10 to 20% in

adult populations.⁸⁻¹¹ Humphris et al. examined the prevalence of dental anxiety among a representative sample (n=11,382) of adults aged 16 years and older from the general population in England, Wales, and Northern Ireland using the Modified Dental Anxiety Scale (MDAS).⁸ They reported the prevalence of high dental anxiety in 11.6% of their study population.⁸ Two other studies from India and France suggest 46% of patients had some degree of dental anxiety; with 6 to 16% being moderately anxious, 17.33% being highly anxious, and 7 to 12.67% being extremely anxious.^{9,10} The overall prevalence reported was between 11.6 to 12.67%.⁸⁻¹⁰

Results from the aforementioned studies indicated that women tend to have greater anxiety than men, anxiety decreases with age, and those with higher anxiety receive less regular dental care.⁸⁻¹¹ Also, those with previous negative dental experiences were more anxious than those with no history of previous negative experiences.^{8,9} Limitations include cross-sectional study designs, self-reported bias, and lack of generalizability; but apart from these limitations, a valid, reliable scale was used to assess dental anxiety.⁸⁻¹¹

Use of Dental Anxiety Assessments

Since research has shown a possible correlation between dental anxiety and avoidance of care,^{5,-8, 10, 12} assessing anxiety prior to treatment would increase awareness for dental staff so that anxiety-reducing measures could be incorporated into patient care. Using the Level of Exposure Dental Experiences Questionnaire (LOE-DEQ) and the MDAS, Humphris and King determined that "extreme helplessness" during treatment was the most influential experience affecting anxiety levels and recommended the use of these questionnaires so the dental team can plan appropriate treatment patients with identified dental anxiety.¹³ It would seem appropriate to administer an anxiety assessment such as the MDAS to determine whether patients are suffering from dental anxiety, as research has shown it to be a valid, reliable scale.^{8, 9, 11, 14-17} Any concern that using these assessments may increase patients' anxiety prior to treatment is unfounded, as current research shows otherwise.^{18,19}

A United Kingdom (UK) study by Dailey et al. revealed a lack of use of anxiety assessments among a relatively large sample of dentists.¹⁴ Of the 269 questionnaires included in the final analysis, the most frequently used assessment for adults was the MDAS; only 54 dentists (20%) used adult dental anxiety assessments, and only 31% of the 54 dentists used them often or always, while 69% used them sometimes or rarely.¹⁴ Studies in other countries have also supported the use of the MDAS in terms of reliability and validity.¹⁵⁻¹⁷ Even with its ease of use, it seems that dentists may not be regularly employing such a survey to assess anxiety among their patients.¹⁴

The purpose of this study was to determine the prevalence of dental anxiety among a convenience sample of patients within three types of dental offices: general, endodontic, and periodontal; to identify possible correlations between dental anxiety, age, gender, and missed appointments; and to reveal, in their own words, what patients feel is the source of their dental anxiety.

Methods and Materials

This cross-sectional study, approved by the Massachusetts College of Pharmacy and Health Sciences (MCPHS) University Institutional Review Board (IRB), assessed the level of dental anxiety and missed dental appointments due to anxiety among a convenience sample of patients in three different types of dental offices: a general dental office that offers sedation dentistry, an endodontic office, and a periodontal office, all located in Framingham, Massachusetts. Inclusion criteria included anyone over 18 years of age. Exclusion criteria included: those under age 18, those who were unable to read and write English, those who failed to provide consent, and those who failed to fully answer the questionnaires.

Informed consent was obtained and the ability to refuse to participate at any point during the study was provided along with the dental anxiety questionnaire. The questionnaire included demographic questions regarding the type of dental office age, gender, and level of dental anxiety. Figure 1 shows the MDAS, which was used to assess dental anxiety.¹¹ Participants were asked to respond to the questions based on their level of agreement. Possible responses include: not anxious, slightly anxious, fairly anxious, very anxious, and extremely anxious.¹¹ Using a Likert scale, not anxious is equal to a score of 1, slightly anxious is equal to a score of 2 and so on.¹¹ The sum of all five questions can range from 5 to 25, with 5 being not anxious and 25 being extremely

Figure 1

Modified Dental Anxiety Scale: Scoring Instructions
Not anxious = 1
Slightly anxious = 2
Fairly anxious = 3
Very anxious = 4
Extremely anxious = 5

Total score is a sum of all five questions, ranging from 5 to 25. A cut-off of 19 or above indicates high dental anxiety.

anxious.¹¹ Any score of 19 or higher indicates a highly anxious patient.¹¹ Similar research using this survey determined any score of 11 or higher indicative of moderate to high dental anxiety.⁹ One open-ended question was included to ask if patients had ever missed a dental appointment due to their anxiety and, if so, what they believed was the source of their dental anxiety.

Data collected from the survey was downloaded into Microsoft Excel and imported into STATA® statistical software version 11.2 for analysis. As per the survey responses, demographics including age, gender, and dental office type were enumerated using

frequency percentiles and summary statistics. Differences in age and gender across dental office type were assessed via ANOVA and Fisher's Exact Test. Modified Dental Anxiety Scale (MDAS) scores were tabulated for each survey. MDAS scores were assessed as both a linear continuous outcome and a binary outcome (MDAS score ≥ 19). Using the binary outcome (MDAS score ≥ 19) as an indicator of dental anxiety, dental anxiety prevalence across dental office types was enumerated with exact Binomial 95% Confidence Intervals. The prevalence of moderate to high dental anxiety (MDAS score > 15) was determined as a percentage of the entire study population.

Univariate and multivariate linear and logistic regression models were used to assess associations between age and gender on MDAS scores (both continuous and binary). Qualitative analysis was used to analyze answers from the one open-ended question on missed appointments and dental anxiety. Themes were identified among all participants' answers and coded accordingly.

Results

There were a total of 308 participants; 200 from the general dental office, 99 from the endodontic office, and 9 from the periodontal office. Table I shows the demographic characteristics of the study population; 59% of participants were females; the mean age of the study population was approximately 52 years (SD 14.7 years) with an age range between 18 and 90 years. Mean MDAS score for the total study population was 10.19; with 10.06 from the general dental office, 10.59 from the endodontic office, and 9.22 from the periodontal office. Using the cut-off score of ≥ 19 , the prevalence estimate of high dental anxiety within the total study population was 6.82% (Exact Binomial 95% CI: 4.27%-10.23%); 5% within the general dental office (Exact Binomial 95% CI: 2.42%-9.00%), 3.16% within the endodontic office (Exact Binomial 95% CI: 5.68%-19.01%), and 0% within the periodontal office (Exact Binomial 95% CI: 0.00%-33.63%). Using the cut-off score of > 15 , the percentage of participants with moderate to high dental anxiety was 19%.

Table II shows univariate and multivariate logistic regression models using the MDAS score as a binary variable based on the cut-off score of ≥ 19 . As per the MDAS score ≥ 19 cutoff, the odds of dental anxiety is 3.19 (95% CI 1.05, 9.71) times greater for females than males. The univariate association between binary MDAS score and age was not found to be statistically significant.

A multivariate logistic regression model including both gender and age showed little change in the estimated odds ratios for gender and age respectively, with additional control for office type showing little change with identical inference (odds ratio for gender 3.28; 95% CI 1.06, 10.01).

Table III shows univariate and multivariate linear regression models for the MDAS scores when used as a continuous variable. Females had a mean MDAS score 2.12 points higher than males (95% CI 1.09, 3.15), with mean MDAS score 0.08 points lower for each one-year increase in age (95% CI -0.12, -0.05). A multivariate linear regression model including both age and gender showed little change in the estimated regression coefficients. Additionally controlling for office type showed little difference in the estimated regression coefficients for age and gender on mean MDAS score, leading to identical inference.

As per the qualitative analysis, 26 participants (8.4%) responded to missing a dental appointment due to dental anxiety; 17 from the general dental office, 8 from the endodontic office, and 1 from the periodontal office. Five common themes were coded as being the source of dental anxiety: fear of dental experience (8), previous negative dental experience (13), cost of treatment (2), gag reflex (1), and fear of bad news (2).

Discussion

The results of this study indicate there was no statistically significant difference in the prevalence of high dental anxiety among different types of dental offices. This suggests the type of dental procedure being performed may not be a significant factor in terms of dental anxiety. The prevalence estimate of 6.82% for high dental anxiety among the study population is lower than expected when compared to other studies, which indicate a prevalence of 10-20%.⁸⁻¹¹ However, the percentage of

Table I: Demographic Characteristics of Study Population

	Total Survey Population (n = 308)	General Dental Office (n = 200)	Oral Surgery Office (n = 99)	Periodontal Office (n = 9)	p-value
Gender, n (% female)	181 (59%)	116 (58%)	57 (58%)	8 (89%)	p = 0.188
Participant Age, mean yrs (SD)	51.55 (14.70)	52.06 (14.62)	51.10 (14.65)	45.11 (17.22)	p = 0.358
MDAS score, mean (SD)	10.19 (4.64)	10.06 (4.19)	10.59 (5.48)	9.22 (4.12)	p = 0.510
MDAS score ≥ 15 , n (%)	51 (17%)	27 (14%)	23 (23%)	1 (11%)	p = 0.105
MDAS score ≥ 19 , n (%)	21 (7%)	10 (5%)	11 (11%)	0 (0%)	p = 0.125

*p-values for continuous variables via ANOVA; p-values for categorical variables via Fisher's Exact Test

Table II: Univariate and Multivariate Logistic Regression Models for MDAS \geq 19 vs MDAS $<$ 19 (n=308)

Univariate Models	
	Odds Ratio (95% CI)
gender (female)	3.19 (1.05 , 9.71)
age	0.97 (0.94 , 1.01)
Multivariate Model I	
gender (female)	3.07 (1.01 , 9.38)
age	0.97 (0.94 , 1.01)
Multivariate Model II	
gender (female)	3.28 (1.06 , 10.01)
age	0.97 (0.94 , 1.01)
Oral Surgery Office	2.36 (0.95 , 5.87)
Periodontal Office	—

* p < 0.05 for parameter estimate

the study population with moderate to high dental anxiety (19%), suggests that a substantial portion of the patient population suffers from some degree of anxiety and would benefit from anxiety-reducing measures during treatment.

Similar to other research findings, this study found a statistically significant difference in dental anxiety between males and females, with females reporting higher levels of dental anxiety.⁸⁻¹⁰ This study also found that high dental anxiety decreases with increased age, which was similar to other findings.⁸⁻¹⁰ For participants who reported missing an appointment due to dental anxiety, a common theme among a majority of the participants was having had a previous negative dental experience as the source for their dental anxiety, similar to other research findings.¹³

There are several limitations to this study. The overall response rate of 308 is low; the response rate of 9 for the periodontal office is too low to draw any significant conclusions for this type of office specifically and also makes it difficult to compare data between the three offices. The mean age of the patients was 52 years, suggesting that young adults and elderly populations may not have been adequately represented in this sample. Participants were not asked if it was their first visit to the office and those who were new patients may have been more likely to feel anxious compared to those who had been receiving care at a familiar office for a period of time. All three offices were located in one community, making it difficult to generalize results to other populations. Another limitation is the cross-sectional design of the study, which does not allow for causality to be shown. Also, studies such as this one, using self-reported data, are likely to introduce bias into the study results, as participants may not

Table III: Univariate and Multivariate Linear Regression Models for MDAS score (n=308)

Univariate Models	
	Coefficient Estimate (95% CI)
gender (female)	2.12 (1.09 , 3.15)
age	-0.08 (-0.12 , -0.05)
Multivariate Model I	
gender (female)	2.01 (1.01 , 3.01)
age	-0.08 (-0.11 , -0.05)
Multivariate Model II	
gender (female)	2.09 (1.09 , 3.09)
age	-0.08 (-0.11 , -0.05)
Oral Surgery Office	0.49 (-0.57 , 1.55)
Periodontal Office	-2.01 (-4.97 , 0.95)

* p < 0.05 for parameter estimate

answer questions honestly or may misunderstand what a question is asking.

Suggestions for future research include longitudinal studies to examine possible correlations between gender, age, socioeconomic status and dental anxiety. It is important to survey those who do not regularly seek care at dental offices, as research suggests that those with high dental anxiety may avoid regular care altogether.³⁻⁵ For this reason, it would be beneficial to reach out to a larger segment of the population; not limited to those who are actually arriving for treatment at a dental office. Further research should also be conducted to examine possible correlations between dental anxiety and missed appointments, as well as whether the use of dental anxiety assessments in dental offices improves patient outcomes. A qualitative research design could provide a deeper understanding of sources of dental anxiety as well as anxiety-reducing measures that patients feel would lower their dental anxiety.

Conclusion

Although it may be helpful to assess the prevalence of dental anxiety among a more representative sample of the population as in previous studies,⁸⁻¹¹ dental offices may directly benefit from assessing the prevalence of anxiety among their patient population. Dental hygienists are in a unique position to assess patient comfort and to educate patients on dental anxiety and coping mechanisms. Anxiety assessments such as the MDAS are arguably an easy, reliable way to assess dental anxiety so that care can be more patient-centered and effective. Being aware of patients' anxiety may contribute to the dental professionals' establishment of a trusting rapport and thus encourage routine care in an effort to help patients maintain optimal oral health.

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References

1. Kamin V. Fear, stress, and the well dental office. *Northwest Dent.* 2006;Mar-Apr; 85(2):10-1,13,15-8.
2. Randall C, Shulman P, Crout R, McNeil D. Gagging and its associations with dental care-related fear, fear of pain and beliefs about treatment. *J Am Dent Assoc.* 2014 May;145(5):452-457.
3. Sanikop S, Agrawal P, Patil S. Relationship between dental anxiety and pain perception during scaling. *J Oral Sci.* 2011 Sep;53(3):341-348.
4. Oosterink FM, de Jongh A, Hoogstaten J. Prevalence of dental fear and phobia relative to other fear and phobia subtypes. *Eur J Oral Sci.* 2009 Apr; 117(2):135-143.
5. Lin KC. Behavior-associated self-report items in patient charts as predictors of dental appointment avoidance. *J Dent Educ.* 2009 Feb;73(2):218-224.
6. Armfield JM. What goes around comes around: revisiting the hypothesized vicious cycle of dental fear and avoidance. *Community Dent Oral Epidemiol.* 2013 Jun;41(3):279-287.
7. Sohn W, Ismail AI. Regular dental visits and dental anxiety in an adult dentate population. *J Am Dent Assoc.* 2005 Jan; 136(1):58-66.
8. Humphris G, Crawford JR, Hill K, Gilbert A, Freeman R. UK population norms for the Modified Dental Anxiety Scale with percentile calculator: adult dental health survey 2009 results. *BMC Oral Health.* 2013 Jun24;13:29. doi:10.1186/1472-6831-13-29.
9. Malvania EA, Ajithkrishnan, CG. Prevalence and socio-demographic correlates of dental anxiety among a group of adult patients attending a dental institution in Vadodara city, Gujarat, India. *Indian J Dent Res.* 2011 Jan-Feb; 22(1):179-180.
10. Nicolas E, Collado V, Faulks D, Bullier B, Hennequin M. A national cross-sectional survey of dental anxiety in the French adult population. *BMC Oral Health.* 2007 Oct;7:12.
11. Humphris GM, Dyer TA, Robinson PG. The modified dental anxiety scale: UK general public population norms in 2008 with further psychometrics and effects of age. *BMC Oral Health.* 2009 Aug 26;9:20. doi:10.1186/1472-6831-9-20.
12. Hagglin C, Hakeberg M, Ahlqwist M, Sullivan M, Berggren U. Factors associated with dental anxiety and attendance in middle-aged and elderly women. *Community Dent Oral Epidemiol.* 2000 Dec;28(6):451-460.
13. Humphris G, King K. The prevalence of dental anxiety across previous distressing experiences. *J Anxiety Disord.* 2011 Mar; 25(2):232-236.
14. Dailey YM, Humphris GM, Lennon MA. The use of dental anxiety questionnaires: a survey of a group of UK dental practitioners. *Br Dent J.* 2001 Apr 28;190(8):450-453.
15. Coolidge T, Arapostathis KN, Emmanouil D, et al. Psychometric properties of Greek versions of the Modified Corah Dental Anxiety Scale (MDAS) and the Dental Fear Survey (DFS). *BMC Oral Health.* 2008 Sep 30; 8:29-6831-8-29.
16. Coolidge T, Hillstead MB, Farjo N, Weinstein P, Coldwell SE. Additional psychometric data for the Spanish Modified Dental Anxiety Scale, and psychometric data for a Spanish version of the Revised Dental Beliefs Survey. *BMC Oral Health.* 2010 May 13;10:12. doi:10.1186/1472-6831-10-12.
17. Tunc EP, Firat D, Onur OD, Sar V. Reliability and validity of the Modified Dental Anxiety Scale (MDAS) in a Turkish population. *Community Dent Oral Epidemiol.* 2005 Oct;33 (5):357-362.
18. Humphris GM, Clarke HM, Freeman R. Does completing a dental anxiety questionnaire increase anxiety? A randomised controlled trial with adults in general dental practice. *Br Dent J.* 2006; 201(1):33-35.
19. Humphris GM, Hull P. Do dental anxiety questionnaires raise anxiety in dentally anxious adult patients? A two-wave panel study. *Prim Dent Care.* 2007 Jan;14 (1):7-11.

Perceptions Related to Use of Electronic Cigarettes among California College Students

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Abstract

Purpose: To assess electronic cigarette (e-cigarette) use, factors associated with use, and exposure to e-cigarette-related information from health professionals in a sample of college students attending a public university in northern California, using a web-based survey.

Methods: In this quantitative cross-sectional study, survey items assessed e-cigarette use, perceived risks and benefits, and exposure to e-cigarette-related information from health professionals and were pilot tested for feasibility and acceptability. Participants were recruited from three courses taught at a northern California public university and were given an electronic link to the survey with informed consent information. Frequency distributions and cross-tabulations were calculated for survey responses. The Mann-Whitney U-test was used to compare differences in perceived risks, benefits, and social consequences between ever-users and never-users.

Results: Ninety-one individuals completed the web-based survey. Among respondents, 89% were aware of e-cigarettes, 49% were ever-users, and 10% were current (past-30 day) e-cigarette users. Compared to e-cigarette ever-users, never-users perceived a higher chance of experiencing 5 out of 8 physical and social risks from e-cigarette use ($P < 0.05$). E-cigarettes, marijuana, and hookah were perceived to be less harmful to health than cigarettes. Few participants reported receiving counseling regarding e-cigarettes from health professionals, including dental hygienists. Counseling about the adverse health effects of cigarettes was more common in this study population.

Conclusion: Dental hygienists must stay current with the scientific evidence related to e-cigarette use and incorporate such information into their client tobacco-related counseling. Addressing the perceived physical and social risks associated with e-cigarette use when counseling college students may deter them from initiating or continuing e-cigarette use.

Keywords: electronic cigarettes, awareness, perceptions, health promotion

This manuscript supports the NDHRA priority area, **Client level: Oral health care** (new therapies and prevention modalities).

Introduction

Despite declines in cigarette smoking among adolescents and adults in the United States (US), the use of electronic cigarettes (e-cigarettes) is increasing rapidly.^{1, 2} The percentage of adults who have ever used e-cigarettes rose from 3.3% in 2010 to 8.5% in 2013.³ Current e-cigarette use (defined as use in the past 30 days) among high school students increased from 1.5% in 2011 to 16% in 2015.¹

E-cigarettes are battery-operated devices that work by heating and converting a liquid mixture, often called e-liquid, into an aerosol, commonly termed vapor, and delivering nicotine to the user without the combustion of tobacco.⁴ E-cigarettes contain nitrosamines (potent cancer-causing chemicals), diethylene glycol, and other contaminants potentially harmful to humans.⁵ The adverse health effects of e-cigarette use are currently under study.

As a possible alternative product for conventional cigarettes, it has been suggested that e-cigarettes have the potential to reduce harm.⁶ However, it also has been proposed that e-cigarettes could act as a gateway product to cigarette smoking and encourage dual use with other forms of tobacco and/or marijuana.⁷ Moreover, e-cigarettes are heavily marketed and portrayed as a safe alternative to tobacco.⁸ Mixed messages and lack of consensus may lead college students to rely on their own risk and benefit perceptions of e-cigarettes in their decision making about whether or not to use.

Dental hygienists, like other healthcare professionals, play an important role in preventing initiation and encouraging cessation of tobacco use among their patients.⁹⁻¹¹ The current Clinical Guideline for the Treatment of Tobacco Use and Dependence recommends that the 5A's, consisting of the following:

Asking about tobacco use at each appointment, advising users to quit, assessing readiness to quit, providing assistance with the quitting process, and arranging follow up, be implemented at each patient visit.¹² Studies have documented that a physician's brief advice to quit smoking significantly increased long-term smoking abstinence rates by about 10%.¹² Moreover, brief tobacco interventions by non-physician clinicians can result in estimated long-term abstinence rates of 16%.¹³

A 1996 telephone survey of first-year college students, however, revealed that only 26% of those who reported a medical visit within the past 12 months (89% of the total sample) had received any information from their physician about traditional tobacco products.¹⁴ Because e-cigarettes are a relatively new product, they are not explicitly mentioned in the Clinical Guideline for Treatment of Tobacco Use and Dependence.¹² It is unknown whether or not healthcare professionals, including dental hygienists, address e-cigarettes in their delivery of tobacco related counseling to their patients.

Although e-cigarette use has been documented among college students generally, little is known about factors associated with use or exposure to health professional counseling about use among college students.¹⁵ Therefore, the purpose of this study was to assess e-cigarette use; factors associated with use (e.g., perceptions of risks and benefits); and exposure to e-cigarette-related information from health professionals, in a sample of college students attending a public university in the San Francisco bay area using a web-based survey.

Methods

This quantitative cross-sectional study surveyed a sample of English-speaking students aged 18 years or older at a public university in the San Francisco Bay Area. The study was implemented using the online survey software program, Qualtrics™ (Qualtrics, Provo, UT). The Institutional Review Board of the University of California, San Francisco approved the study.

Recruitment and Informed Consent: The researcher contacted two faculty members teaching a total of three courses at the university to explain the study and to solicit help recruiting study participants. They agreed to distribute the recruitment letter explaining the study and to provide an electronic link to the survey and an attached consent form. A follow-up email message was sent to all students two weeks later as a reminder to complete the survey.

Measurements: The 18-item survey, developed in part by study investigators, consisted of 1 e-cigarette related awareness item (yes/no response option); 7 e-cigarette use status items (measured on frequency sliding scales); 2 harmfulness items related to use of e-cigarettes, other tobacco products, and marijuana (measured on a 5-point Likert-scale ranging from

“not at all harmful”, to “extremely harmful” or “don't know”); 1 addiction item related to use of e-cigarettes, other tobacco products, and marijuana (measured on a 5-point Likert-scale ranging from “extremely unlikely I would become addicted” to “extremely likely I would become addicted” or “don't know”); 1 healthcare counseling item assessing which of 5 healthcare professionals (physicians, dentists, dental hygienists, psychologist, student health physician) had provided counseling for each of 6 investigated products (cigarettes, smokeless tobacco, e-cigarettes, hookah, cigars, marijuana); 1 social acceptability item (level of agreement with the statement: “My friends think it's ok (socially acceptable) for me to use [specific product]” measured on a 5 point Likert-scale ranging from “strongly disagree” to “strongly agree” or “don't know”); 1 previously developed conditional risk assessment of e-cigarette use item^{16, 17} (measured on a frequency sliding scale) where participants were asked to estimate the chance (perceived probability) from 0-100% that 15 specific health or social outcomes would happen to them given the hypothetical scenario: “Imagine that you just began using e-cigarettes. You use e-cigarettes 2-3 times/day, some-times... alone and sometimes... with friends;”^{16, 17} and 4 demographic items (age, ethnicity, gender, year in college).

Pre-testing: The survey was pretested for feasibility and acceptability by a convenience sample of 10 college students, aged 18-24 years old who did not take part in the final survey. The pre-test sample was debriefed after survey administration to address their understanding of questionnaire items and questions were revised based on their feedback.

Data analysis: Responses to the survey items were tabulated for each respondent using Microsoft Excel (2010) and the mean response frequency for each item was calculated. Perceived harmfulness, perceived environmental harm to others, and perceived social acceptance, respectively, were cross-tabulated by various tobacco products and marijuana. SPSS software (Version 22.0; IBM Corporation, Armonk, NY, USA) was used to analyze the perceived chance (from 0-100%) of developing physical and social risks and benefits associated with daily use of e-cigarettes among ever-users and never-users. The Mann-Whitney *U*-test was utilized with a level of significance set at ≤ 0.05 . Respondents who did not complete the item related to risks and benefits of e-cigarettes use were removed from this particular analysis.

Results

Of 300 online surveys distributed, 91 were completed (response percentage: 30%). The majority of the participants were 18-21 years of age, female, Caucasian or Asian, and in their second or third year of college (Table I).

Nearly all respondents were aware of e-cigarettes;

Table I. Demographic Characteristics of Sample N=91

	%	(n)
Age n=55		
18-21	60	(33)
22-24	22	(12)
25+	18	(10)
Year in College		
1st Year	7	(4)
2nd Year	31	(17)
3rd Year	29	(16)
4th Year	16	(9)
5th Year	7	(4)
Graduate	9	(5)
Gender		
Male	40	(22)
Female	60	(33)
Race/Ethnicity		
White	35	(9)
American Indian or Alaska Native	2	(1)
Hispanic/Latino	15	(8)
Asian	33	(18)
Black or African American	2	(1)
Native Hawaiian or other Pacific Islander	0	(0)
Middle Eastern	24	(13)
Don't Know	4	(2)

almost half were ever-users (defined as having used at least once in their life) and 10% were current users (defined as having used in the past-30 days). All e-cigarette never-users reported it was unlikely that they would try e-cigarettes in the next 6 months. The remaining 6% did not answer the question. Ever-users' most frequently stated reasons for using e-cigarettes were, "I enjoy sampling different e-juice flavors with friends" and "I enjoy watching the exhaled vapor" (Table II).

Of the ever-users who responded, almost half reported using hookah pens. Most ever-users either used 0-6mg/ml of nicotine in their e-liquid, or did not know the concentration of nicotine used. The most common e-liquid flavors preferred by ever-users were fruit, mint/wintergreen, and candy (Table III).

When given a hypothetical scenario of using e-cigarettes routinely, never users perceived a statistically significantly higher chance of experiencing 5 out of 8 physical and social risks from e-cigarette use than ever-users ($P \leq 0.05$) (Table IV). Although never-users perceived a lower chance of experiencing

Table II. E-Cigarette Use Status (N=91)

	%	(n)
Awareness		
Heard of EC	89	(81)
Never heard of EC	6	(5)
Missing	6	(5)
EC Use Status		
Ever users of EC	49	(45)
Current-users	10	(9)
Never users of EC	45	(41)
Missing	6	(5)
Gender		
Male	40	(22)
Female	60	(33)
Likelihood of never users trying EC within next 6 months		
Very Unlikely	89	(25)
Somewhat Unlikely	11	(3)
Somewhat Likely	0	(0)
Very Likely	0	(0)
Ever users reason for use (n=45)*		
Enjoy sampling e-juice flavors w/ friends	36	(16)
Enjoy watching the exhaled vapor	33	(15)
For the calming affect	20	(9)
No worries about second hand smoke	16	(7)
Healthier than smoking	16	(7)
Enjoy not having to go outdoors to smoke	11	(5)
Enjoy using different EC with friends	11	(5)
Alternative to cigarettes	9	(4)
More satisfaction "vaping" than smoking	4	(2)
Other nicotine products have not worked as well to help me stop smoking	4	(2)

*Respondents were given the option of checking all that apply

physical and social benefits from e-cigarette use than ever-users, this difference was not statistically significant (Table IV).

Most of the respondents perceived cigarettes, cigars and smokeless tobacco (dip and chewing tobacco) as "extremely harmful." Whereas 60%

Table III. Characteristics Associated with Ever-use of EC (N=45)

	%	(n)
Type of EC*		
Hookah-	45	(9)
E-pen	20	(4)
MODs	20	(4)
Tanks	15	(3)
Ciga-likes	0	(0)
Missing	56	(25)
Concentration of Nicotine in E-liquid		
0-6 mg/ml	47	(14)
7-18 mg/ml	10	(3)
Don't know	43	(13)
Missing	33	(15)
E-liquid Flavors* (n=45)		
Fruit	56	(25)
Mint/Wintergreen	29	(13)
Candy	27	(12)
Tobacco	11	(5)
Dessert	11	(5)
Coffee or Cola	9	(4)

*Respondents were given the option of checking all that apply

perceived marijuana to be “not at all harmful” or “slightly harmful,” and 47% perceived e-cigarettes as “moderately harmful” (Table V).

Sixteen percent of respondents thought that e-cigarettes caused extreme environmental harm to those around someone using e-cigarettes (Table VI). In general, e-cigarettes, hookah, and marijuana were perceived as causing less environmental harm to others than cigarettes and cigars (Table VII).

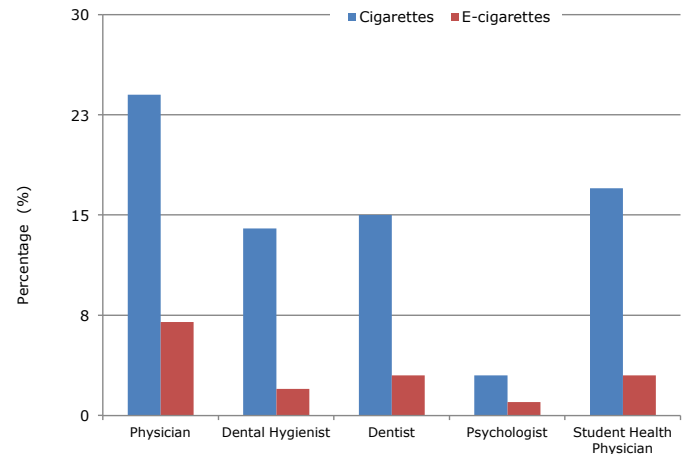
Over half of the respondents perceived e-cigarettes, hookah, and marijuana as being socially acceptable, whereas cigarettes, cigars, and smokeless tobacco were perceived as less socially acceptable products (Table VII).

Students were more likely to report receiving counseling about the adverse health effects of cigarettes from physicians than from dental professionals. Few respondents reported receiving counseling regarding e-cigarettes from any health professional (Figure 1).

Discussion

Consistent with the 2011 findings of Trumbo and Harper, the majority of the college student participants in this study had heard of e-cigarettes.¹⁵ Moreover, one-tenth of the respondents were current

Figure 1: Health Professionals Counseling About Cigarettes and E-cigarettes (N=40)



e-cigarette users, and 49% of the survey population had used e-cigarettes at least once. In contrast though, Trumbo and Harper found that only 13% of college students in their study had ever used e-cigarettes.¹⁵ This discrepancy may be explained by the study’s small convenience sample size, as well as by the fact that the Trumbo and Harper study was conducted in 2011 three years prior to this study. Studies report that e-cigarette use has been increasing over time.^{1,3} The increase has been particularly rapid among high school adolescents, for whom e-cigarette use has been reported at 16% in 2015.¹

In 2014, e-cigarette advertising was the most widely circulated of all marketing for non-combustible tobacco products.¹⁸ E-cigarettes entered the US market in 2007, and the affordability, availability, and marketing of these products has increased over recent years.¹⁹ A 2014 study indicated that young adult cigarette smokers were receptive to television ads and reported intentions to use e-cigarettes after viewing an advertisement that was televised on numerous US cable networks.²⁰ Advertising of tobacco products such as e-cigarettes have been shown to influence consumer awareness, experimentation, and current use among young people.²¹

Among the ever-users of e-cigarettes in this study, less than half did not know the concentration of nicotine in the e-liquid that they used. Most users preferred an e-liquid flavored with fruit, mint/wintergreen, and candy as the most preferred flavors, illustrating that e-cigarette flavors are appealing to young adults. Farsalinos et al. reported that most of their adult respondents commonly used a fruit flavored e-liquid.²²

Most e-cigarette ever-users in this study used pen-type devices. In contrast, other studies have shown that ever-users are more likely to use first generation devices, which look similar to a cigarette and are classified as “ciga-likes.” Established

Table IV. Mean Percent (%) Chance Out of 100% of Developing Physical and Social Risks and Benefits Associated With Daily Use of EC Among Ever-Users or Never-Users Use (N=91)

	Health or Social	Ever-User Mean Perceived Chance %	n*	Never-User Mean Perceived Chance %	n*	Mann Whitney U Test P-value
Perceived Risks						
You'll have bad breath	Physical	47	21	62	16	0.015**
You'll have trouble catching your breath	Physical	47	25	51	19	0.545
You'll get a bad cough	Physical	46	24	57	19	0.056
You will feel jittery/nervous	Physical	43	24	56	19	0.023**
You will get mouth sores	Physical	29	23	39	18	0.017**
Your friends will be upset with you	Social	44	25	71	18	<0.001**
You will get into trouble	Social	35	21	47	17	0.051**
Your performance in sports will get worse	Social	46	23	55	18	0.155
Perceived Benefits						
You'll feel high or buzzed	Physical	48	21	45	15	0.531
You will feel less hungry	Physical	29	23	31	16	0.852
You will feel less stressed	Physical	37	24	29	15	0.426
You will look cool	Social	20	18	14	13	0.072
You will look more mature	Social	15	18	9	12	0.243
You will have better concentration	Social	15	24	11	20	0.106
You will fit in with your peers	Social	12	18	10	12	0.339

*Responses may vary due to missing data

** A p-value ≤ 0.05 was used to determine statistical significance

users (used e-cigarettes more than 50 times in their lifetime) are reported to be more interested in the advanced generation devices, classified as "tanks," that have a large, high-powered battery and often a button to press before inhalation.^{23, 24}

Major reasons for e-cigarette use in this study included "I enjoy sampling different e-juice flavors with friends" and "I enjoy watching the exhaled vapor." These findings are consistent with those of Etter who reported that young adult and adult respondents used e-cigarettes because they liked the taste and the variety of flavors offered.²⁵ In contrast, Peters et al found that almost half of their college students who ever used e-cigarettes endorsed quitting or reducing smoking as their reasons for use.²⁶ In the Peters et al study, 32% also endorsed reasons for use related to curiosity/experimentation.²⁶

In this study, e-cigarettes were perceived to be the most socially acceptable of all products included in this survey, followed by marijuana and hookah, whereas cigarettes and cigars were perceived as not socially acceptable. Berg et al reported similar findings among college students, suggesting that the new culture of hookah and e-cigarette lounges

attracting young adults, supports the perception that hookah and e-cigarettes are being increasingly viewed as socially acceptable.²⁷ This social acceptance may have been initially due to the lack of regulation of these products at the federal and state level. In 2013, the Food and Drug Administration (FDA) issued a deeming rule, which has been finalized in 2016, giving the FDA authority to regulate the marketing, sale, and manufacturing of e-cigarettes, cigars, pipe tobacco, and hookah tobacco.²⁸ Previously, such restrictions were left to state and local governments. In California, where this sample was drawn, the sale of e-cigarettes to minors under 18 years of age has been banned since 2011.²⁹ Local ordinances enacted in the community in which this study was conducted have amended clean indoor air laws to prohibit e-cigarette use in public areas, such as restaurants and bars. Local regulatory action may also influence the perceived social acceptability of e-cigarettes, and therefore, the level of social acceptance measured in this study might differ from what would be measured in communities under different regulatory approaches.

The college students in this study who had never

Table V. Perceived Harmfulness of Various Tobacco Products, Devices, and Marijuana (N=55)

Products	Not at all % (n)	Slightly % (n)	Moderately % (n)	Extremely % (n)
Cigarettes	—	—	12 (7)	87 (48)
E-cigarettes	2 (1)	4 (14)	47 (26)	24 (13)
Cigars	—	2 (1)	7 (4)	89 (49)
Hookah	5 (3)	20 (11)	29 (16)	42 (23)
Smokeless Tobacco (Dip and Chew)	—	7 (4)	16 (9)	75 (41)
Marijuana	18 (10)	42 (23)	15 (8)	24 (13)

Table VI. Perceived Environmental Harm to Others (N=56)

Products	Not at all % (n)	Slightly % (n)	Moderately % (n)	Extremely % (n)
Cigarettes	2 (1)	9 (5)	21 (12)	66 (38)
E-cigarettes	16 (9)	34 (20)	30 (17)	16 (9)
Cigars	-	16 (9)	21 (12)	63 (35)
Hookah	11 (6)	43 (24)	20 (11)	23 (13)
Smokeless Tobacco (Dip and Chew)	43 (24)	14 (8)	9 (5)	32 (18)
Marijuana	30 (17)	34 (19)	13 (7)	21 (12)

Table VII. Perceived Social Acceptance by Products (N=56)*

Products	Strongly Disagree/Disagree** % (n)	Strongly Agree/Agree** % (n)
Cigarettes	70 (39)	30 (17)
E-cigarettes	39 (22)	61 (34)
Cigars	70 (38)	30 (16)
Hookah	29 (16)	71 (40)
Smokeless Tobacco (Dip and Chew)	75 (41)	22 (12)
Marijuana	30 (17)	70 (39)

*Percentages may vary due to missing data

**Respondents were given the statement "My friends think it's OK (socially acceptable) to use the following products." Social acceptance was measured on a 5 point Likert-scale ranging from "strongly disagree" to "strongly agree" or "don't know." In analyzing the 5-point Likert scale the bottom 2 categories and the top two categories were combined respectively to form two new categories of "Strongly Disagree/Disagree" and "Strongly Agree/Agree."

used e-cigarettes perceived a significantly higher percent chance of developing bad breath, feeling jittery and nervous, getting mouth sores, upsetting friends, and getting into trouble if they used e-cigarettes than college students who had ever used e-cigarettes. These findings are consistent with those of Halpern-Felsher and colleagues who reported that adolescent non-smokers estimated their chance of experiencing a smoking-related negative outcome as more likely than smokers.¹⁶ Chaffee

and colleagues also reported in a sample of adolescents that risk composite scores were inversely associated with e-cigarette ever-use and use intention.¹⁷ These findings can be explained by the Health Belief Model which posits that when the perceived risks of performing a behavior outweigh the perceived benefits, an individual tends not to adopt the behavior.³⁰

Respondents in this study perceived e-cigarettes, marijuana, and hookah use to be less harmful to their health and to cause less harm to others than the use of cigarettes. These findings are similar to those reported in a study of 2,002 students from two southeastern universities in the US that found students perceived marijuana, e-cigarettes, and hookah use to be less harmful to their health than use of cigarettes, cigar products, and smokeless tobacco.²⁷ In that study, the majority of college students also believed that e-cigarettes had fewer health risks than traditional cigarettes. This perception is of concern, because if e-cigarette use is viewed as having few health consequences, there may be relatively little hesitation among young people to try the product. While e-cigarette aerosol may contain fewer toxicants than cigarette smoke, scientific evidence has not yet been accumulated to evaluate the short-term and long-term health effects of e-cigarette use.³¹ Dental hygienists need to inform their clients of this lack of evidence, to stay abreast of e-cigarette-related research as it becomes available, and to incorporate such information into their client tobacco-related counseling.

In this study, college students reported receiving little or no counseling related to e-cigarette use from health professionals, including dental hygienists, although about a quarter of respondents reported receiving counseling regarding the adverse health effects associated with

cigarette use. These findings suggest a need for dental hygienists and other healthcare professionals to increase their awareness of e-cigarettes and their comfort level in discussing e-cigarettes and other tobacco products with their college-age clients. These findings are consistent with several studies evaluating self-reported tobacco education and cessation interventions by dental professionals. Such studies have reported that dental professionals, including dental hygienists, do not regularly ask about patients' tobacco use or implement the 5 A's,³²⁻³⁴ although evidence suggests that counseling from dental professionals can effectively reduce tobacco use when implemented.¹² These findings are also consistent with those of Foote et al who found that only 26% of college students in their study reported receiving tobacco-related counseling by physicians at their medical visit in the last year.¹⁴ In contrast, Sutfin et al found that 62% of North Carolina college students reported being screened for tobacco use at their student health center; and 50% of those students reported being advised to quit or reduce tobacco use.³⁵

Although there have been multiple comprehensive reports about the adverse health effects of cigarettes, to date there have been no such reports on e-cigarettes as this evidence is being collected currently.^{21,36-38} A 2013 study of Minnesota health care providers' awareness of e-cigarettes reported that although nearly all had heard of e-cigarettes, they knew little to nothing about e-cigarettes, and more than half were either somewhat or very uncomfortable talking to patients about e-cigarettes.³⁹ The findings in this study highlight the need to encourage dental hygienists and other healthcare professionals to screen every patient routinely for use of e-cigarettes, as well as use of other tobacco products and to provide a brief intervention for users.

This study has several limitations. The sample is a small, convenience sample of college students enrolled in humanities and science courses at a university in northern California. At the state level, California has strict cigarette and smokeless tobacco regulations, and local ordinances have extended clean indoor air laws to include e-cigarettes. These regulations may influence e-cigarette perceptions and limit the ability to generalize findings to all United States college students. The low response percentage increases the possibility of selection bias in that those who responded may have been more interested in e-cigarettes than those who did not respond. In addition, the data analysis focused on ever-users and never-users of e-cigarettes. Due to the small number of current-users in this sample (n=9), this group was not analyzed separately. Further research is needed to examine how patterns of current use, including total nicotine exposure, are related to attitudes and risk perceptions among e-cigarette users. In addition, some questionnaire

items were developed specifically for this study and further validity and reliability testing is warranted. Finally, this study focused only on e-cigarette use and did not assess use behaviors of other tobacco products. Consequently, our groups of ever-users, current-users and never-users may have been users of other tobacco products which may have confounded our results. Nevertheless, this study provides insights into the use of e-cigarettes among college students and factors associated with use to inform future studies.

Conclusion

The use of e-cigarettes is increasing in the US, especially among adolescents and young adults. Our findings demonstrate a high prevalence of e-cigarette use and experimentation among college students in our sample population. Participants' perceptions related to reduced harm of e-cigarettes may influence their willingness to use such products. Dental hygienists need to stay current with the scientific evidence related to e-cigarette use and incorporate this information into their tobacco-related education and cessation counseling. Such information will help their patients develop accurate perceptions about physical and social risks associated with e-cigarette use so that they can make informed decisions to protect their current and future health.

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Acknowledgments

The authors would like to thank the students and faculty who gave their time to this research. The authors also acknowledge the passing of their colleague, mentor, and friend, Dr. Margaret Walsh, a renowned scholar in the areas of dental hygiene, oral disease prevention, and tobacco cessation. Her remarkable legacy will continue to inspire and impact the dental hygiene profession as a whole, especially those in the field of tobacco control.

References

1. Singh T, Arrazola RA, Corey CG, et al. Tobacco Use Among Middle and High School Students — United States, 2011–2015. *MMWR Morb Mortal Wkly Rep* 2016;65:361–367.
2. Agaku IT, King BA, Husten CG, et al. Tobacco product use among adults - United States, 2012–2013. *MMWR Morb Mortal Wkly Rep*. 2014 Jun 27;63(25):542–7.
3. King BA, Patel R, Nguyen KH, Dube SR. Trends in awareness and use of electronic cigarettes among US adults, 2010–2013. *Nicotine Tob Res*. 2015 Feb;17(2):219–27.
4. Grana R, Benowitz N, Glantz SA. E-cigarettes: a scientific review. *Circulation*. 2014 May 13;129(19):1972–86.
5. Westenberger B. Evaluation of e-cigarettes. St Louis, MO: Food and Drug Administration. 2009:1–8.
6. Cahn Z, Siegel M. Electronic cigarettes as a harm reduction strategy for tobacco control: A step forward or a repeat of past mistakes? *J Public Health Policy*. 2011 Feb;32(1):16–31.
7. Riker CA, Lee K, Darville A, Hahn EJ. E-cigarettes: Promise or peril? *Nurs Clin North Am*. 2012 Mar;47(1):159–71.
8. Grana RA, Ling PM. “Smoking revolution”: A content analysis of electronic cigarette retail websites. *Am J Prev Med*. 2014 Apr;46(4):395–403.
9. American Medical Association. AMA strengthens policy on electronic cigarettes to protect youth [Internet]. [cited 2015 Jun 30]. Available from <http://ama-assn.org>
10. American Dental Association. Evidence-based dentistry: systematic reviews.[Internet]. [cited 2015 Jun 30]. Available from: <http://ebd.ada.org/en/evidence/evidence-by-topic/tobacco-use-and-smoking-cessation>.
11. American Dental Hygienists’ Association. ADHA association policy manual [Internet]. [cited 2014 June 23]. Available from: https://www.adha.org/resources-docs/7614_Policy_Manual.pdf.
12. Fiore MC, Jaén CR, Baker TB, et al. Treating tobacco use and dependence: 2008 update. clinical practice guideline. Rockville, MD: U.S. Department of Health and Human Services. Public Health Service; 2008.
13. Fiore MC. US public health service clinical practice guideline: Treating tobacco use and de-pendence. *Respir Care*. 2000 Oct;45(10):1200–62.
14. Foote JA, Harris RB, Gilles ME, et al. Physician advice and tobacco use: A survey of 1st-year college students. *J Am Coll Health*. 1996 Nov;45(3):129–32.
15. Trumbo CW, Harper R. Use and perception of electronic cigarettes among college students. *J Am Coll Health*. 2013;61(3):149–55.
16. Halpern-Felsher BL, Biehl M, Kropp RY, Rubinstein ML. Perceived risks and benefits of smoking: Differences among adolescents with different smoking experiences and intentions. *Prev Med*. 2004 Sep;39(3):559–67.
17. Chaffee BW, Gansky SA, Halpern-Felsher B, Couch ET, Essex G, Walsh MM. Conditional risk assessment of adolescents’ electronic cigarette perceptions. *Am J Health Behav*. 2015 May;39(3):421–32.
18. Richardson A, Ganz O, Stalgaitis C, Abrams D, Vallone D. Non-combustible tobacco product advertising: How companies are selling the new face of tobacco. *Nicotine Tob Res*. 2014 May;16(5):606–14.
19. Chen IL. FDA summary of adverse events on electronic cigarettes. *Nicotine Tob Res*. 2013 Feb;15(2):615–6.
20. Duke JC, Lee YO, Kim AE, et al. Exposure to electronic cigarette television advertisements among youth and young adults. *Pediatrics*. 2014 Jul;134(1):e29–36.
21. US Department of Health and Human Services. Preventing tobacco use among youth and young adults: A report of the surgeon general. Atlanta, GA: US Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Pre-vention and Health Promotion, Office on Smoking and Health; Washington, DC.,US GPO.2012.
22. Farsalinos KE, Romagna G, Tsiapras D, Kyrzopoulos S, Spyrou A, Voudris V. Impact of fla-vour variability on electronic cigarette use experience: An internet survey. *Int J Environ Res Public Health*. 2013 Dec17;10(12):7272–82.

23. Giovenco DP, Lewis MJ, Delnevo CD. Factors associated with e-cigarette use: A national population survey of current and former smokers. *Am J Prev Med.* 2014 Oct;47(4):476-80.
24. Yingst JM, Veldheer S, Hrabovsky S, Nichols TT, Wilson SJ, Foulds J. Factors associated with electronic cigarette users' device preferences and transition from first generation to advanced generation devices. *Nicotine Tob Res.* 2015 Oct;17(10):1242-6.
25. Etter JF. Electronic cigarettes: a survey of users. *BMC Public Health.* 2010 May 4;10:231,2458-10-231.
26. Peters EN, Harrell PT, Hendricks PS, et al. Electronic cigarettes in adults in outpatient substance use treatment: awareness, perceptions, use, and reasons for use. *Am J Addict.* 2015 Apr;24(3):233-9.
27. Berg CJ, Stratton E, Schauer GL, et al. Perceived harm, addictiveness, and social acceptability of tobacco products and marijuana among young adults: marijuana, hookah, and electronic cigarettes win. *Subst Use Misuse.* 2015 Jan;50(1):79-89.
28. Food and Drug Administration (US). Products, guidance and regulations: deeming extending authorities to additional tobacco products. Final rules. *Fed Regist.* 2016 May; 81FR: 28973-29106.
29. CA Health and Safety Code. Division 104. Environmental Health; HSC:119405.[Internet] California Legislative Information;2015 [cited 2015 Dec 22]. Available from <http://www.leginfo.ca.gov>.
30. Rosenstock IM, Strecher VJ, Becker MH. Social learning theory and the health belief model. *Health Educ Q.* 1988 Summer;15(2):175-83.
31. Goniewicz ML, Knysak J, Gawron M, et al. Levels of selected carcinogens and toxicants in vapour from electronic cigarettes. *Tob Control.* 2014 Mar;23(2):133-9.
32. Warnakulasuriya S. Effectiveness of tobacco counseling in the dental office. *J Dent Educ.* 2002 Sep;66(9):1079-87.
33. Tomar SL. Dentistry's role in tobacco control. *J Am Dent Assoc.* 2001 Nov;132:30S-5S.
34. Studts JL, Burris JL, Kearns DK, et al. Evidence-based tobacco cessation treatment by dental hygienists. *J Dent Hyg.* 2011 Winter;85(1):13-21.
35. Sutfin EL, McNamara RS, Blocker JN, et al. Screening and brief intervention for tobacco use by student health providers on college campuses. *J Am Coll Health.* 2012;60(1):66-73.
36. US Department of Health and Human. Preventing tobacco use among young people: A report of the surgeon general. Atlanta, GA: US Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health. 1994;338p.
37. US Department of Health and Human Services. The health consequences of smoking: a report of the surgeon general. Atlanta, GA: US Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health. 2004.
38. US Department of Health and Human Services. The health consequences of smoking—50 years of progress: a report of the surgeon general. Atlanta, GA: US Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health. 2014.
39. Alberg AJ, Shopland DR, Cummings KM. The 2014 surgeon general's report: commemorating the 50th anniversary of the 1964 report of the advisory committee to the US surgeon general and updating the evidence on the health consequences of cigarette smoking. *Am J Epidemiol.* 2014 Feb 15;179(4):403-12.

Gastroesophageal Reflux Disease Symptom Screening in a Dental Setting

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Abstract

Purpose: Gastroesophageal Reflux Disease (GERD) is a chronic health condition in which the symptoms often go unnoticed. Oral problems accompanying GERD may include non-specific burning sensation, mucosa ulceration and erosion, erythema of the soft/hard palate mucosa and uvula, loss of taste and either xerostomia or increased salivary flow with potential long-term complications such as difficulty swallowing, trouble breathing, esophagitis and potential development of esophageal adenocarcinoma (EAC). The purpose of this study was to assess the feasibility of using a GERD screening in the dental clinic setting to identify and refer patients.

Methods: This was a descriptive survey design utilizing a convenience sample of patients (n=227) from two dental hygiene clinics. Students and faculty were calibrated to administer a previously validated, GERD diagnostic screening questionnaire.

Results: The prevalence of GERD in the study population was 8.7%; with 10.1% of female reporting symptoms versus 7.0% of male. There were no statistically significant differences in the study population demographics and GERD prevalence.

Conclusion: Screening for GERD symptoms should be a routine procedure for oral health care providers, as is oral cancer screening. GERD screening has the potential to identify those at risk and enable referral to medical care in order to decrease the serious complications associated with GERD.

Keywords: GERD, screening, heartburn, complications, cancer, oral health

This manuscript supports the NDHRA priority area, **Client level: Oral health care** (new therapies and prevention modalities).

Introduction

The prevalence of GERD in the United States is estimated to be 18.1%-27.8% accounting for over 8.9 million primary care visits annually.^{1,2} GERD is a chronic or longer lasting form of gastroesophageal reflux.³ GERD occurs when the lower esophageal sphincter (LES), a group of muscles at the lower end of the esophagus, relaxes and allows the stomach's contents to flow up into the esophagus or beyond, into the oral cavity (including larynx) or lung.^{3,4} Gastric acid has a pH of 1.2 which can damage the tissue lining of the esophagus with repeated exposures.¹ A diagnosis of GERD is made using a combination of indicators including self-report of heartburn and regurgitation; endoscopy, or monitoring of reflux in an outpatient setting.³

GERD is common in a number of conditions including post-bariatric surgery, obesity, irritable bowel syndrome, developmental disorders, asthma, sleep apnea, obesity and pregnancy.^{5,6} Heartburn and regurgitation are typical symptoms of GERD, although some adults with GERD are asymptomatic.⁴

GERD symptoms may differ from person to person and range from mild to severe and can include a chronic dry cough, wheezing, asthma, recurrent pneumonia, sinusitis, nausea, vomiting, sore throat, chronic hoarseness or laryngitis, difficulty or painful swallowing, pain in the chest or the upper abdomen, dental erosion and oral malodor.^{3,4}

The symptoms are influenced by daily activities including diet, stressors and drugs, which can make the assessment of GERD symptoms at one point in time challenging.⁷ For individuals with disruptive GERD (daily symptoms) sleep may be disturbed and quality of life may be impacted resulting in missed work and/or reduced work productivity.³

Oral symptoms and complications associated with GERD may include non-specific burning sensation, mucosa ulceration and erosion, erythema of the soft/hard palate mucosa and uvula, loss of taste and either xerostomia or increased salivary flow.^{1,8} Untreated or unmanaged GERD is capable of long-term complications such as dysphagia, difficulty breathing and esophagitis.⁴ Esophagitis is an irritation of the

esophagus that can lead to precancerous changes or dysplasia and Barrett's esophagus.⁹ Barrett's esophagus is a condition where the tissue of the esophagus is replaced by tissue found in the lining of the intestine and can lead to a rare and deadly cancer, EAC.⁹ Adenocarcinoma is the leading cause of esophageal cancers in the U.S., constituting 80 percent of the cases, and rendering it the fastest-growing cancer in the U.S. according to the National Cancer Institute.^{10,11} The International Barrett's and Esophageal Adenocarcinoma Consortium (BEACON) found the risk of EAC is five times higher with increased frequency and duration of exposure to symptoms of heartburn and/or regurgitation.¹²

Lifestyle modifications are an essential part of managing GERD. Dietary factors associated with reflux symptoms include white bread, chocolate, mint, cinnamon, carbonated beverages, fatty foods, alcohol, wine and beer.³ Smoking is also a risk factor for GERD.³ The health professional should provide support for weight loss to attain a healthy weight, cessation of tobacco and alcohol, elevation of the head while sleeping, avoidance of foods that cause symptoms, and avoid eating before bed.³ If lifestyle modifications fail to manage the GERD, medications like histamine-receptor antagonists such as Pepcid® or Zantac® or proton pump inhibitors like Prilosec® may be recommended.³ It is important that use of medications be monitored by medical providers to ensure management of the reflux to prevent long-term complications.

Considering 79-87% of patients have persistent symptoms, the use of a GERD screening tool in the oral health care setting would provide a simple approach to identify the presence and severity of symptoms.⁷ Symptoms of GERD can be burdensome on quality of life and can lead to severe, life-threatening complications.³ Moreover, screening would increase the awareness of the burden and risk of cancer imposed by GERD. Oral health care professionals' utilization of a GERD screening tool can be effective in recognizing the early symptoms of GERD. Screenings would encourage interprofessional collaboration between medical and dental health care providers to work together to increase awareness of GERD symptoms and manage the associated oral and systemic complications and ultimately improve overall health outcomes. The purpose of this study was to assess the feasibility of using a GERD screening in the dental clinical setting to identify and refer patients.

Methods

This study received approval from the Massachusetts College of Pharmacy and Health Sciences (MCPHS) University's Institutional Review Board. Patients, 18 years and older, were solicited between January 2014 through March 2014 from two dental hygiene clinics, the first location in Boston, Massachusetts, and the second in Worcester, Massachusetts.

Dental hygiene students and faculty were calibrated and upon patient consent, the questionnaire was administered. Students administered a previously validated, GERD diagnostic screening questionnaire with known enumerated sensitivity (61.4%, 95% CI: 49.0% - 72.8%) and specificity (96.2%, 95% CI: 91.4% - 98.8%) parameters for GERD diagnosis. Permission to use the GERD screening questionnaire was obtained by authors of said instrument.¹³ Data obtained in the questionnaire included demographics (age, gender, pregnancy status, history of gastrointestinal disease, and surgeries in the past two years), and six questions relating to GERD symptoms used to construct the diagnostic test for GERD diagnosis as shown in Table I. Responses to the six questions in Table I were used to construct the diagnostic test for GERD diagnosis, Positive (+) GERD test was calculated for each patient as per Offman et al with (a) the presence of heartburn or regurgitation

Table I: GERD Screening Questions

"Have you had a burning pain or discomfort behind the breast bone in your chest (HEARTBURN) in the last year? (Please do not count pain in your stomach or pain from heart trouble)"	0: no 1: yes
"How many times have you had heartburn in the last year?"	1: less than once a month 2: about once a month 3: about once a week 4: several times a week 5: daily
"How bad is your heartburn usually?"	1: Mild 2: Moderate 3: Severe 4: Very Severe
"Have you had a bitter or sour tasting fluid coming up into your throat or mouth (ACID REGURGITATION) in the last year?"	0: no 1: yes
"How many times have you had acid regurgitation in the last year?"	1: less than once a month 2: about once a month 3: about once a week 4: several times a week 5: daily
"How bad is your acid regurgitation usually?"	1: Mild 2: Moderate 3: Severe 4: Very Severe

≥ “about once per week” with associated severity level ≥ “moderate”; or (b) the presence of heartburn or regurgitation ≥ “several times per week” with associated severity level ≥ “mild”; or (c) the presence of heartburn or regurgitation ≥ “about once per month” with associated severity level ≥ “severe.”¹³ Responses were recorded on two page No-Carbon-Required (NCR) paper. One copy was retained for data collection and the second copy was given to the patient. The questionnaire was reviewed by the clinical faculty and individuals indicating a “yes” response to heartburn or acid regurgitation were referred to their primary care provider for evaluation.

Survey responses referring to demographics were calculated using frequency percentiles and summary statistics. Differences in demographics across GERD diagnostic test results were assessed via global Fisher’s Exact Test.¹⁴ Using the known sensitivity and specificity parameters with 95% intervals of the GERD diagnostic test, adjusted prevalence estimates for actual GERD diagnosis with exact 95% confidence intervals were calculated.^{15,16} All statistical tests were performed at an alpha threshold of 0.05. All statistical analyses were performed in STATA® statistics/data analysis software version 11.2.

Results

A total of 227 respondents successfully completed the GERD screening questionnaire. Using the diagnostic test reported in Offman et al. for testing positive (+) for GERD from the questionnaire answers, 20 respondents of the total 227 respondents tested positive (+) for GERD with 207 testing negative (-) as per the screening

questionnaire.¹³ Table II shows summary statistics of demographics by GERD testing status.

The majority of respondents were female (55%) and between the ages of 18-25 years of age (54%), with a small percentage of respondents reporting prior diagnosis of a stomach or peptic ulcer in the last 2 years (1%) and having previous surgery on their stomach or esophagus (5%). Results of the GERD test shows a trend of decreasing prevalence of a positive test (+) with increasing age (global Fishers Exact Test, $p=0.02$). Additionally, respondents who reported a previous diagnosis of a stomach or peptic ulcer were more likely to test positive (+) for GERD as per the diagnostic questionnaire ($p=0.02$). Using the previously reported sensitivity and specificity parameters of the GERD diagnostic test (sensitivity 61.4%, 95% CI: 49.0% - 72.8%; specificity 96.2%, 95% CI: 91.4% - 98.8%), Table III shows prevalence estimates adjusted for the imperfect diagnostic test, resulting in an estimate of the true prevalence estimates of GERD with Exact Binomial 95% confidence intervals.

The true prevalence of GERD in the study population was 8.7% (95% CI 0%, 17.8%). When only considering estimation of the point estimates, the prevalence of GERD among females was slightly higher (10.1%) than among males (7.0%), with age subgroup 36-50 years of age having the largest prevalence of GERD (38.5%), and subgroup 51-70 years of age having the lowest (2.8%). When the confidence intervals constructed around the point estimates are interpreted, as per adjustment for the imperfect diagnostic test, there were no statistically significant differences observed in demographics by actual prevalence of GERD.

Table II: Demographics by Positive (+) and Negative GERD test

	Total Survey Population (n = 227)	Positive (+) GERD Test (n = 20)	Negative (-) GERD Test (n = 207)	p-value
Gender Female, n (%)	125 (55%)	12 (60%)	113 (55%)	0.41
Age Years				0.02
18-35, n (%)	122 (54%)	8 (40%)	114 (55%)	
36-50, n (%)	27 (12%)	7 (35%)	20 (10%)	
51-70, n (%)	56 (25%)	3 (15%)	53 (25%)	
>70, n (%)	22 (10%)	2 (10%)	20 (10%)	
Diagnosed with stomach ulcer or peptide ulcer disease in last 2 years, n (%)	3 (1%)	2 (10%)	1 (0.5%)	0.02
Previous surgery on stomach or esophagus, n (%)	11 (5%)	1 (5%)	10 (5%)	0.65

Discussion

Twenty out of 227 respondents were identified as GERD sufferers. The GERD screening questionnaire used in this study was developed and validated to be utilized as a case-finding tool for patients with symptoms of GERD and was found to be a sufficient and accurate means to screen for GERD in a community dental setting.¹³ Practical, valid and reliable GERD screening questionnaires should be developed and routine screening should be implemented for oral health care providers, as is oral cancer screening.¹⁷

The findings are noteworthy because they demonstrate GERD screening can be implemented in a dental setting. Moreover, this study provides a template for how to effectively implement GERD screening in a dental setting to increase early detection and promote collaborative work among dental and medical professionals. Routine oral cancer screening is critical, but GERD symptoms screening is of equal importance. GERD symptoms can affect individuals' quality of life and symptom complications can be fatal. Oral healthcare professionals' utilization of a GERD symptoms questionnaire will increase awareness of GERD symptoms among patients at risk and potentially bridge the gap between dental and medical professionals. Collaboration among health care providers would represent a significant step toward increasing the awareness of GERD symptoms and promoting overall health.

Oral health professionals are the first line of defense in detecting oropharyngeal at an early stage. A GERD screening tool could be effective in recognizing the early symptoms of GERD in order to increase awareness and the management of the oral and systemic complications. Likewise, identifying GERD sufferers reporting increased frequency and duration of exposure to symptoms of heartburn and/or regurgitation may reduce the incidence of EAC, a highly lethal cancer with an increased incidence in the United States and Western Europe.^{12,18}

Table III: Demographics by actual Prevalence of GERD corrected for sensitivity and specificity of GERD diagnostic test

	Corrected GERD Prevalence (Exact 95% CI)
Total Survey Population	8.7 % (0%, 17.8%)
Gender Female	10.1% (0%, 22.5%)
Gender Male	7.0% (0%, 20.2%)
Age Years	
18-35	4.9% (0%, 16.2%)
36-50	38.5% (14.4%, 74.2%)
51-70	2.8% (0%, 20.3%)
>70	9.2% (0%, 44.6%)
Diagnosed with stomach ulcer or peptide ulcer disease in last 2 years	100% (27.7%, 100%)
Previous surgery on stomach or esophagus	9.2% (0%, 64.0%)

Study limitations include a small population in only two locations, as well as the absence of follow-up among patients referred to their primary care providers for further evaluation of GERD.

Conclusion

This study explored routine assessment for GERD symptoms among dental patients and provided referrals to primary care providers of patients indicating GERD symptoms. To the authors' knowledge, this is the first study to implement a GERD screening in a community dental setting. By way of completing the survey questionnaire, participants also gained awareness about GERD, enabling them to think about symptoms they may have otherwise overlooked. GERD symptoms are often not addressed because they are sometimes unseen or unnoticed.

Future studies should explore the development and implementation of a validated, reliable and practical combined risk assessment tool for oropharyngeal cancer and GERD, along with an efficient routine screening regimen, to promote early detection. Additionally, future studies should also include a follow-up mechanism for individuals referred to a primary care provider.

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References

1. Ranjitkar S, Smales RJ, Kaidonis JA. Oral manifestations of gastroesophageal reflux disease. *J Gastroenterol Hepatol.* 2012 Jan;27(1):21-27.
2. El-Serag HB, Sweet S, Winchester CC, Dent J. Update on the epidemiology of gastro-oesophageal reflux disease: A systematic review. *Gut.* 2014 Jun;63(6):871-880.
3. Katz PO, Gerson LB, Vela MF. Guidelines for the diagnosis and management of gastroesophageal reflux disease. *Am J Gastroenterol.* 2013 Oct; 108(3):308-28.
4. National Institute of Diabetes and Digestive and Kidney Diseases [Internet] Bethesda: 2016. Gastroesophageal reflux (GER) and gastroesophageal reflux disease (GERD); [cited 2016 Mar 1] Available from: http://www.niddk.nih.gov/health-information/health-topics/digestive-diseases/barretts-esophagus/Documents/barretts_508.pdf.

5. Merrouche M, Sabate JM, Jouet P, et al. Gastroesophageal reflux and esophageal motility disorders in morbidly obese patients before and after bariatric surgery. *Obes Surg.* 2007 Jul;17(7):894-900.
6. Moraes-Filho JP, Navarro-Rodriguez T, Barbuti R, et al. Guidelines for the diagnosis and management of gastroesophageal reflux disease: An evidence-based consensus. *Arq Gastroenterol.* 2010 Jan-Mar;47(1):99-115.
7. Stanghellini V, Armstrong D, Monnikes H, Bardhan KD. Systematic review: Do we need a new gastrooesophageal reflux disease questionnaire? *Digestion.* 2007;75 Suppl 1:3-16.
8. Di Fede O, Di Liberto C, Occhipinti G, et al. Oral manifestations in patients with gastro-oesophageal reflux disease: A single-center case-control study. *J Oral Pathol Med.* 2008 Jul;37(6):336-340.
9. National Institute of Diabetes and Digestive and Kidney Diseases [Internet] Bethesda: 2016. Barrett's esophagus; [cited 2016 Mar 1] Available from: http://www.niddk.nih.gov/health-information/health-topics/digestive-diseases/barretts-esophagus/Documents/barretts_508.pdf.
10. Absi A, Adelstein DJ, Rice T, eds. Esophageal cancer. Cleveland Clinic Center for Continuing Education [Internet] Cleveland (OH) Cleveland Clinic; 2010. [cited 2016 Mar 1] Available from: <http://www.clevelandclinicmeded.com/medicalpubs/diseasemanagement/hematology-oncology/esophageal-cancer/>.
11. Hoffman M, Haines CD. Esophageal cancer on the rise. [Internet] WebMD 2016 [cited 2016 Mar1] Available from: <http://webmd.com>
12. Cook MB, Corley DA, Murray LJ, et al. Gastroesophageal reflux in relation to adenocarcinomas of the esophagus: A pooled analysis from the Barrett's and esophageal adenocarcinoma consortium (BEACON). *PLoS One.* 2014 Jul; 9(7):e103508.
13. Ofman JJ, Shaw M, Sadik K, et al. Identifying patients with gastroesophageal reflux disease: Validation of a practical screening tool. *Dig Dis Sci.* 2002 Aug;47(8):1863-1869.
14. Fisher RA. On the interpretation of X² from contingency tables, and the calculation. *Journal of the Royal Statistical Society.* 1922;85(1):87-94.
15. Lang Z, Reiczigel J. Confidence limits for prevalence of disease adjusted for estimated sensitivity and specificity. *Prev Vet Med.* 2014 Jan;113(1):13-22.
16. Reiczigel J, Foldi J, Ozsvari L. Exact confidence limits for prevalence of a disease with an imperfect diagnostic test. *Epidemiol Infect.* 2010 Nov;138(11):1674-1678.
17. Oral Cancer Foundation [Internet]. Newport Beach: 2016. Cancer screening protocols; 2016 [cited 2016 Mar 1] Available from: <http://oralcancerfondation.org>
18. Karimi P, Islami F, Anandasabapathy S, Freedman ND, Kamangar F. Gastric cancer: descriptive epidemiology, risk factors, screening, and prevention. *Cancer Epidemiol Biomarkers Prev.* 2014 May;23(5):700-713.

Vietnamese Oral Health Beliefs and Practices: Impact on the Utilization of Western Preventive Oral Health Care

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Abstract

Purpose: Infrequent use of the Western health care by the Vietnamese may be explained by deeply-rooted traditional oral health beliefs and practices unique to the Asian culture. This study investigated Vietnamese oral health beliefs and practices and their relationship to the utilization of Western preventive oral health care services among Vietnamese-Americans.

Methods: An exploratory, cross-sectional survey design with a convenience sample of 140 participants ($n = 140$) was used for this study. Participants were recruited on site of a Vietnamese-owned business, with questionnaires consisting of 28 questions that were distributed in hard copy by the principal investigator (PI) on multiple occasions and at various times of the day.

Results: Spearman Rank Correlations tests showed participants who agreed with the statement, "Regular dental visits will help prevent dental problems," were more likely to utilize medical health services ($p < 0.05$) and visit a dentist if their "gums were bleeding" ($p < 0.05$). However, only 22.86% of the participants would visit a dentist if experiencing a toothache. Despite results showing a strong association between the use of medical health care services and the belief that dental visits can prevent future dental health problems, participants did not believe in seeking Western oral health care for all dental health issues. No statistical significance was found between age, gender, primary language, years spent in the United States, education level, religion and the Vietnamese survey participants' individual oral beliefs and practices.

Conclusion: The results suggest that Vietnamese Americans holding the belief that dental visits help prevent oral health problems, were more likely to utilize Western health care services. The study also supports existing literature that Vietnamese oral health beliefs and practices impact the use of Western health care services.

Keywords: culture, oral health beliefs, Traditional Chinese Medicine Vietnamese Medicine, Western Medicine

This manuscript supports the NDHRA priority area **Population level: Health services** (epidemiology).

Introduction

In the Vietnamese culture, health is seen as a state of physical and spiritual harmony, with the body requiring balance to remain in good health.¹ To achieve health and balance, two essences, such as "hot" and "cold", must harmonize with one another; while illness on the other hand, is considered to be an imbalance between two essences.¹⁻³ Vietnamese medicine evolved from traditional Chinese medicine (TCM),¹⁻³ and is based on a modified version of the Chinese philosophy of yin and yang, referred to as âm and dương.² It is through an imbalance in âm and dương that the traditional form of Vietnamese medicine emerged and is used to explain and address health issues.² The Vietnamese use a health care system comprised of either "Southern medicine"

(thuoc nam) or "Northern medicine" (thuoc bac) in order to treat an imbalance.^{2,3} Vietnamese people more commonly employ Chinese herbal medicine and folk medicine from the Southern medicine system, using local herbs for treatment.^{2,3} Northern medicine relies on medicines from Hong Kong and Taiwan and is used by fewer individuals.^{2,4,5}

The Vietnamese belief system of health and illness, also guides their approach in addressing and identifying oral health problems and influences treatment choices, i.e., the use of traditional Vietnamese practices to treat oral health problems rather than Western oral health care services.^{1,3,6-8} Procedures such as preventive oral examinations and diagnostic x-rays, commonly used in Western oral health care, are not sought out by the Vietnamese.

Traditional Vietnamese health practices are either used concurrently or prior to seeking Western health care services. Additionally, the Vietnamese will typically seek Western health care only when experiencing severe pain.^{1-3,7-9}

The infrequent use of Western preventive oral health care services by the Vietnamese, resulting from deeply ingrained oral health beliefs and traditional Vietnamese health practices, was the predominant theme in the literature.^{1,2,9-12} It is a common belief within the Asian cultures that an “internal fire” exists in the human body resulting from stress, lack of sleep, or an unhealthy diet that includes an excess of “hot foods” (fried and spicy foods) and a lack of “cold foods” (fruits and vegetables).¹³ Vietnamese cultural beliefs also attribute this “internal fire” with causing oral health problems.¹³ Remedies and methods used in the Asian culture to resolve and prevent oral health issues include the avoidance of fried or spicy food, the consumption of herbal teas, and rinsing the mouth with cold boiled water. Salt water rinsing is also commonly used and believed to prevent dental caries and stress management is believed to be an effective measure in preventing gingival disease.¹³

Kwan and Holmes conducted a qualitative study investigating the oral health beliefs of the Chinese population residing in West Yorkshire, United Kingdom, and reported that participants believed bleeding “gums” were considered to be a normal condition or due to an “imbalance of the body.”¹⁴ These participants also believed the process of tooth loss would be painful, but not preventable since oral health diseases are considered to be inevitable in old age.¹⁴ In fact, these participants did not believe that dental diseases of any kind were preventable. The adolescent group in this study held the belief that it was “natural for people to lose all their teeth as they get old” and that dental disease, primarily dental caries, was an inevitable “part of life.”¹⁴ However, in contrast to the adult and elderly group, the adolescent group preferred oral health treatment from a Western health care provider and did not believe traditional Asian health practices could help remedy oral health problems.¹⁴ Kwan and Holmes’ findings regarding oral health beliefs in this Chinese population were similar to those reported in Vietnamese populations discussed in the literature.^{5,6,15-17}

In a study regarding traditional oral health care practices of Vietnamese-speaking parents (n=24) of children in Sydney, Australia, it was reported that while still in Vietnam, participants brushed their teeth with palm fruit husks or with their fingers and used salt to clean their teeth.⁹ These same Vietnamese parents who used traditional oral health care practices did not seek preventive oral health screenings, diagnostic testing, or treatments and would wait until symptoms progressed before seeking oral health care services.^{2,8,10,11} This use of

Table I: General & Demographic Characteristics of Study Population (n = 140)

Mean age, yrs (SD)	39.01 (12.38)
missing, n (%)	5 (3.57%)
Primary Language	
English, n (%)	7 (5%)
Vietnamese, n (%)	115 (82.14%)
English & Vietnamese, n (%)	15 (10.71%)
missing, n (%)	3 (2.14%)
Birth Place	
Cần Thơ, n (%)	6 (4.29%)
Hồ Chí Minh City, n (%)	45 (32.14%)
Đà Nẵng, n (%)	10 (7.14%)
Hải Phòng, n (%)	1 (0.71%)
Hà Nội, n (%)	2 (1.43%)
Other, n (%)	62 (44.29%)
missing, n (%)	14 (10%)
Years spent in the USA, yrs (SD)	13.01 (10.69)
missing, n (%)	9 (6.43%)
Marital Status	
Married, n (%)	41 (29.29%)
Single, n (%)	94 (67.14%)
missing, n (%)	5 (3.57%)
Highest Education Level	
High School, n (%)	8 (5.71%)
2-4 years of college, n (%)	73 (52.14%)
Graduate School, n (%)	47 (33.57%)
Not Applicable, n (%)	5 (3.57%)
missing, n (%)	7 (5%)
Country Where Education Received	
Vietnam, n (%)	81 (57.86%)
United States, n (%)	36 (25.71%)
Vietnam & United States, n (%)	14 (10%)
Vietnam, United States, & Other, n (%)	1 (0.71%)
missing, n (%)	8 (5.71%)
Religion	
Buddhist, n (%)	79 (56.43%)
Catholic, n (%)	23 (16.43%)
Christian, n (%)	14 (10%)
Other, n (%)	9 (6.43%)
missing, n (%)	15 (10.71%)

traditional oral health care practices and approach to oral health care services by parents was also passed onto their children.⁹

The oral health beliefs and practices identified in Vietnamese and Chinese cultures, are parallel to the choices made by Asians when considering general health care options and utilization patterns for general health services.² In a study designed to assess the patterns of health care service use by Chinese immigrants (n=75), 45.3% of the participants used Western health care services or traditional clinics in the United States (US).¹¹ Thirty-two percent of the study participants stated that they travelled home to China or Taiwan for health care needs, 21.3% used US clinics as a primary source for health care needs, while 45.3% used both Western and traditional Asian clinics within the US.¹¹ Self-treatment and home remedies were practiced by 94.6% of the immigrants with 20% never using health care services at all.¹¹ The Chinese immigrants who indicated that they did not seek Western health services for care, also believed Western medicine could not cure their illnesses; most of the participants relied on self-care or traditional alternative health resources to treat their health problems.¹¹ The purpose of this study was to explore Vietnamese oral health beliefs and practices and their impact on the use of Western preventive oral health care services.^{2,3,6}

Methods and Materials

This quantitative, cross-sectional survey explored the oral health beliefs and utilization of preventive oral health care patterns of Vietnamese-Americans. This study was approved by the Massachusetts College of Pharmacy and Public Health (MCPHS) University Institutional Review Board. The survey setting was a Vietnamese-owned business in Dorchester, Massachusetts, frequented by the Vietnamese community. The convenience sample consisted of Vietnamese-Americans (n=140). Participants were recruited on site at the Vietnamese-owned business, with questionnaires distributed in hard copy by the principal investigator (PI) on multiple occasions and at various times of the day.

Survey Instrument

The survey instrument used was a modified version of the survey used in a similar study by Jenkins, et al.² The survey was developed in English, then translated into Vietnamese, with a total of 28 questions with three sections: demographics (8 items), oral health beliefs (9 items), and use of traditional practices and Western oral health care services (11 items). The survey questions required three types of responses: binary "yes" or "no" responses, 4-point Likert scale questions, and narrative responses to open-ended questions. An item content validity index (I-CVI) was determined along with a scale content validity index (S-CVI) to determine the

Table II: Responses to "Oral Health Belief" Questions (n = 140)

	Strongly Disagree	Disagree	Agree	Strongly Agree	Missing
Questions relating to Western medicine					
"Regular dental visits will help prevent dental problems."	10 (7.14%)	4 (2.86%)	73 (52.14%)	50 (35.71%)	3 (2.14%)
"It is important to keep your natural teeth."	11 (7.86%)	0 (0%)	56 (40%)	70 (50%)	3 (2.14%)
"Bleeding gums is a serious matter."	7 (5%)	6 (4.29%)	77 (55%)	46 (32.86%)	4 (2.86%)
"Losing teeth a serious matter."	4 (2.86%)	10 (7.14%)	72 (51.43%)	51 (36.43%)	3 (2.14%)
Questions relating to Eastern medicine					
"It is natural for people to lose all of their teeth as they get older."	10 (7.14%)	19 (13.57%)	85 (60.71%)	23 (16.43%)	3 (2.14%)
"Eating too much "hot" foods contribute to oral health problems."	8 (5.71%)	21 (15%)	92 (65.71%)	17 (12.14%)	2 (1.43%)
"Eating certain food will help maintain good oral health."	8 (5.71%)	24 (17.14%)	99 (70.71%)	6 (4.29%)	3 (2.14%)
"Bleeding gums is normal."	22 (15.71%)	88 (62.86%)	21 (15%)	4 (2.86%)	5 (3.57%)

Table III: Responses to “Oral Health Utilization” Questions (n = 140)

	Yes	No	Missing	
Questions relating to Western medicine				
Use medical health care services	127 (90.71%)	10 (7.14%)	3 (2.14%)	
Would visit a dentist if gums were bleeding	124 (88.57%)	14 (10%)	2 (1.43%)	
Would you visit a dentist if you had a toothache	32 (22.86%)	105 (75%)	3 (2.14%)	
Questions relating to Eastern medicine				
Have traveled to Vietnam for dental treatment	70 (50%)	65 (46.43%)	5 (3.57%)	
Use home remedies or self-treatment for oral health problems	14 (10%)	124 (88.59%)	2 (1.43%)	
Use Chinese herbs (Thuoc bac)	101 (72.14%)	36 (25.71%)	3 (2.14%)	
Parents or grandparents used folk remedies or home remedies on you	45 (32.14%)	92 (65.71%)	3 (2.14%)	
Use folk medicine for your children	63 (45%)	75 (53.57%)	2 (1.43%)	
Questions relating to Western medicine				
	Never	> two yrs ago	≤ two yrs ago	Missing
Timing of last physical	4 (2.86%)	31 (22.14%)	102 (72.86%)	3 (2.14%)
Timing of last dental visit	5 (3.57%)	36 (25.71%)	95 (67.86%)	4 (2.86%)
Timing of last dental cleaning	23 (16.43%)	39 (27.86%)	75 (53.57%)	3 (2.14%)

proportion of items with high I-CVI ratings for the individual items on the survey.¹⁸ A panel of seven experts was chosen based on experience interacting with the Dorchester, Massachusetts Vietnamese community, to review the survey instruments. The panel of experts was comprised of a physician and pharmacist from the Vietnamese community, two acculturated Vietnamese business owners centered in the community, and an employee of a Vietnamese medicine and herbal supplement business with expertise regarding traditional Eastern practices. The panel reviewed and scored the survey instruments. Each expert employed a 4-point scale to calculate a value on the individual content (I-CVI) as well as the overall content (S-CVI). The content validity was deemed excellent if the I-CVI was .78 or higher for three or more experts and the S-CVI was .90 or higher. For the study questionnaire, four or more experts agreed with each item giving an overall I-CVI of .97. The S-CVI for the questionnaire was

.93 indicating overall excellent content validity.¹⁸ A pilot test was conducted to assess the validity of the survey instrument and to increase data reliability.²⁰ Vietnamese participants (n=10) from the same pool used for the full study, participated in a pilot study and were asked to provide feedback on the survey instrument with regards to clarity, word choice, ease of survey completion, and appropriate length of the survey instrument. Pilot test results were not included in the results of the final survey.

Data Analysis

Descriptive statistics for demographic variables, oral health belief questions and oral health utilization questions were calculated using frequency percentiles. Non-parametric Spearman Rank Correlation tests were performed to assess statistical correlations between oral health belief and oral health utilization responses.¹⁹ Based on the results of correlations tests, select univariate and multivariate logistic

Table IV: Correlation trend tests between Oral Health belief and Oral Health utilization variables

Spearman's Rank Correlation Coefficient (ρ)						
	"Use medical health care services" 1:yes 0:no	Timing of last physical 1:Never, 2:> two yrs ago 3:≤ two yrs ago	Timing of last dental visit 1:Never, 2:> two yrs ago 3:≤ two yrs ago	Timing of last dental cleaning 1:Never, 2:> two yrs ago 3:≤ two yrs ago	Use Chinese herbs 1:yes 0:no	Would visit a dentist if gums were bleeding 1:yes 0:no
"It is natural for people to lose all of their teeth as they get older. (1:strongly disagree, 2:disagree, 3:agree, 4:strongly agree)"	0.06	0.04	0.02	0.01	0.05	-0.08
"Losing teeth a serious matter. (1:strongly disagree, 2:disagree, 3:agree, 4:strongly agree)"	0.03	0.22**	0.22**	0.05	-0.04	-0.06
"Regular dental visits will help prevent dental problems. (1:strongly disagree, 2:disagree, 3:agree, 4:strongly agree)"	0.18*	0.18*	0.16	0.17	0.08	0.21*

* $p < 0.05$ for trend

** $p < 0.01$ for trend

and multinomial logistic regression analyses were performed.²¹ An alpha threshold of 0.05 was set for all statistical testing. Due to the exploratory nature of the study, adjustment for multiple comparisons was not performed.²¹ All statistical analyses were performed in STATA® statistics/data analysis software version 11.2.

Results

Two hundred people were asked to participate in the study survey, and a response rate of 69.5% was achieved, resulting in a total of 140 participants. Of the 140 participants, 97.85% chose to complete the survey in Vietnamese. The general and demographic characteristics of the study population can be found in Table I. The mean participant age was 39 years and the primary language spoken was Vietnamese (82.14%). The mean number of years participants had lived in the US was 13.01 years and almost half of the participants (45.71%) were born in Vietnam. The highest level of education for most of the participants was 2-4 years of college (52.14%) and the majority

had received their education in Vietnam (57.86%). Most participants reported being Buddhist (56.43%).

Table II shows the response counts and frequencies for oral health belief questions. Seventy-seven percent agreed or strongly agreed with the statement "It is natural for people to lose all of their teeth as they get older," while 90% agreed or strongly agreed that "It is important to keep your natural teeth." Nearly 88% reported "Losing teeth is a serious matter." Only 26% preferred Eastern medicine over Western medicine. Nearly 78% of participants agree or strongly agreed "Eating too much 'hot' foods contribute to oral health problems" and 75% believed "Eating certain foods will help maintain good oral health." Most participants (87.86%) identified bleeding gums as an issue and not normal. The same percentage (87.85%) of participants agreed or strongly agreed that "Regular dental visits will help prevent dental problems."

Responses to questions related to oral health utilization are shown in Table III. Over 90% of respondents reported use of medical health care services and

Table V: Selected Results of Logistic Regression and Multinomial Logistic Regression

		Use medical health care services (Odds Ratio)	Timing of last physical (Odds Ratio)		Timing of last dental visit (Odds Ratio)		Use Chinese herbs (Odds Ratio)	Would visit a dentist if gums were bleeding (Odds Ratio)
			> 2 yrs ago	≤ 2 yrs ago	> 2 yrs ago	≤ 2 yrs ago		
"Regular dental visits will help prevent dental problems." (1:strongly disagree, 2:disagree, 3:agree, 4:strongly agree)	<i>Univariate Analysis</i>	2.39**	0.96	1.48	—	—	—	1.95*
	<i>Multivariate Analysis</i>	3.15**	0.96	1.35	—	—	—	2.08*
"It is important to keep your natural teeth." (1:strongly disagree, 2:disagree, 3:agree, 4:strongly agree)	<i>Univariate Analysis</i>	—	1.23	2.27	0.59	1.23	0.65	—
	<i>Multivariate Analysis</i>	—	1.42	3.1*	0.66	1.52	0.7	—

* p < 0.05

** p < 0.01

Multivariate Analysis I: adjusted for age and gender

88.57% would visit a dentist for bleeding gums, but only 22.86% would visit a dentist for a toothache. About half of participants have traveled to Vietnam for dental treatment however, 10% reported using home remedies for oral health problems. Seventy-two percent reported using Chinese herbs and 45% use folk medicine for their children. Sixty-eight percent indicated having had a physical examination and 73% had visited a dental practice in the last two years.

Selected results of Spearman Rank Correlation tests between oral health beliefs and utilization questions are shown in. The results demonstrate that participants agreeing with the statement, "Regular dental visits will help prevent dental problems" were more likely to utilize medical health care services (p<0.05) and have had a physical within the last two years (p<0.05). These participants were also more likely to visit a dentist if their gums were bleeding (p<0.05). Participants who agreed with the statements "Losing teeth is a serious matter" were more likely to have had a physical and a dental visit in the last two years (p<0.01).

Guided by the results of the correlation tests shown in Table IV, Table V shows results from select univariate and multivariate logistic and multinomial logistic regression models assessing the association between oral health beliefs and the utilization of oral

health care services. Univariate analysis associating the belief that "regular dental visits will help prevent dental problems" with utilization of health care services showed a strong direct association (Odds Ratio (OR) 2.39, p<0.01). Adjusting the point estimate by age and gender using a multivariate model produced an increased OR of 3.15 (p<0.01). Additionally, belief that "regular dental visits will help prevent dental problems" was directly associated with utilization of dental services for bleeding gums in both univariate analysis (OR=1.95, p<0.05) and after adjusting for age and gender (OR=2.08, p<0.05). These results suggest a strong association between participant belief that dental visits prevent dental problems, and participant utilization of health care services. In addition, survey participants who strongly believed "it is important to keep your natural teeth" were also more likely to have had a physical examination within the last 2 years after adjustment for age and gender (OR=3.1, p<0.01). Additional multivariate models controlling for age, gender, primary language, years spent in the US, education level, and religion were performed, however no statistically significant associations were identified.

Discussion

Findings regarding the oral health belief questions supporting traditional Vietnamese health beliefs as seen in the literature, may impact utilization of

health care services by this population.^{6,7,9,13,14} While only 26% of respondents preferred Eastern medicine over Western medicine, 78% of participants in this study agreed or strongly agreed "eating too much "hot" food contributes to oral health problems." Health beliefs about "hot" and "cold" foods are a central tenet of Eastern medicine and the responses to this survey suggest it continues to be a widely-held belief of Vietnamese-Americans. As previously mentioned, Vietnamese culture classify "hot foods" as fried and spicy foods and "cold foods" as fruits and vegetables.¹³ This differs from the Western culture's classification of hot and cold foods as defined by the temperature of the food.

More than half of the participants indicated that they would not use folk medicine for their children. However, 72% of these adults reported using Chinese herbs for medicinal purposes which is higher than expected considering that only 26% reported a preference for Eastern medicine. These findings suggest Vietnamese Americans may actually use a combination of Eastern and Western medicine practices and this becomes an important practice for clinicians to understand in making recommendations for treatment.

Oral health beliefs and practices significantly impact utilization of health care service.^{1,2,7-10} This study found that participants acculturated into Western culture and Western health beliefs and practices were more likely to utilize Western health care services. Those who do not acculturate into the Western culture and retain their Vietnamese cultural beliefs may be less likely to utilize Western health care services. The small percentage of participants with a preference for Eastern medicine over Western medicine, demonstrates the impact of acculturation among Vietnamese living in the United States.^{2,3} Results of this study support and build on the existing literature, i.e. a correlation exists between health beliefs and practices of the respective Asian culture and their use of Western services.^{1-3,7-10} A recommendation for future study would be the inclusion of open-ended questions as a means to increase understanding of the Vietnamese American's oral health beliefs. This may lead to identifying improved ways to offer Western medicine to this population in combination with the approaches to care found in Eastern medicine.

Almost all of the participants reported using medical health care services, which contradicts some of the literature.^{2,7,9,11} This inconsistent finding may have been due to participants' misinterpretation of questions regarding use of Western health care services. This may have altered the accuracy of the findings regarding the question pertaining to the impact of participants' beliefs on utilization of medical health care services. Furthermore, in regards to the responses to the "oral health utilization" questions,

future research should provide more well defined options to determine the specific Western health care services, i.e. emergency versus preventive care, being used by the Vietnamese population surveyed.

This study cannot definitively state that participants who believe in traditional Asian oral health beliefs and practices are less likely to use Western preventive oral health care services via a direct casual pathway; however results of this study do support the existing literature regarding the influence of Vietnamese and Chinese population groups' current oral health beliefs and practices on their oral health care choices.^{1,2,7-10}

It is important to address the limitations in this study. Like any observational study, structural biases including residual confounding, selection bias, and data misclassification and misspecification can occur. The present study may also lack the statistical power to identify important statistical associations due to the limited sample size. The study cohort was created using a convenience sample, calling into question whether the results can be generalized to broader populations. This was also a cross-sectional study, greatly limiting the ability to "tease-out" the direction of causality and limiting the analysis to associational measures. More studies of the Vietnamese t are needed to further assess associations between oral health beliefs and practices, and the utilization of Western preventive oral health care services.

Conclusion

This research study identified correlations between traditional Eastern oral health beliefs and the likelihood of Western preventive oral health care service use among Asian population groups. In regards to encouraging more frequent use of Western preventive oral health care services among Vietnamese, this research suggests the need for oral health care professionals to educate Vietnamese patients concerning oral health and the importance of utilizing Western oral health care services.

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References

1. Tripp-Reimer T, Thieman K. Traditional health beliefs/practices of Vietnamese refugees. *J Iowa Med Soc.* 1981;71(12):533-535.
2. Jenkins CN, Le T, McPhee SJ, Stewart S, Ha NT. Health care access and preventive care among Vietnamese immigrants: Do traditional beliefs and practices pose barriers? *Soc Sci Med.* 1996 Oct;43(7):1049-1056.
3. Schultz SL. How southeast-asian refugees in California adapt to unfamiliar health care practices. *Health Soc Work.* 1982 May;7(2):148-156.
4. Fisher-Owens SA, Isong IA, Soobader MJ, et al. An examination of racial/ethnic disparities in children's oral health in the United States. *J Public Health Dent.* 2013 Spring;73(2):166-74.
5. Gordon S, et al. Vietnamese culture: Influences and implications for health care. *Molina Health-care, Inc.* 2006:1.
6. Smith A, MacEntee MI, Beattie BL, et al. The influence of culture on the oral health-related beliefs and behaviours of elderly Chinese immigrants: A meta-synthesis of the literature. *J Cross Cult Gerontol.* 2013Mar;;28(1):27-47.
7. Zhang W. Chinese culture and dental behaviour: Some observations from Wellington. *N Z Dent J.* Mar; 2009;105(1):22-27.
8. Buchwald D, Panwala S, Hooton TM. Use of traditional health practices by southeast Asian refugees in a primary care clinic. *West J Med* 1992 May;156(5):507-11.
9. Finney Lamb C, Phelan C. Cultural observations on Vietnamese children's oral health practices and use of the child oral health services in central Sydney: A qualitative study. *Aust J Prim Health.* 2008;14Apr(1):75-81.
10. Fasano MB, Hayes J, Wilson R. Traditional beliefs and use of health care services by Vietnamese and Laotian refugees. *Tex Med.* 1986 Aug;82(8):33-36.
11. Ma GX. Between two worlds: The use of traditional and western health services by Chinese immigrants. *J Community Health.* 1999 Dec; 24(6):421-437.
12. Lamb CF, Smith M. Problems refugees face when accessing health services. *NSW Public Health Bull.* 2002 Jul;13(7):161-3.
13. Dong M, Loignon C, Levine A, Bedos C. Perceptions of oral illness among Chinese immigrants in Montreal: A qualitative study. *J Dent Educ.* 2007 Oct;71(10):1340-7.
14. Kwan S, Holmes M. An exploration of oral health beliefs and attitudes of Chinese in west Yorkshire: A qualitative investigation. *Health Educ Res.* 1999 Aug;14(4):453-460.
15. Nguyen D. Culture shock - A review of Vietnamese culture and its concepts of health and disease. *West J Med.* 1985 Mar;142(3):409-412.
16. Uba L. Cultural Barriers to health care for south-east Asian refugees. *Public Health Rep* 1992 Sep-Oct;107(5):544.
17. Calhoun MA. Providing health care to Vietnamese in America: What practitioners need to know. *Home Health Nurse.* 1986 Sep-Oct ;4(5):14-22.
18. Polit DF. Is the CVI an acceptable indicator of content validity? appraisal and recommendations. *Res Nurs Health.* 2007 Aug;30(4):459-67.
19. Hogg RV, Craig AT. Introduction to mathematical statistics. 5th ed New York: Macmillan. 1995: p338-400.
20. LaValley, MP. Logistic regression. *Circulation.* 2008 May;117(18):2395-9.
21. Rothman KJ. Six persistent research misconceptions. *J Gen Intern Med.* 2014 Jul;29(7):1060-4.

DENTSPLY SIRONA/ADHA GRADUATE STUDENT CLINICIAN RESEARCH ABSTRACTS

The following abstracts are from the participants of the 2016 Annual Dentsply Sirona/ADHA Graduate Student Clinician's Research Program. The purpose of the program, generously supported by Dentsply Sirona for the past 9 years, is to promote dental hygiene research at the graduate level. Dental hygiene post-graduate programs may nominate one student to participate in the program and present their research at ADHA's annual conference.

*Indicates poster presenter

A Descriptive Study of the Experiences of the Kansas Extended Care Permit Providers

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Salivary Risk Factors for Dental Caries in Individuals with Cystic Fibrosis

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Problem: To improve access to basic oral health services for underserved populations 38 states have expanded the role of dental hygienists. In Kansas, legislative changes have resulted in the Extended Care Permit (ECP) designation. The purpose of this study is to describe the experiences of dental hygienists in Kansas who held an ECP certificate as of July of 2014.

Methods: Secondary data analysis was performed utilizing data collected from a survey conducted in 2014 by Oral Health Kansas. All registered ECP RDH's were sent the 32-item survey using Survey Monkey®. Descriptive analyses consisted of frequency distributions, and measures of central tendency. T-tests and ANOVA were conducted to compare between groups.

Results: A total of 73 responses or a 41% response rate (73/176) was achieved. Of the 73 clinicians that responded 80% worked at least part-time in school settings, 33% in senior housing and 19% in skilled nursing facilities. The most consistent barriers to providing care were the inability to direct bill insurance (52%), financial viability (42%) and physical requirements (42%). Follow-up tests found a significant difference between groups when examining barriers.

Conclusion: The ECP does appear to be expanding access to care for citizens in Kansas however significant barriers still exist in making this a viable model for oral healthcare delivery.

Problem: Factors like salivary flow rate, pH, and buffering capacity are associated with caries prevalence, but have not been recently explored in U.S. individuals with Cystic Fibrosis (CF). The goal of this study was to test the associations between salivary factors and dental caries in a hospital-based sample of individuals with CF.

Hypotheses: Increased salivary flow rate, basic salivary pH, and increased buffering capacity are associated with lower caries prevalence in individuals with CF.

Methods: Unstimulated saliva samples were collected from individuals with CF ages 6-20 years (N=83). Salivary flow rate was measured in mL/minute. Salivary pH was assessed using a laboratory pH meter. Buffering capacity was assessed by titration with HCl. The primary outcome measure was caries prevalence defined as the number of decayed, missing, and filled primary and permanent tooth surfaces (dmfs+DMFS). Spearman's rank correlation coefficient and the t-test were used to test for bivariate associations. Multiple variable linear regression models were used to run confounder-adjusted analyses and assess for potential interactions.

Results: There was no significant association between salivary flow rate or buffering capacity and caries prevalence. There was a significant negative association between salivary pH and caries prevalence, but this association was no longer significant after adjusting for age.

Conclusion: Our results indicate that unstimulated salivary factors are not associated with dental caries prevalence in individuals with CF. Future studies should investigate other potential saliva-related caries risk factors in individuals with CF such as medication use, cariogenic bacteria levels and salivary host defense peptide levels.

Missouri College Students' Attitudes and Beliefs Regarding the Profession of Dental Hygiene in Comparison to their Oral Health and Dental Knowledge

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Purpose: This study explored the attitudes and beliefs of minority college students enrolled at Missouri College in Brentwood, Missouri in regards to the dental hygiene profession. Specifically, this study examined whether minority college students' oral health and dental knowledge related to their knowledge of the dental hygiene profession.

Methods: One hundred and six students gave their consent to participate in the study via Survey Monkey. The study was conducted over a period of four weeks in May 2015. Four statements were designed to gauge minority students' knowledge of dental hygiene as a career.

Results: No differences were found based on gender, age, education and ethnicity. A difference between age groups were found based upon the respondent's program of study.

Conclusions: Further research is needed to spread the word about dental hygiene programs and to explain the role of the dental hygienist.

The Impact of Community Rotations on the Cultural Competence of Texas Dental Hygiene Students

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Purpose: This study investigated the role of community rotations on the cultural competence of second-year Texas dental hygiene students.

Methods: A modified version of the validated self-assessing Clinical Cultural Competency Questionnaire (CCCQ) was given to students at twelve Texas dental hygiene programs with a 100% response rate (239/239). Data analysis was performed using the Kendall tau correlation for associations and Kruskal-Wallis and Mann-Whitney U tests for differences among and between groups.

Results: Students scored highest in attitude (86th percentile). Time spent in community rotations ($p=0.009$), number of community rotations ($p=0.028$), ethnic diversity of program clinic patients ($p=0.042$), and training hours ($p=0.044$) were associated with increased cultural competence scores. Students with over 50 community rotation hours ($p=0.006$) scored significantly higher than students with less than 50 hours. Generally, those with four rotations ($p=0.002$) scored highest. Those with public clinic ($p=0.049$) and school ($p=0.044$) rotations scored significantly higher than those without these experiences. Those with nursing home ($p=0.009$) and hospital ($p=0.026$) experience scored lower than those without these experiences. Students seeing the most ethnically diverse patients in program clinics scored higher ($p=0.014$) than students seeing less diverse patients. Those with 6-10 training hours scored higher ($p=0.013$) than those with other training levels. All ethnic minorities, excluding Asians, scored higher than Whites ($p=0.008$, $p=0.020$).

Conclusions: Dental hygiene programs should invest time in cultural competence training and choose a robust program of community rotations, while considering the diversity of the student body and clinic patient pool to enhance graduates' cultural competence.

Perceptions of California Dental Hygienists regarding Mandatory Continued Competence Requirements as a Condition of License Renewal

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Purpose: To determine the perceptions of California dental hygienists (DHs) regarding mandatory continued competence requirements (MCCRs) as a condition for license renewal.

Methods: A quantitative cross-sectional survey was distributed through email by the California Dental Hygienists' Association (CDHA). The CDHA agreed to send a link to the survey and informed consent information to DHs whose email addresses were in the CDHA database. The online survey consisted of 19-items. All survey responses were analyzed using frequency distributions for categorical variables and means for continuous variables. Chi-square tests assessed associations between variables and differences between groups. The Wilcoxon signed rank test assessed relationships between perceptions and support of MCCRs for license renewal.

Results: Almost all (93%) believed that they have remained competent to deliver care since licensure. Over half agreed that continued competence should be verified throughout ones' professional career (53%). Most (81%) agreed that continued competence is important for patient safety and well-being. Less than half (47%) supported MCCRs as a condition of license renewal; however, 51% of those who agreed that competence is important for patient safety and well-being and 67% of those who agreed with verification of competence were in support of MCCRs.

Conclusion: While California DHs agreed that continued competence is important for patient safety and well-being and verification of competence is important, less than half supported MCCRs. Prior to instituting mandate for license renewal in California, continued competence and methods to ensure continued competence throughout ones' career should be defined.

The Use of Digital Media by State Dental Boards in Licensure and Enforcement of Oral Health Professionals

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Purpose: Studies suggest that the specific consequences of professional and ethical standards violations have not been well established in the area of social media. A literature search conducted using PubMed and ERIC showed that while studies have explored the ways in which social media can affect medical professionals, there has been little research conducted on dental professionals. This study explores the ways in which the licensing of a dental professional can be affected by unprofessional conduct in the area of social media.

Methods: This study used a non-experimental descriptive electronic survey research design. A total of 52 surveys were sent to the dental board executive directors and the dental hygiene executive directors in the United States.

Results: Eighteen responses were collected for a 34.6% response rate. Overall, respondents indicated a lack of social media usage by state dental boards. Incidents of online unprofessional behavior came to the attention of the board in various ways and with a variety of consequences for the licentiates. Overall, there is a level of concern about online activities by licensees that may be in violation of laws, rules and regulations of the state or the dental board yet no state dental boards in this study reported that they are creating a social media policy.

Conclusions: While social media is very common in today's society, specific social media policies are limited at the professional licensing board level. Dental boards should consider developing policies to address potential unprofessional conduct online in order to protect businesses, employers, employees, clients and patients.

Millennial students' learning preferences compared to faculty teaching methods: A national dental hygiene study

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Purpose: The purpose of this study was to compare the learning preferences of millennial dental hygiene students and the teaching methods used by their faculty.

Methods: Student and faculty cross-sectional surveys were developed with a 21-item 5-point Likert scale. The surveys asked student preference for and faculty use of lecture, collaborative activities, technology, independent work, and group discussion. Surveys were sent via email in September 2015. The convenience sample response rate was 800 students (9.4%) and 343 faculty (6.8%). A 3x2 Chi-Square for independence table calculated agreement between millennial students and faculty for each question.

Results: Faculty (88.7%) used case studies more than students (61.2%) preferred and students (71.4%) preferred games when learning more than faculty (57.2%) used games ($p < 0.0001$). Students (82.1%) preferred handouts for lecture more than faculty (58.8%, $p < 0.0001$). Faculty expected students to read before class 39.3% more than students read ($p < 0.0001$).

Students preferred study guides for exams 39.2% more than faculty provided them ($p < 0.0001$). Faculty (84.0%) had students (57.8%) work in groups more than students preferred, and 92% of faculty used group activities in class ($p < 0.0001$).

Conclusions: Millennial dental hygiene students in this study responded similarly to previous research on millennial traits. This study found areas of disagreement between millennial dental hygiene students and dental hygiene faculty on the use of case studies, study guides, and group work. Although millennial students stated they prefer lecture over group work, trends in education stress using active learning over lecture.

Dental Hygiene Clinical Instructors' Self-efficacy: An Evidence-based Faculty Development Program

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Problem: Health care clinicians are often hired to teach in clinical settings with little or no formal educational methodology. Research is limited in evidence-based faculty development programs (EB FDP) specifically addressing the needs of clinical instructors, including dental hygiene clinical educators. Clinical instructors require training to improve teaching efficacy prior to being placed in clinical teaching positions and throughout their careers as educators.

Purpose: The intent of this research was to determine if an EB FDP improves dental hygiene clinical instructors' perceived self-efficacy in teaching.

Methods: This mixed methods study of dental hygiene clinical instructors ($N=26$) utilized the Teachers' Sense of Efficacy Scale (TSES) as a pretest prior to the EB FDP, and two posttests, one immediately following implementation of the EB FDP, and the second at the end of the 10 week quarter. Two focus group sessions gave insight relating to the outcomes of the techniques clinical instructors applied while teaching in clinic, and teaching challenges faced in a clinical setting while managing client care.

Results: A statistically significant difference ($p \leq .05$) in clinical instructors' perceived self-efficacy was found in each of the three TSES subscales and each survey item in two of the subscales. Five of the eight survey items in The Efficacy in Clinical Management subscale showed statistically significant difference. Comments

clinical instructors made during two focus group sessions support the quantitative findings.

Conclusion: This study indicates evidence-based FDPs are a viable method to provide clinical instructors teaching methodologies to improve their self-efficacy and teaching strategies.

Effects of Instrument Handle Design on Forearm Muscle Activity During Scaling by Dental Hygienists

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Purpose: The purpose of this study was to determine the effects of 4 different commercially available instrument handle designs (A. 16 grams and 12.7 mm diameter, B. 23 grams and 11.1 mm diameter, C. 21 grams and 7.9 mm diameter and D. 18 grams and 6.35 mm diameter) on the muscle activity of four forearm muscles during a simulated scaling experience.

Methods: A convenience sample of 27 dental hygienists used a Columbia 13/14 curet with four different instrument handles to scale artificial calculus from typodont teeth. Each participant's muscle activity was measured using surface electromyography.

Results: Similar muscle activity was generated when scaling with instruments at 16, 18, and 21 grams with varying diameter handles. Instrument B generated significantly more muscle activity when compared to each of the other three instrument handle designs ($p=0.001$, $p=0.002$, $p=0.039$). The lower left quadrant displayed significantly less muscle activity during scaling than the right quadrants ($p=0.026$, $p=0.000$), although no significant interaction effect was found with instruments within quadrants.

Conclusions: Instrument handle design has an effect on forearm muscle activity when scaling in a simulated environment. The instrument that weighed the most produced the highest muscle activity. Similar amounts of muscle activity were produced by instruments weighing between 16 and 21 g. Results support the need for further research to determine the impact of these results on muscle load related to risk of cumulative trauma disorders in a real-world setting.

An Evaluation of a School-Based Dental Sealant Program

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Information-Seeking Preferences for Clinical Decision-making Among California Dental Hygienists

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Problem: Dental caries is a preventable infectious disease continuing to affect millions of children with low socioeconomic status.

Purpose: There is no statistically significant difference in the *referral treatment rate* at 6 months and at 12 months after implementation of a school-based dental sealant program. This study examines the dental sealant retention rate and dental sealant decay rate at 12 months in a school-based dental sealant program.

Methods: Children (n = 54) ages 6-12 were screened for active decay, need for a referral, and sealant placement. Decay rates were analyzed with a t-test for paired samples; whereas, a Chi-Square test was used to determine a difference in referral treatment rates. Sealant retention and sealant decay rates were computed at 12 months (n = 32) using descriptive statistics.

Results: A 16 percent decrease in active decay was observed; however, there was no statistically significant difference in decay rates (P = 0.21) at baseline and 12 months. Similarly, referral treatment rates showed no statistically significant difference at 6 months and 12 months (P = 0.75). Sealant retention outcomes were 74 percent fully retained with 0% decay, 13% partially retained with 25% decay, and 13% no retention with 25% decay.

Conclusions: Sealant programs can eliminate disparities in accessing oral health care and contribute to attaining Healthy People 2020 oral health objectives.

Problem: Many journals and scientific updates are now accessed online; however, previous studies have grouped online resources into one category and not investigated the variety of resources or their frequency of use to answer clinical questions.

Purpose: This study examines information-seeking behaviors of California dental hygienists (RDHs) for clinical decision-making and their education related to evidence-based decision making (EBDM) skills.

Methods: A convenience sample of 5542 RDHs was invited to participate in an online survey via the California Dental Hygienists' Association email list. Information about respondents' information seeking-behavior, Internet and non-electronic resources used for clinical-decision making, education and confidence in using EBDM skills, and demographics was collected. Statistical tests were performed at the 95% confidence level.

Results: Of the 5542 emails, 1974 opened the invitation and 386 responded (19.6%), however 40 were not in clinical practice (n=346). The most frequently accessed Internet resource was Google; whereas, the most frequently used non-electronic resource was consultation with a dentist at work. Use of the Internet was related to the decade in which an RDH graduated and the type of dental hygiene program attended (p<0.001). Respondents who believed they received adequate EBDM education were likely to spend more time searching the Internet, and indicated that the Internet is the most current and relevant information source (p<0.001).

Conclusion: RDHs use both Internet and non-electronic resources to answer practice related questions. However, Google may not be the best "go to" resource for answering clinical questions.

Exploring Factors Associated with Lack of Parental Consent in School-Based Dental Sealant Programs

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Purpose: School-based dental sealant programs are one avenue for reducing decay in children 6-8. The Community Dental Care in Maplewood, Minnesota implemented a school-based sealant program four years ago to help manage the dental caries in Minnesota's children called Program to Improve Community Oral Health (PICOH). The purpose of this study was to explore factors associated with lack of parental consent in a local school-based dental sealant program.

Methods: In this descriptive study, the sample analyzed included approximately 948 children ages 6-8, who participated in 2013-14 and 2014-15, from 5 out of the 18 schools in the program. The highest percentage of the participants were in the Free and Reduced Lunch Program (FRLP). Basic descriptive data retrieved from "yes" consent forms included the number of participants and the cultural statistics of the schools to examine any associations or trends that may have affected the participation rate of 35%. The 'no' response consent forms provided no information for the study. The dependent variable is the lack of parental consent in the participation of the program. Tables are used to display the data in terms of counts and proportions.

Results: The study found that African Americans/Africans and Asian/Other Asian had a higher participation in some schools compared to other races. School with non-Caucasian and non-English speaking had a lower participation. Similarly, schools with mostly Caucasian and English speaking speakers also had lower participation.

Conclusion: Race and ethnic groups and primary language spoken in the home are potential barriers to reduced participation in school-based sealant programs.

Faculty perceptions of supporting students' delivery of motivational interviewing during patient care.

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Problem: Motivational Interviewing (MI) is a patient-centered, collaborative counseling approach for eliciting behavior change. In 2012, the University of Michigan (U-M) Dental Hygiene (DH) Program's health behavior change curriculum was enhanced to include a special focus on MI. Faculty participated in MI workshops and became involved in grading of student-patient MI interactions.

Purpose: To assess the faculty's perception of importance of and their confidence in supporting students' delivery of MI during patient care.

Methods: Convenience sample of sixteen U-M DH Program clinical faculty members participated utilizing a pre-test, post-test and qualitative question design. The U-M IRB approved this study as exempt.

Results: Faculty's perceptions of facilitating eight MI strategies with students increased after the 2014 MI Workshop from a mean of 4.6 to 4.8 (importance) and from 4.1 to 4.5 (confidence), but decreased to 4.5 (importance) and to 4.0 (confidence) by the end of the academic year. Wilcoxon signed ranked test compared facilitation questions from T1, T2, and T3. Faculty perceptions decreased (T1, $p=.03$) related to students having enough time to incorporate MI and decreased (T3, $p=.03$) regarding faculty having a positive influence on students. Fifty-six percent of faculty participated in team-grading and reported that the most helpful professional development activities were team-grading (58%) and in-service (25%).

Conclusion: Faculty's perceptions of importance and confidence in supporting students' delivery of MI decreased slightly over the academic year. Faculty found professional development activities helpful and recommended more be offered. Research on longitudinal impact of MI faculty professional development is recommended.

Perceptions and Experience on Cultural Preparedness Among Dental Hygiene Students and Treatment of a Culturally Diverse Refugee Population

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Purpose: In a diverse patient population, limited research exists regarding the cultural preparedness of dental hygiene students. This study utilized a phenomenological research design to gain a deeper understanding of the lived perceptions and experiences on cultural preparedness among senior dental hygiene students. This unique design provides an interpretation of cultural preparedness from dental hygiene students enrolled in an accredited dental hygiene education program.

Methods: This qualitative research design consisted of a purposeful sample of dental hygiene students (n=18) who participated in a pre-focus group prior to the treatment of a culturally diverse refugee patient and then (n=17) participated in a post-focus group after treatment. The data was gathered and analyzed using the eight step creative process for qualitative research. Demographics were enumerated using frequency percentiles, means, and summary statistics. All statistical analyses were performed in STATA® statistics/data analysis software version 11.2.

Results: The majority of the study participants (n=17) were Caucasian (64.7%) with a mean age of (21). The majority of the culturally diverse refugee patients were Haitian (47.1%). Common themes on cultural preparedness in dental hygiene students before the treatment of a culturally diverse refugee patient included professionalism, self-assurance, and resource utilization. Post focus groups themes demonstrated a heightened value of experiential learning and realization of the importance and knowledge necessary to become a culturally competent health care provider.

Conclusion: Exposing dental hygiene students to culturally diverse patients in a clinical setting can be an effective method for improvement on cultural competency.

Comparing the Prevalence of Oral and Systemic Disease Between Bonded Child Laborers and School Children in Bagalur, Tamil Nadu, India.

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Objectives: This study compares the prevalence of oral and systemic disease between bonded child laborers and school children living in Bagalur, Tamil Nadu, India. No oral health data currently exist for this city. The research hypothesis was that public school children were less likely to experience oral and systemic disease than bonded child laborers.

Methods: School children (N=50) and bonded child laborers (N=52) were examined by a medical doctor and two dental examiners (IRB # 15-3001), who recorded the presence or absence of disease. Chi square analysis was used to compare the two groups of children. Level of significance was set at 0.05.

Results: The proportion of children with at least some dental decay was significantly different (p=.001) for child laborers (71%) than school children (36%). Child laborers were 1.9 times more likely to have decay than school children (95% CI, 1.2-2.9). Dental pain was reported by 40% of the child laborers compared to 18% of school children (p=.018) and child laborers were 2.2 times more likely to experience dental pain than school children (95% CI, 1.1-4.4). Fifty-one percent of child laborers required urgent dental treatment compared to 12% of school children (p<.001) and they were 4.2 times more likely to require dental treatment than school children (95% CI,1.9-9.5). Child laborers were also three times more likely to require urgent medical treatment (95% CI,1.1-8.9).

Conclusion: Bonded child laborers in Bagalur, India are more likely to experience dental decay, dental related pain, and require urgent dental and medical treatment, than school children.