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- Exploring the Integration of the Dental Hygiene Diagnosis in Entry-Level Dental Hygiene Curricula
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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.

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What does research tell us about the future of dental hygiene? A New Classification of Periodontal Diseases: A paradigm shift for all!

Jane L. Forrest, RDH, EdD; Salme E. Lavigne, PhD, RDH

We were both privileged to attend the recent EuroPerio conference in Amsterdam this past June, the largest periodontal conference in the world. With over 10,000 attendees from around the globe, this year's highlight was the presentation of the work undertaken by the 110 experts participating in the World Workshop on the Classification of Periodontal and Peri-Implant Diseases and Conditions. The resulting new classification of these diseases and conditions is important for all dental hygiene professionals. Given that the former classification is nearly two decades old (1999), it was truly time for a change to account for new knowledge and its implications.

Development of the new classification required an extensive review of the scientific literature and its interpretation that was completed by experts in four separate working groups: Periodontal Health and Gingival Diseases and Conditions; Periodontitis; Manifestations of Systemic Diseases and Conditions; and Peri-Implant Diseases and Conditions. Once work began, it was recognized that disease severity was not simply the mere presence of plaque, as everyone is not the same. Consideration for classifying disease based on plaque microbes was also found not to be a viable option. The recent Human Microbiome Project has revealed the presence of over 1,000 oral microbes alone and has introduced the concept that symbiosis is destroyed when biofilm accumulates, thus creating a dysbiosis. Secondary descriptors such as extent, rate of progression, diagnostic biomarkers and patient outcomes were also considered. However, once the working groups examined the evidence, they agreed that the new system must first be designed to prevent overtreatment, thus leading to the creation of "Case Definitions" for each of the periodontal and peri-implant diseases and conditions.

One notable change to the new system is that no evidence was found to justify the distinction between chronic and aggressive periodontitis as two separate disease entities; both are now under the single category of "*Periodontitis*." Additionally, a new category of "*Periodontal Health*," has been added; however, necrotizing diseases and periodontitis as a manifestation of systemic disease remain the same.

Overall, the resulting new classification is very different from the prior one as the periodontitis category is based on the oncology system of "Staging" and "Grading" of disease. **Staging** classifies both severity and extent of current tissue loss, including tooth loss due to periodontitis, while also incorporating the level of complexity in the long-term management of both function and esthetics. **Grading**, on the other hand, incorporates four biological dimensions: history-based periodontitis progression, risk for further periodontitis progression, anticipated inferior treatment outcomes, and risk that the disease or its treatment may have a negative impact on the general health of the patient. This new system is aligned with the principles of "Personalized Medicine," based on the multifactorial etiology of disease, and is believed to optimize care and improve prognosis while being adaptable over time.

The presentation concluded with a practical 4-step approach for implementing the new classification for periodontitis:¹

Step 1: Initial Case Overview: Based on full mouth radiographs, full mouth probing depths, and missing teeth; categorize case as either Mild to Moderate Periodontitis or Severe/Very Severe Periodontitis.

Step 2: Determine the Stage (I, II, III, IV): By taking into consideration maximum CAL or bone loss; confirmation of bone loss patterns (horizontal or

vertical); tooth loss due to periodontitis; determine case complexity.

Step 3: Determine the Grade (A, B or C): Based on health history/risk of progression/age; risk factors; consideration of medical status and systemic inflammatory considerations; response to scaling and root planing and plaque control; detailed assessments, refine grade.

Step 4: Develop a Treatment Plan based on Stage and Grade: Standard treatment (Mild to Moderate Periodontitis, Stages I & II; Grade A or B); Complex and/or Multidisciplinary treatment (Severe/Very Severe Periodontitis, Stages III & IV; Grade B or C)

We hope that we have been able to provide you with some of the background regarding the new periodontal disease classification system. However, coverage of all the specific details is beyond the scope of this editorial. We urge you to read the recently published article by Caton et al.² in the June 2018 supplement to the Journal of Periodontology for a more in-depth introduction into the new system.

It is important for dental hygienists to begin using the new classification to be current in clinical practice and in the preparation of future practitioners. The new system will also influence how inclusion criteria are defined for future periodontal and peri-implant research.

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Critical Issues in Dental Hygiene

Synergy in Social Action: A Dental Hygiene Theory

Ellen J. Rogo, RDH, PhD

Abstract

Purpose: The intent of this qualitative study was to construct a new theory for the discipline of dental hygiene. Dental hygienists' experiences while participating in legislative efforts to expand their scope of practice and the provision of direct access to oral care were explored as social action experiences.

Methods: A grounded theory approach was used to collect and analyze data. Using semi-structured interviews, data were collected from eight practitioners in three states, who met the inclusion criteria. Data analysis consisted of three separate coding procedures: initial, focused and theoretical. Critical theory was used as the theoretical lens, which focused on the struggle to improve access to care.

Results: The learning process was categorized into actions: *Committing to Social Action, Challenging the Status Quo to Improve Access to Care, Surviving in Social Action and Envisioning the Future*. The education process involved: *Raising Critical Awareness of Underserved Populations' Oral Health Needs, Building Support for Improving Access to Care, Sustaining Support for Social Action and Building the Next Generation of Dental Hygiene Practitioners*. The resulting theory, Synergy in Social Action, is composed of three key elements which provide energy to sustain momentum for social action through the interaction both within and among these elements. The identified elements are: learning and educating process, critical awareness and empowerment, and individual and collective action.

Conclusion: The Synergy in Social Action Theory provides the means to understand the challenge of improving access to oral health care from a new vantage point and advances dental hygiene as a discipline with its own theories.

Keywords: social action, dental hygienists, dental hygiene education, grounded theory, social determinants of health

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Introduction

The World Health Organization (WHO) has established health as a fundamental human right of every person in the global community.¹ Recently, the WHO provided credibility to the adoption of the *Tokyo Declaration on Dental Care and Oral Health for Health Longevity* at the 2015 World Congress. This declaration affirmed oral health as a fundamental right throughout the lifespan while emphasizing the needs of the geriatric population and the overall improvement of the quality of life when oral health is maintained.² Furthermore, the declaration recommended the inclusion of oral health when creating evidence-based health policies.²

Such health policies include laws and regulations influencing the systems, communities and individuals that promote health, well-being and quality of life. Improvements made to policies at the broad systems level have the greatest impact on population health.³ Policy changes made at the

state or national level influence the health of communities, families and individuals. If a current policy is ineffective, the policy requires modification or the establishment of a new policy.⁴ Ineffective policies relative to unmet health needs and unfair treatment include inequitable access to care and maldistribution of health resources.⁴

Governments in agreement with human rights concepts have a responsibility to maximize efforts in creating policies to reduce health inequities in vulnerable populations.⁵ These populations experience a disproportionate number of health problems including disability and death.¹ In 2000, the Economic and Social Council (ESC) of the United Nations reported that justice and fairness regarding the right to health are based on four elements: availability, accessibility, acceptability and quality.⁵ Availability refers to the quantity of healthcare facilities, goods and services from skilled healthcare

practitioners. Accessibility implies access to healthcare facilities and to services without discrimination to marginalized populations. Additionally, accessibility means eliminating barriers to physical access, affordability and information. Acceptability is the application of ethical principles and sensitivity to culture, age and gender, whereas, quality is associated with evidence-based practice and overall quality in healthcare facilities, goods and services. Health equity can be improved for vulnerable populations by changing policies related to these four elements.

Dental hygienists from across the United States (U.S.) have worked to change health policies to advance the availability, accessibility, acceptability and quality of oral health care by implementing new practice models requiring legislative changes to state dental practice acts. The first legislative initiative in 1984 expanded dental hygiene practice to include direct access in limited settings in Washington state⁶ and was followed in 1987 by changes in the Colorado dental practice act which granted direct access to dental hygiene care in all settings.⁶ Oregon created the Limited Access Permit to expand direct care in 1997, however in 2012 this dental hygiene designation was revised to the Expanded Practice Permit.⁷ In 1998, California created the Registered Dental Hygienist in Alternative Practice whereby specially licensed dental hygiene practitioners provide direct care in underserved areas and settings.⁸ Additional practice models expanding access to serve vulnerable populations include collaborative practice, special dental hygiene permits and public health endorsements.⁹ To further address the oral health needs of the U.S. population, the American Dental Hygienists' Association (ADHA) created the competencies for a new mid-level provider, the Advanced Dental Hygiene Practitioner (ADHP), in 2008.¹⁰ The concept of the mid-level oral health care provider was realized in the passing of legislation to implement the advanced dental therapist in Minnesota in 2009.¹¹⁻¹³ Other states have followed Minnesota's lead to change health policy to establish an advanced dental hygiene practitioner.

The dental hygiene profession has a historical commitment to implementing and changing health policies to expand access to care and will most likely to continue these efforts. The development of a theory specific to the discipline is beneficial to understand the complexities of these actions. While the dental hygiene community is beginning to collect data documenting individual and collaborative efforts to improve access to care,¹¹⁻¹³ no theory exists in the dental hygiene literature to understand this process. For the purpose of this investigation, *social action* was defined as engaging in actions to change health policies and provide direct care in alternative practice settings. Accordingly, the purpose of this grounded

theory inquiry was to construct an interpretive dental hygiene theory on social action to improve health equity, centered on the process of learning and educating. The qualitative inquiry focused on dental hygienists' experiences in social action in their pursuit to expand the availability, accessibility, acceptability and quality of oral health care for vulnerable populations. The data collected from the study participants were used to develop a new theory for the discipline to guide future social action initiatives to ultimately improve the oral health of all populations.

Methods

The framework for this qualitative inquiry was adult learning based on Lindeman's perspective that lifelong learning occurs within the context of daily life through experiences and situations.¹⁴ Critical theory, an adult learning theory, provided the theoretical lens to view learning as the recognition of controlling beliefs and systems, identification of powerful forces, awareness of alternatives to the status quo and controlling systems, and a future vision of freedom from powerful forces and adherence to justice, fairness, and compassion.¹⁵ Therefore, data collection, data analysis and theory construction focused on the participants' struggle against the status quo of the traditional oral care delivery system, and the power and injustice of external forces to impede those efforts. These factors are evident in current struggles to change practice acts to enhance access to care for vulnerable populations.

A grounded theory approach was employed, and the data analysis consisted of three rounds of analysis (initial coding, focused coding, and theoretical coding).¹⁶ Each round of coding involved different procedures to move the analysis of the same data to a higher abstract level, resulting in the construction of a theory. Grounded theory is a well-established qualitative research method in the social sciences and has expanded into healthcare, primarily in nursing, as researchers have recognized the value of theory to guide clinical practice and advance the discipline. The methodology applied to this inquiry included traditional social sciences methods¹⁷ and more current approaches including constructivist grounded theory¹⁶ and situational analysis methods.¹⁸

Dental hygienists engaged in social action in the states of Washington, Oregon and California were recruited to participate in the study. Additional selection criteria included current licensure, a minimum of 5 years practicing as a dental hygienist, and experience with legislative initiatives or direct access practice. Participants were screened to ensure personal experiences would inform the data collection. After informed consent was gained

and a pseudonym selected, a face-to-face or telephone interview was conducted to explore the dental hygienists' experiences in social action. Data from interviews were audio recorded, transcribed verbatim and verified for accuracy.

After each interview, initial coding of the transcripts resulted in analyzing the data into small segments and assigning a code to interpret the participant's experiences. Focused coding was implemented following the initial coding of multiple interviews which occurred during the second coding procedure. Focused coding allowed similar initial codes to be grouped into categories to interpret larger amounts of data. Additionally, the analysis of multiple interviews provided the opportunity to use the constant comparative method to evaluate the consistency of applying initial codes and focused codes among the transcripts. Further analysis raised some focused codes to substantive categories while other codes were subsumed under the substantive codes as subcategories. As additional data were needed to inform the theory construction and achieve theoretical saturation, theoretical sampling using the same inclusion criteria was employed to recruit dental hygienists with varied social action experiences to enrich the data collection.

According to constructivist grounded theory methodology, the third coding procedure, theoretical coding, was used to conceptualize how the substantive codes were related and raise the analysis in a theoretical direction.¹⁶ This final coding procedure required theorizing as an interpretation of the complexities and variation of the social action experiences.¹⁶ The construction of theoretical concepts served as a mechanism to understand the relationships between and among substantive codes.¹⁶

Situational analysis served as a supplemental data analysis procedure to explore the power of various social worlds and uncover situations, people, and issues in which learning and educating in social action occurred.¹⁸ Mapping techniques were used in conceptualizing the relationship of the codes and categories allowing for a deeper interpretation of data.¹⁸

Throughout the data analysis processes, memos were written by the principal investigator (PI) to document thoughts and decisions about the analysis, raise questions, clarify interpretations, create conceptual definitions for substantive codes and improve the conceptualization of codes to theoretical concepts. Memo writing was one strategy used as an audit trail to confirm the validity of the data analysis.¹⁹ The use of member checks and an inquiry auditor were additional methods applied to assert the credibility (validity) of the data analysis.²⁰ Member checks involved the participants' review of the data analysis to confirm the researcher's interpretation of

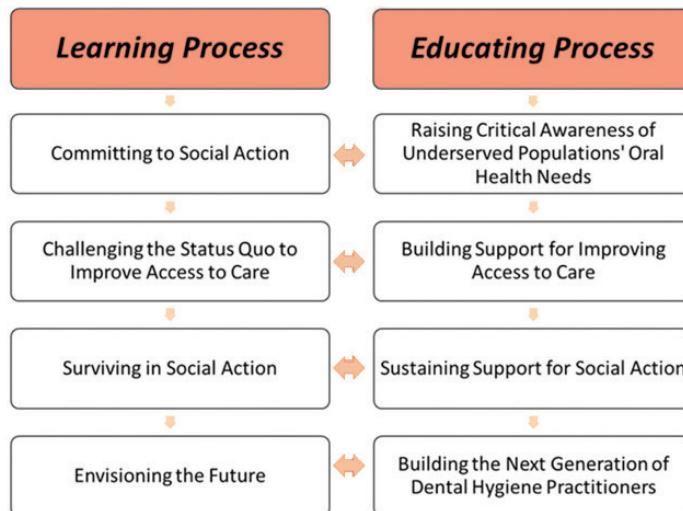
their experiences. The inquiry audit was conducted by a peer who used the memos written by the PI during data analysis to establish the credibility of the data interpretation.

Results

The results of the focused coding procedures revealed three categories of learning and one educating category. Categories for the process of learning were: awareness, adaptation and relationships; the category for the learning process was: improvement.²¹ This research summarizes the theoretical coding results and subsequent theory created from the social action experiences of the dental hygienist participants. All participants were licensed for at least 25 years, were members of the ADHA and had actively participated in their state association's legislative endeavors. The majority of participants were engaged in direct access practice and provided care for residents in a long-term care facility (n=5). Two participants were employed in a public health setting and one participant was employed in private practice and had served as a change agent for a state dental hygienists' association.

Results of the theoretical coding procedures revealed that dental hygienists who engaged in social action used a combination of learning and educating processes in the quest to improve access to care. Figure 1 illustrates the relationship between and among the learning and educating processes. The learning process was categorized into actions of *Committing to Social Action*, *Challenging the Status Quo to Improve Access to Care*, *Surviving in Social Action* and *Envisioning the Future*. The actions for educating process involved *Raising Critical Awareness of Underserved Populations' Oral Health Needs*, *Building Support for Improving Access to Care*, *Sustaining*

Figure 1. Theoretical Coding Results: Relationship between actions in the learning and educating processes



Support for Social Action and Building the Next Generation of Dental Hygiene Practitioners.

Table I provides detail on the learning action of *Committing to Social Action* and the educating action of *Raising Critical Awareness of Underserved Populations' Oral Health Needs*. Dental hygienists developed a commitment to social action as they learned about vulnerable populations with oral health inequities impeding the ability to meet basic needs. These populations were marginalized based on the inability to access oral healthcare and the lack of power to change the status quo. Dental hygiene practitioners' interactions with individuals in their direct access practices and community oral health programs influenced their awareness of the high stakes of oral diseases. These interactions and situations impacted the practitioners' self-awareness of values and mission to establish a personal commitment to social action. The educating action involved communicating to raise critical awareness of the vulnerable populations' poor oral health as dental hygienists interacted with colleagues, dentists, legislators and advocacy groups.

The learning action, *Challenging the Status Quo to Improve Access to Care*, is shown in relationship to the educating action, *Building Support for Improving Access to Care*, in Table II. Dental hygienists developed critical awareness of the need to contest the existing oral health care delivery system, the laws restricting dental hygiene practice and the lack of direct reimbursement from third party payers to dental hygienists. These challenges were addressed by participating in legislative advocacy to expand the scope of practice and thereafter, providing care in a direct access practice or community oral health program. From these pursuits, dental hygiene professionals developed critical awareness of the power exerted by organized dentistry to create roadblocks to impede the progress of legislation to expand dental hygiene's scope of practice. Participants regarded this power as attempt to maintain the status quo of the oral health care delivery system and dentistry's gatekeeper function to regulate care.

Furthermore, the realization of injustices of the political and dental third party payer systems contributed to an awakening of critical awareness. Dental hygienists became empowered when critical awareness was gained and the fear of power and injustice was overcome. Empowerment fueled the practitioners to take control of their careers and develop confidence and competence in their social action abilities. In addition, empowerment was enhanced through a sense of "making a difference" in the oral health of marginalized populations and in the political arena by influencing changes in health policies. However, participants also learned the vulnerable aspects of involvement in social action by experiencing

Table I. Relationship between Learning to Commit to Social Action and Educating to Raise Critical Awareness of Unmet Oral Health Needs

Committing to Social Action (Learning Process)
Realizing the Stakes of Poor Oral Health in Underserved Populations <ul style="list-style-type: none">• Emotionally connecting to underserved individuals and their families• Developing critical awareness of unmet oral health needs of vulnerable populations• Gaining critical awareness of low stakes of preventable oral diseases and high stakes of life threatening oral diseases
Establishing a Personal Commitment to Social Action <ul style="list-style-type: none">• Identifying values such as the right to oral health care, justice, fairness, advanced education, that guide actions to improve access to care• Viewing direct dental hygiene care as a worthwhile endeavor to improve access to care instead of providing care as a commodity for financial gain• Committing to a mission or vision to improve oral health of underserved populations and educating the next generation of practitioners
Raising Critical Awareness of Underserved Populations' Oral Health Needs (Educating Process)
Develop Awareness in Others of Underserved Populations' Poor Oral Health <ul style="list-style-type: none">• Communicating with others to raise the consciousness of oral health status and access to care needs• Educating dental hygienists, dentists, legislators and middle class advocacy groups who do not interact with individuals experiencing pain and suffering from the lack of oral health care

personal and financial risks. The educating action consisted of individual practitioners improving knowledge of direct access practice and legislation within the dental hygiene community. Lastly, educating non-dental stakeholders was important to enhance the value of oral health and the importance of dental hygiene practitioners providing care directly to underserved populations. Furthermore, education was necessary to raise awareness of legislative efforts to improve access to care.

Table III presents the relationship between the learning action, *Surviving in Social Action*, to the educating action, *Sustaining Support for Social Action*. Participants learned to adapt to new situations and create new strategies to overcome challenges in social action. The most significant aspect of learning was developing an awareness of the collective power resulting from collaborative efforts to achieve a goal by multiple groups

Table II. Relationship between Learning to Challenge the Status Quo and Educating to Build Support for Improving Access to Care

Challenging the Status Quo to Improve Access to Care (Learning Process)	Building Support for Improving Access to Care (Educating Process)
<p>Bucking the System</p> <ul style="list-style-type: none"> Developing awareness of need to change status quo of systems to improve oral health Taking action to implement direct access practices and oral health promotion community programs Battling with dental insurance entities to provide reimbursement for care Engaging in legislative advocacy efforts 	<p>Improving Knowledge Within Dental Hygiene</p> <ul style="list-style-type: none"> Communicating with dental hygiene practitioners and students about direct access practice Educating dental hygiene practitioners and students about legislative advocacy
<p>Attaining Critical Awareness of Powerful Forces</p> <ul style="list-style-type: none"> Understanding the power of organized dentistry and its long reach into systems influencing oral health Feeling the impact of roadblocks placed to impede change in status quo initiated by hygienists Distrusting organized dentistry's agenda to improve access Developing critical awareness of power to maintain gatekeeper function to oral health 	<p>Enhancing the Value of Oral Health and Direct Care Provided by Dental Hygienists</p> <ul style="list-style-type: none"> Informing public, legislators, clients and healthcare practitioners on oral-systemic link Educating public, legislators, dentists and healthcare practitioners to build professional identity Informing others about solutions to access to care problem such as direct access practice, dental insurance reimbursement, and Advanced Dental Hygiene Practitioner (ADHP)
<p>Reaching Critical Awareness Related to the Injustice of the Political System</p> <ul style="list-style-type: none"> Distrusting the fairness of the legislative system and actions of policymakers Developing critical awareness of backroom politics influenced by wealthy contributors 	<p>Raising Critical Awareness of Legislation to Improve Access to Care</p> <ul style="list-style-type: none"> Educating to build support and gain respect within dental hygiene practitioners and professional association membership Informing legislators and their staff to build support and gain respect
<p>Realizing Critical Awareness Regarding the Injustice of the Dental Insurance System</p> <ul style="list-style-type: none"> Facing the problem of the lack of insurance codes for every dental hygiene procedure Experiencing the denial of reimbursement to dental hygienists for care provided Developing critical awareness of overburdened Medicaid system 	
<p>Achieving a Sense of Personal Power</p> <ul style="list-style-type: none"> Taking control of one's career by operating a business or implementing a community oral health program and participating in legislative advocacy efforts to expand the scope of practice Gaining competence and confidence in emotional, mental, and spiritual abilities Overcoming fear from sources of power and injustices Finding empowerment by "making a difference" in oral health of underserved populations and in political arena 	
<p>Experiencing Risks</p> <ul style="list-style-type: none"> Experiencing vulnerability when challenging the status quo Vulnerability = personal risks and business financial risks 	

and the public. Collaborative efforts included dental hygiene professional associations as well as stakeholder groups such as oral health coalitions and senior citizen advocacy organizations. The educational component to sustain support for social action required ongoing education of dental hygiene association members, policymakers, stakeholders and the public.

Relationships between the last actions of the learning and educating processes are detailed in Table IV. *Envisioning the Future* with a new view of the oral health delivery system and enhancement of dental hygiene education and graduate preparation was related to *Building the Next Generation of Dental Hygiene Practitioners*. Participants created resources, mentored and served as role models for students and clinicians to educate the next generation of direct access practitioners and advocates for legislative action. Moreover, the educator role was important for creating collective consciousness and collective action to support new oral health delivery systems within the dental hygiene community and entities external to the dental hygiene profession.

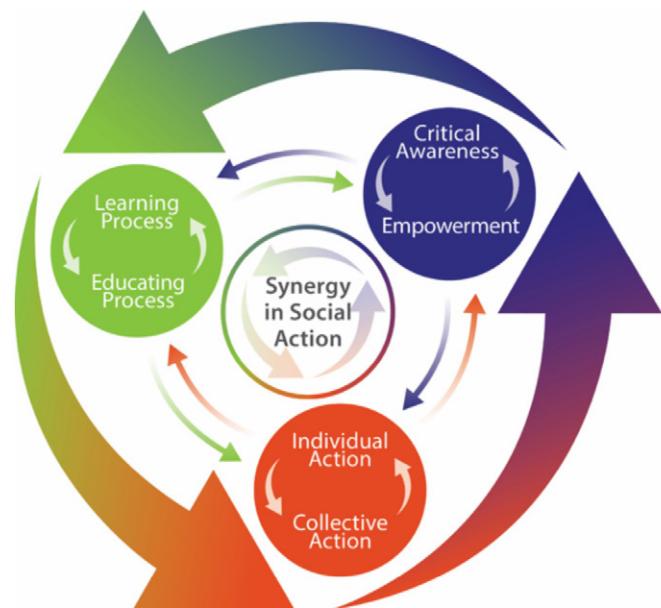
Results of the situational analysis¹⁸ mapped situations, people and issues influencing the learning and educating processes. This analysis was useful for determining the complexities influencing the participants' experiences.¹⁸ The situations in which dental hygienists experienced learning and educating included formal, non-formal and informal educational settings. Formal situations related to educational programs at universities or colleges for entry-level and degree completion as well as direct access care preparation. Non-formal settings included continuing education and professional development courses, whereas informal situations occurred in the context of providing care in nursing homes, implementing community health programs, and participating in dental hygiene professional association and legislative endeavors. The people influencing the participants' learning and educating experiences were numerous and included dental hygiene educators, practitioners and professional association members in addition to individuals and groups such as nursing home administrators, residents and their families; public health employees; dental association members and dentists; lobbyists, legislators and their staffs; and coalition members. Social action issues experienced by the participants related to the policies, systems, laws, power and injustices that presented challenges to improving health equity.

Constructing a theory grounded in the data followed the completion of the theoretical coding and situational analysis. The resulting theory is an interpretation of the complexities and variation of the phenomenon under study derived from a constructivist grounded theory perspective.¹⁶

A Grounded Theory: Synergy in Social Action

The Synergy in Social Action Theory consists of three key elements. (Figure 2) The first element is the interconnected actions of the Learning and Educating processes in social action. These processes are influenced by the second element of the theory, the interplay between Critical Awareness and Empowerment. The third element consists of the reciprocity between Individual Action and Collective Action. Movement within each key element generates the force to create the momentum among the three elements, which in turn produces synergy.

Figure 2. Synergy in Social Action Theory



Synergy is the perpetual momentum energized by the interaction of the three key elements, thereby creating a combined power greater than the sum of the individual elements. The momentum is fortified by the ongoing interrelationship within and among the key elements. Perpetual momentum is necessary to sustain social action during the continual quest to improve access to care.

Discussion

The Synergy in Social Action Theory explains a dynamic system of interrelated elements that establish momentum for challenging the status quo to improve the availability of and access to oral health care. Momentum for social action begins from the force of movement within each key component and then builds over time as the three elements combine individual energy to produce a momentum greater than the sum of the individual components. Continual movement and energy are necessary to sustain social action on a long-term basis.

Table III. Relationship between Learning to Survive in Social Action and Educating to Sustain Support for Social Action

Surviving in Social Action (Learning Process)	Sustaining Support for Social Action (Educating Process)
<p>Adapting to Make Improvements</p> <ul style="list-style-type: none"> • Adjusting to new situations to overcome challenges faced related to restrictive laws, dental insurance system, economic viability of practice, and ongoing access to care problems • Revising policies, procedures, organization, and strategies to improve efficiency and effectiveness in a direct access practice or a community oral health program and legislative advocacy • Applying improvements to direct access practices or community oral health programs and legislative endeavors as members of professional association 	<p>Ongoing Education to Sustain Collective Consciousness within the Dental Hygiene Professional Association</p> <ul style="list-style-type: none"> • Constantly educating the dental hygiene association at the local, state, and national level regarding solutions to access to oral health care • Communicating with members of a subcommittee at the state association level charged with initiating legislative changes • Informing membership of a state professional association specifically for direct access dental hygienists
<p>Generating Unique Approaches</p> <ul style="list-style-type: none"> • Taking on new roles as a change agent for a state association, an advocacy role for patients and dental hygiene association or a case manager in the public health arena. • Creating strategies to overcome challenges or make opportunities to improve oral health 	<p>Ongoing Education to Sustain Support of Policymakers</p> <ul style="list-style-type: none"> • Securing a professional lobbyist for the state dental hygiene association to assist with education of legislators and their staff on dental hygiene legislation • Dental hygiene association membership informing legislators and their staff to sustain their support • Dental hygiene association membership testifying at subcommittee hearings on legislation • Dental hygiene association membership communicating with the state board of dentistry executive director and members
<p>Embracing Collective Power within Dental Hygiene</p> <ul style="list-style-type: none"> • Building relationships within the dental hygiene association membership • Creating a subcommittee at the state association level charged with initiating legislative changes • Creating a state professional association specifically for direct access dental hygienists • Diversifying support for access to care from groups external to dental hygiene • Becoming more politically savvy as a collective power • Inspiring collective action towards achieving a common goal • Recognizing the direct and indirect collective power to influence change 	<p>Building Support in Stakeholder Groups</p> <ul style="list-style-type: none"> • Dental hygiene association membership becoming active members in stakeholder groups such as senior advocacy groups, public health committees, • Dental hygiene association membership educating healthcare professional associations and their membership on dental hygiene solutions to access to care problems
<p>Embracing Collective Power External to Dental Hygiene</p> <ul style="list-style-type: none"> • Developing relationships with groups to foster a mutual appreciation of each other, to gain respect, and to build support • Collaborating with groups of stakeholders regarding a common purpose, vision, or mission • Developing a collective consciousness in associations, coalitions, task forces, advocacy groups, state boards of dentistry • Inspiring collective action towards achieving a common goal • Recognizing the direct and indirect collective power to influence change 	

Table IV. Relationship between Learning to Envision the Future and Educating to Build the Next Generation of Practitioners

Envisioning the Future (Learning Process)
Creating a New Oral Health Delivery System to Improve Access to Care
<ul style="list-style-type: none"> Establishing successful alternative practice settings Conceiving the Advanced Dental Hygiene Practitioner (ADHP) as a mid-level provider
Improving Dental Hygiene Education and Graduate Preparation
<ul style="list-style-type: none"> Ensuring that entry-level degree is commensurate with years of education Incorporating more public health in the entry-level curricula Increasing the number of dental hygienists with baccalaureate, master's, and doctoral degrees will enhance respect of profession Providing ADHP preparation at the graduate level
Building the Next Generation of Dental Hygiene Practitioners (Educating Process)
Improving Direct Access Practice
<ul style="list-style-type: none"> Creating materials and resources to educate new direct access practitioners and advocates for legislative changes Mentoring and serving as role models to students and clinicians in direct access practice and legislative action
Building a Collective Consciousness and Collective Action for New Oral Health Delivery Systems
<ul style="list-style-type: none"> Building collective consciousness and action within dental hygiene profession Building collective consciousness and action among the public, legislators, coalitions, task forces, associations and advocacy groups

Although this theory was constructed from data collected from dental hygienists located in Washington, Oregon, and California regarding their experiences prior to 2009, the theory can be applied to the more recent initiative to improve the oral health of the underserved population in Minnesota. For example, the implementation of the advanced dental therapist as a new mid-level provider stemmed from actions spanning 8 years,¹³ thus demonstrating the longstanding nature of social action movements. Dollins et al. suggested that efforts to pass legislation related to “new workforce models is not a quick process,”¹¹ therefore dental hygienists who are interested in implementing these new models must understand the commitment needed over a relatively long period of time. Furthermore, the implementation of the advanced dental therapist was not the endpoint. Continual watchfulness of reimbursement and regulatory policies is an critical aspect of the long-term commitment to a new workforce model.¹² Advocates must be prepared to monitor proposed policies and procedures by the board of dentistry, legislature, Department of Human Services, the Commission on Dental Accreditation and

the regional testing agency for licensure requirements that could negatively impact positive progress towards the new workforce model.¹³

According to the Synergy in Social Action Theory, the interactions between the actions in the Learning and Educating Processes contribute to the development of momentum within this key element. The most significant experiential learning opportunities were presented in the situations and interactions as participants provided direct care to vulnerable populations and advocated for improving health policy. Participants' personal experiences in the context of social action were transformational in changing their priorities to challenge the status quo and envision change. These endeavors were rich contexts for learning and educating. Moreover, the inter-relationship between learning and educating was evidenced in the context of other social action movements,²²⁻²⁸ as well as in the Minnesota legislative initiative.¹¹

In this qualitative inquiry, education of the dental hygiene community at large along with external individuals and groups was identified as important factor in gaining support for access to care initiatives. Participants felt a responsibility to mentor and educate future generations of dental hygienists to provide direct access to care and to engage in legislative advocacy. Education has played an important role in other social movements.²⁹⁻³⁰ During the initial efforts in Minnesota, education was a “strategic initiative” focused on legislators, the public, and the dental hygiene and dental community regarding the benefits of this new mid-level provider¹³ and raising awareness of problems that challenge the oral health of vulnerable populations.^{11,13} Two years later as the bill was considered by the state legislature, education of legislators focused on helping policymakers discern “myths vs facts” and inaccurate information offered by opposing groups.¹³

The interplay between the first key element Learning/Educating Processes and the second key element Critical Awareness/Empowerment is based on the definitions of Foley because learning is essential for developing critical awareness and empowerment. Critical learning enhances the development of critical awareness of unfair systems and injustices, whereas emancipatory learning influences empowerment and action to gain freedom from unfair and unjust circumstances.²²

Momentum within the second key element is created from the relationship between critical awareness and empowerment in the Synergy in Social Action Theory. While the participants learned to challenge the status

quo, they also developed critical awareness of the power of organized dentistry, the injustice of the political system based on wealthy contributors' influence on policymakers' votes, and injustices of third party payers related reimbursement for dental hygiene providers. Participants viewed these unfair forces as influencing the lack of access to oral healthcare. In the Minnesota advanced dental therapist endeavor, opponents included the national and state dental associations and the school of dentistry.¹² The original proposed legislation included no supervision requirements for the advanced dental therapist; however, powerful forces influenced a modification to the bill to add the dental therapy model and change the supervision requirement to general supervision for the advanced dental therapist.¹²

The study participants' professional lives had provided the experiences to develop critical consciousness, which according to Freire³¹ is learning to understand the social, political, and economic oppressive forces within a system followed by taking action against these forces. Once these forces were identified, the participants learned to overcome their fear of powerful and unjust forces. Participants' actions included adapting to make improvements and generating unique approaches to overcome challenges. Learning to overcome fear and gain freedom from these circumstances was the first step in achieving a sense of personal power or empowerment. Furthermore, empowerment was experienced by the participants as the power to have control over their professional lives and the power to impact health policy changes and impact the oral health of underserved populations.

The interplay between the second key element, Critical Awareness/Empowerment and the third key element of Individual Action/Collective Action is based on Friere's concept³¹ that critical awareness influences taking action. Results from this study suggest that empowerment of individuals and groups must be achieved before engaging hearts, souls and minds in social action.

Momentum in the Synergy in Social Action Theory within the third key element is created from the relationship between Individual Action and Collective Action. The participants' singular actions to improve the availability, accessibility, acceptability and quality of oral health care led to interactions with other people and groups to achieve the same outcome. Collective social action was interpreted to mean the collaboration of individuals and groups to achieve a desired outcome to improve access to oral health care by overcoming powerful forces and oppressive injustices. The ADHA was the unifying organization within the dental hygiene community for collective action. Legislative changes were possible through

collective action of members within the state association. Legislators tended to vote favorably for policy change in legislative campaigns supported by both dental hygiene and dental associations. However, when collaboration between the two associations was not possible, participants found that a broader network of collective support external to dental hygiene was necessary to increase the power of collective action necessary to change health policies.

The relationship between Individual Action and Collective Action was evident in the Minnesota mid-level provider legislative process. Endeavors began with the individual actions of two educators and the Dental Director of the Minnesota Department of Health.¹³ This was followed by the first phase of collective action consisting of the strong support of three groups: the Safety Net Coalition, the Minnesota Dental Hygienists' Association, and the Minnesota higher education system.¹²

The power of collective action for the participants' social action movements was based on building relationships within the dental hygiene community and with policymakers, external and public groups to gain respect and support for legislative advocacy endeavors. In addition, participants who were members of oral health coalitions and task forces experienced the power of collective action where multiple stakeholder groups worked in collaboration to improve oral health. Evidence of the importance of building "sustainable relationships with influential community leaders and organizations" was established in Minnesota's legislative efforts, which resulted in the support of 60 organizations.¹³ Furthermore, building relationships with legislators in the Minnesota House and Senate was also played a critical role in the process.¹² The collaborative relationships developed among the organizations and with policymakers were vital in gaining the support to pass the advanced dental therapist legislation.¹¹ Collaboration from entities external to the dental community were the most influential in establishing the need for access to care, because these entities were viewed as not having a "personal bias" on the legislative outcome.¹¹

The energy of the Synergy in Social Action Theory is generated from the momentum *within* each key element and the relationship *among* the three elements. This relationship stems from two domains of learning, which in turn influence action. The learning/educating element focuses on the development of knowledge in the cognitive domain of learning, whereas the element of critical awareness/empowerment emphasizes the affective domain. Learning in the cognitive domain is built on a hierarchy of knowledge requiring an increasing complexity of thought.³² The lowest

levels of learning involves remembering, understanding and applying knowledge. Higher levels of cognition entail analyzing, evaluating and creating knowledge.³² Participants experienced knowledge development within the context of social action as they provided direct dental hygiene care to clients and were engaged in changing health policy.

In contrast, the affective domain deals with the more complex emotional aspects of learning such as values, perspectives, attitudes, motivations and feelings.³³ The two lowest levels of this domain include developing an initial awareness and then responding by demonstrating a new way of thinking or acting because of the awareness.³³ The three higher levels require assigning a value to something of worth and committing to the value, then prioritizing values to create a new internal values system and lastly, acting consistently with the new values set.³³

Participants in this study, along with the dental hygienists involved in the Minnesota legislative efforts, developed a critical awareness of the access to care problem in their respective states.^{11,13} This awareness influenced the development of values related to the right to oral health care, justice and fairness in access to care and the need for new workforce models. These values, in turn fostered participants to view improving the status quo as a worthwhile endeavor, and to commit to working towards positive change. Empowerment is embodied in the affective level of prioritizing values and making a transformation to a new perspective, which includes acknowledging injustices, feeling freedom from fear of powerful forces and having the power to impact change. At the highest level of affective development, participants demonstrated social action by engaging in activities to improve the oral health of underserved populations. Social action included providing direct access dental hygiene care or advocating for improving health policy for new workforce models. Therefore, both cognitive and affective learning are paramount to an individual or a collective group, taking action. The interaction among the three key elements creates the synergy and energy to sustain ongoing policy changes to improve the availability of and access to oral health care.

Implications of the Theory

The development of conceptual models and theoretical frameworks is vital for dental hygiene's evolution into a substantive healthcare discipline.³⁴ Key aspects of dental hygiene's scholarly identity include the creation and testing of the conceptual models and theories on which the body of dental hygiene knowledge is built.³⁵ Three conceptual models borrowed from other disciplines and adapted to dental hygiene exist in the literature: the Client Self-Care Commitment Model,³⁶ Oral

Health Quality of Life Model³⁷ and Human Needs Conceptual Model.³⁸ Researchers have recently investigated the use of two of these conceptual models within dental hygiene practice, education and research.^{39,40} At the present time two models created by dental hygiene researchers exist in the literature, the E-Model for Online Learning Communities⁴¹ and the Advocacy Engagement Model.⁴² The Synergy in Social Action Theory resulting from this qualitative study is a unique contribution to dental hygiene scientific body of knowledge.

Theories are used to understand a phenomenon and to apply this knowledge to future situations. As dental hygienists continue to promote health policies implementing and sustaining new workforce models, the Synergy in Social Action Theory may be useful in understanding and supporting colleagues' experiences actions in challenging the status quo, advocating for legislation and providing direct access to dental hygiene care.

The Synergy in Social Action Theory can also guide dental hygiene educators in entry-level and master degree programs to ensure graduates are prepared with the knowledge and values to participate in legislative advocacy to improve health policies and provide dental hygiene care in direct access practices. Results from a quantitative study of entry-level and graduate degree dental hygiene students demonstrated that students' knowledge, values, and projection of future advocacy actions increased significantly after completing a 7-week legislative advocacy project.^{43,44} Educators must be mindful of preparing practitioners to engage in expanded practice by addressing gaps in knowledge identified in the literature and not addressed in current curricula.^{7,44}

The small number of participants in this study may be viewed as a limitation. However, this inquiry established data saturation, and the validity and credibility of data collection and analysis through the use of standard qualitative research methodology. Dental hygiene researchers and practitioners must challenge their thinking regarding the value of qualitative research as a means to explore unanswered questions and create theories and conceptual models as guides for practice. Establishing doctoral programs in dental hygiene and educating researchers competent in qualitative methods will contribute to advancing and validating dental hygiene as a substantive healthcare discipline based on its own theories.

Future research could focus on exploring each element of the theory in greater detail using either qualitative or quantitative approaches or by a mixed methods approach. Dental hygienists engaged in social action endeavors should consider documenting their experiences based on the theory and add new insights into the process of social action.

Conclusion

Dental hygienists are engaged in social action to improve access to oral health care. Realizing this vision requires decades-long sustained energy and commitment. Dental hygienists' experiences in social action were collected and analyzed according to grounded theory methods to create an interpretive theory. The Synergy in Social Action Theory is the perpetual momentum energized by the interaction of three key elements, thereby creating a combined power greater than the sum of the individual elements. The momentum is fortified by the ongoing interrelationship within and among the key elements of Learning and Educating, Critical Awareness and Empowerment, and Individual and Collective Action. This theory assists dental hygienists in understanding the multidimensional components of social action, their interrelationship, and ultimately the role they play in improving access to care. The Synergy in Social Action Theory is unique to the dental hygiene discipline as it was created by a dental hygienist researcher based on data derived from dental hygienists. Theory development must be a priority for the research community in order to enhance the credibility of the discipline by creating a strong theory base in the scientific body of knowledge.

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Exploring the Integration of the Dental Hygiene Diagnosis in Entry-Level Dental Hygiene Curricula

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Abstract

Purpose: The purpose of this study was to investigate how dental hygiene educational programs currently incorporate dental hygiene diagnosis (DHDx) into entry-level, dental hygiene curriculum.

Methods: An exploratory, quantitative, descriptive cross-sectional study was designed to assess the extent to which DHDx is integrated into entry-level dental hygiene curriculum. A 30-item survey was designed and content validity established using a subset of dental hygiene faculty and researchers as well as participants from the American Dental Hygienists' Association. Data was collected using the Qualtrics® electronic platform; two electronic mailings were sent to all entry-level dental hygiene programs. All surveys included a consent form and confidentiality was maintained. Descriptive statistics were used to analyze data.

Results: Of the 334 surveys e-mailed, 198 responses ($n=198$) were received for a 59% response rate. Of the program respondents, 98% ($n=191$) reported that the dental hygiene process of care and concepts specifically relating to the DHDx were being taught. In addition, 79% ($n=153$) of respondents confirmed that they "always" require students to write a DHDx statement for the patients. Of the respondents, 80% ($n=150$) recognized that formulating a DHDx should result in improved patient outcomes and 76% ($n=143$) indicated that formulating a DHDx increases the dental hygienist's accountability in patient care.

Conclusion: This exploratory study assessed the extent to which the DHDx is taught in entry-level dental hygiene programs. Findings confirmed that the DHDx is an integral component of dental hygiene education, but there is a need for standardization and faculty calibration for DHDx concepts and terminology. These results support adding DHDx into the Commission on Dental Accreditation (CODA) standards.

Keywords: dental hygiene diagnosis, dental hygiene education, dental hygiene process of care, accreditation standards

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Introduction

Health care professionals practice to promote, improve and facilitate the health and well-being of individual patients and societal populations. Dental hygienists have expertise in the prevention, education and treatment of oral diseases while working in partnership with dentists and other health care specialists.¹ In order to assist in the understanding of a dental hygiene diagnosis (DHDx) for the purpose of collaborating with multiple health practitioners, terminology needs to be clear and consistent. The term diagnosis, is used by all health care professionals as it pertains to their specific discipline.²⁻⁶

Educational standards and requirements for the clinical practice of dental hygiene are foundational in understanding what is expected of a licensed dental hygienist. The discipline of

dental hygiene is defined by the American Dental Hygienists' Association (ADHA) as the "art and science of preventive oral health including the management of behaviors to prevent oral disease and promote health."⁷ Prevention of oral diseases first requires an astute recognition of the particular disease, including the associated causes and risks. Promotion of health necessitates an understanding of how to improve and maintain the body in a state of health. Dental hygiene education, licensing, and practice incorporate health prevention and promotion strategies in order to address a client/patient's individual oral health needs. Needs are assessed and recognized through the use of a DHDx. Strict guidelines have been established by accrediting and licensing bodies to ensure the competency of dental hygienists in all areas of practice.

Entry-level dental hygiene programs educate and prepare graduates to gain licensure and competency for clinical practice. In order to be licensed as a dental hygienist, a candidate must graduate from an accredited dental hygiene program, pass a comprehensive written examination and a clinical examination.¹ All states within the United States (U.S.) accept the American Dental Association Joint Commission on National Dental Examinations National Board Dental Hygiene Examination to meet the comprehensive written examination component. “Diagnosis” is specifically listed as a possible test topic in the study guide for this 350 question examination.⁸

Dental hygiene programs are accredited through the Commission on Dental Accreditation (CODA). In 2010, CODA removed DHDx from the Accreditation Standards for Dental Hygiene Education Programs (Standard 2-13), even though DHDx had been included in the Standards since 1998.^{9,10} Although the term DHDx is not specifically included in the CODA dental hygiene patient care competencies, graduates are expected to exhibit competence in the dental hygiene process of care.¹¹ The dental hygiene process of care involves standards established by the ADHA that provide consistency, accountability and responsibility within the dental hygiene profession in regards to the care provided to clients/patients.¹ These standards for clinical dental hygiene practice provide guidance for the oral health professional regarding the relationship between patient and provider. Further, the dental hygiene process of care helps the oral health care provider to “identify the causative or influencing factors of a condition that can be reduced, eliminated, or prevented by the dental hygienist.”¹ The DHDx is a critical element of the process of care for the provision of quality, comprehensive care. Because CODA requires knowledge and application of the dental hygiene process of care, graduates must be taught and prove competence in DHDx, the second standard in the ADHA process of care.¹¹ Therefore, it has been recommended that educators prepare students and faculty to formulate and use DHDx in the classroom and clinical setting.¹⁰

Components of the dental hygiene process of care include: assessment, DHDx, planning, implementation, evaluation, and documentation (ADPIED). DHDx is defined as “the identification of an individual’s health behaviors, attitudes, and oral health care needs for which a dental hygienist is educationally qualified and licensed to provide. A dental hygiene diagnosis requires evidence-based critical analysis and interpretation of assessments in order to reach conclusions about the patient’s dental hygiene treatment needs. The dental hygiene diagnosis provides the basis for the dental hygiene care plan.”¹ The ADHA standard for the DHDx is shown in Figure 1.¹

Figure 1. ADHA Standards for Clinical Practice: Dental Hygiene Diagnosis (Standard 2)¹

The ADHA defines dental hygiene diagnosis as the identification of an individual’s health behaviors, attitudes, and oral health care needs for which a dental hygienist is educationally qualified and licensed to provide. The dental hygiene diagnosis requires evidence-based critical analysis and interpretation of assessments in order to reach conclusions about the patient’s dental hygiene treatment needs. The dental hygiene diagnosis provides the basis for the dental hygiene care plan.

Multiple dental hygiene diagnoses may be made for each patient or client. Only after recognizing the dental hygiene diagnosis can the dental hygienist formulate a care plan that focuses on dental hygiene education, patient self-care practices, prevention strategies, and treatment and evaluation protocols to focus on patient or community oral health needs.

- I. Analyze and interpret all assessment data.
- II. Formulate the dental hygiene diagnosis or diagnoses.
- III. Communicate the dental hygiene diagnosis with patients or clients.
- IV. Determine patient needs that can be improved through the delivery of dental hygiene care.
- V. Identify referrals needed within dentistry and other health care disciplines based on dental hygiene diagnoses.

The ADHA DHDx White Paper clearly differentiates between a dental diagnosis and a DHDx by stating, “dentists focus on diagnosing and treating those conditions for which they are educated and licensed in the same manner that dental hygienists diagnose and provide care within the scope of their education and license.”¹⁰ Dental hygienists analyze information collected during the assessment phase of patient care including overall health, clinical findings, and risk assessment data, in order to determine the DHDx appropriate for the individual client/patient.¹ Examples of a DHDx are as numerous and diverse as the patient population.^{12,13} Accuracy of DHDx requires analyzing all of the assessment data and utilization of the clinician’s critical thinking skills. Proficiency in developing diagnostic statements and formulating a DHDx is introduced as part of the dental hygiene education program and is refined with experience.

Assessment provides the foundation for formulating a DHDx. Health history data provides a DHDx related to a patient’s medical risk status according to the American Society of Anesthesiologists Physical Status Classification System (ASA)¹⁴ along with vital sign evaluation, social history,

current and past medications, and hospitalization history. Dental hygienists are responsible for the safety and welfare of the clients/patients within their care. Additional care and possible referral might be indicated for a patient who exhibits a high ASA classification or who presents with elevated blood pressure. Dental hygiene programs incorporate emergency prevention strategies into multiple courses in order to prevent possible complications associated with a patient's medical health during dental hygiene care. Knowledge and experience must be obtained during the dental hygiene education process to ensure adverse health status is identified and accurately documented as part of a DHDx.

Clinical assessment findings dictate other identifiable DHDx for an individual. Examples of diagnoses might involve other specific classifications of periodontal diseases as outlined by the American Academy of Periodontology, the presence of oral conditions such as xerostomia, and/or the evidence of current or past dental caries. Additionally, risk assessment evaluation provides a DHDx relating to any trait increasing the risk for oral disease such as tobacco use. Each DHDx is addressed in the dental hygiene care plan and discussed prior to obtaining informed consent. Explaining the specific states of disease assists the individual in understanding the rationale for treatment. Patients are given the DHDx, recommended interventions, risks for treatment and alternative options, and expected outcomes. Individuals cannot be expected to give informed consent without receiving and understanding their particular DHDx.¹

Concepts related to DHDx in the literature are limited. Literature searches of the term "dental hygiene diagnosis" showed no published research studies. However, historically, professional associations such as the ADHA and the Canadian Dental Hygienists Association (CDHA) have incorporated DHDx as part of their practice standards. The CDHA reference to DHDx is found in Standard 2: Dental Hygiene Process: Assessment 2.5 "Analyze all information to formulate a decision or dental hygiene diagnosis."¹⁵ Various models of the DHDx have appeared in dental hygiene textbooks since the early 1990s. Gurenlian¹⁶ presented a model for diagnostic decision making in 1993; followed by Mueller-Joseph and Petersen's¹⁷ model for developing and formulating a DHDx. In 1995 Darby and Walsh¹⁸ proposed a DHDx system based on the human needs conceptual model which has appeared in each subsequent edition of their textbook. Although DHDx has been discussed in textbooks for over twenty years, there have been no published studies that have addressed how students are taught to formulate a DHDx. The ADHA White Paper referred to an unpublished survey of program directors conducted in 2015 indicating that some information related

to DHDx was covered in clinical education courses, but no specific details were provided.¹⁰ The purpose of this study was to investigate the incorporation of the DHDx into current entry-level dental hygiene curriculum by examining the following questions: Is DHDx integrated into entry-level dental hygiene curriculum?; How is DHDx integrated into the curriculum?; How is the DHDx distinguished from a dental diagnosis?

Methods

An exploratory, quantitative, descriptive cross-sectional study was designed to assess the extent to which DHDx is integrated into entry-level dental hygiene curriculum using an original 30-item survey instrument. Variables addressed included type of entry-level dental hygiene program and the dimensions of DHDx. The survey was reviewed by a subset of expert dental hygiene faculty and researchers and participants from the ADHA to establish content validity. Feedback was provided and minor modifications were made in the instrument. The study design and survey underwent IRB review and was approved by the University of Idaho's Human Subjects Committee (IRB-FY2016-193).

Clinic coordinators from 334 entry-level dental hygiene programs were invited to participate in the survey; program directors were asked to distribute the questionnaire to the clinic coordinators. Clinic coordinators from the sites of the principal investigators were excluded from the study. The electronic platform Qualtrics® was used to distribute the questionnaire via two electronic mailings during the spring semester of 2016. All surveys included a consent form and confidentiality was maintained. Descriptive statistics were utilized to analyze data.

Results

Of the 334 surveys sent, 198 (n=198) responses were received for a response rate of 59%. The majority of the respondents were from associate degree programs, were aged 56-65 years, and had been teaching in a dental hygiene program for at least 11-15 years. Demographic information is summarized in Table I.

Dental Hygiene Diagnosis Overview

The majority of respondents, 98% (n=190) indicated that they teach the utilization of the dental hygiene process of care; one individual indicated that the dental hygiene process of care is not taught at their institution and three respondents were unsure. Four individuals chose not to answer this item. When asked whether the program teaches concepts related to DHDx, 98% (n=191) responded in the affirmative, 2% (n=3) were unsure, and 2% (n=4) did not respond. The majority,

Table I. Demographic Information

Type of Entry-level Program	n =198	%
Technical/certificate	2	1
Associate degree	161	81
Baccalaureate degree	32	16
Other (recently approved to transition to BAS-DH, community college, MSDH)	2	2
Clinical Supervisory Role	n =198	%
First year clinical coordinator	44	22
Second year clinical coordinator	54	27
Clinical coordinator/director	64	32
Other (both first and second year clinical coordinator; program director; dental administrative chair; third, fourth and fifth semester clinical coordinator)	36	18
Age	n =191	%
25-35	14	7
36-45	30	16
46-55	64	34
56-65	81	42
65+	2	1
Years Teaching in a Dental Hygiene Program	n=194	%
<5	27	14
5-10	47	24
11-15	52	27
16-20	22	11
20+	46	24

98% (n=190) of clinic coordinators reported teaching specific DHDx terms while 2% (n=4) indicated that they do not teach specific terms in particular dental caries and medical terms; 2% (n=4) did not respond.

Dental Hygiene Diagnosis Statements

The majority of programs, 79% (n=153), reported teaching students to “always” write DHDx statements on all patients and 86% (n=162) reported the use of specific diagnostic terms. A majority of programs, 80% (n=149) favored diagnostic statements that include related causes 80% (n=149) used signs and symptoms, 93% (n=171) utilized etiologies, and 94% (n=177) incorporated risk factors. Table II highlights how respondents teach students to describe DHDx statements.

Teaching Concepts Related to Dental Hygiene Diagnosis

Clinic coordinators were provided with a series of six statements related to DHDx and asked to identify which concepts were taught in their programs. The concept receiving the majority, 99% (n=186) of the responses was “the dental

hygiene diagnosis is individual for each patient.” The statement receiving the least number of responses, 76% (n=143) was “formulating a dental hygiene diagnosis increases the dental hygienist’s accountability in patient care.”

The majority of the respondents indicated teaching all six concepts as shown in Table III.

Differences Between Dental Diagnosis and Dental Hygiene Diagnosis

Participants were asked whether their program taught the difference between a dental diagnosis and a DHDx. The majority of respondents, 93% (n=177), indicated “yes” while 3% (n=5) replied “no,” and 5% (n=9) responded “unsure”. When asked to describe what they teach as the difference between the two terms, examples of responses for dental diagnosis included: dental diagnosis is the identification of disease activity and the plan for intervention/treatment/ definitive diagnosis/specific disease; dental diagnosis is the overall diagnosis and treatment by the dentist; dental diagnosis is in regard to repair of existing dental disease such as restorative work; and dental diagnosis is something only the dentist can diagnosis such as decay and pathological conditions/the dentist had the legal and ethical responsibility for. Responses provided for DHDx were: DHDx relates to interventions legal within the dental hygiene scope of practice; pertains to the treatment of periodontal disease and contributing factors; aids in treatment planning and implementation; is based on assessment data; must be agreed upon/confirmed by the dentist; is based on the human needs conceptual model; and identifies existing or potential oral health problems that the dental hygienist is qualified and licensed to treat.

Additional Educational Parameters

Clinic coordinators were asked to identify in which term the program implemented instruction in the DHDx. Of the 84% (n=166) respondents to this question, 45% (n=74) indicated beginning DHDx instruction in the first term of the first year, while 48% (n=79) reported beginning instruction in the second term of the first year. Respondents were asked if multiple DHDx were allowed per patient. The majority of the respondents to this item 71% (n=128) answered in the affirmative while 16% (n=28) stated “no” and 13% (n=24) were “unsure.” Case studies were used as a teaching method by a majority, 96% (n=173) of the respondents, 2% (n=4) do not and 2% (n=4) were unsure. Only one clinic coordinator reported using the term “dental hygiene diagnostician.” A majority of the respondents, 82% (n=147) indicated that DHDx statements are part of student evaluations while 16% (n=29) did not include DHDx statements and 2% (n=4) were unsure. Written examination questions regarding DHDx were included by 91% (n=163)

Table II. DHDx Statements Defined

Are Dental Hygiene Diagnosis terms defined?	n=195	%
Yes	183	94
No	3	2
Unsure	9	5
Approximately how many dental hygiene diagnosis terms are taught?	n=190	%
1-6	17	9
7-12	41	22
13-18	48	25
>18	84	44
Do students write dental hygiene diagnosis statements on all patients?	n=193	%
Always	153	79
Frequently	22	11
Seldom	11	6
Never	4	2
Unsure	3	2
Are specific dental hygiene diagnosis terms used in the statements?	n=189	%
Yes	162	86
No	13	7
Unsure	5	3
Dental hygiene diagnostic statements are not written	9	5
Do the statements include related causes?	n=188	%
Yes	142	76
No	29	15
Unsure	10	5
Dental hygiene diagnosis statements are not written	7	4
Do the statements include signs and symptoms?	n=187	%
Yes	149	80
No	19	10
Unsure	9	5
Dental hygiene diagnosis statements are not written	10	5
Does your program teach the etiologies of dental hygiene diagnosis?	n=184	%
Yes	171	93
No	3	2
Unsure	10	5
Does your program include risk factors in the dental hygiene diagnosis?	n=188	%
Yes	177	94
No	8	4
Unsure	3	2

Table III. DHDx Concepts Taught in Dental Hygiene Programs

Concept	n	%
Formulating a dental hygiene diagnosis will improve patient outcomes	150	80
Formulating a dental hygiene diagnosis increases the dental hygienist's accountability in patient care	143	76
The dental hygiene diagnosis is a necessary component of dental hygiene care	185	98
The dental hygiene diagnosis is legal within the dental hygiene scope of practice	146	78
The dental hygiene diagnosis is individual for each patient	186	99
The dental hygiene diagnosis determines dental hygiene interventions	184	98

of the respondents while only 2% (n=3) indicated not including them and 7% (n=3) were unsure.

When asked whether the specific DHDx was discussed with the patient, the majority, 89% (n=160) of the clinic coordinators responded affirmatively, while 6% (n=11) indicated the DHDx was not discussed with patients and 5% (n=9) were unsure. Rationales for not discussing the DHDx included: "patients are educated on their problems, but it is not phrased as a DHDx," "it has never been addressed in faculty meetings," "we use a comprehensive treatment plan that providers more detail than a simple statement," and, "we focus on their needs deficits not the diagnosis."

Responses to the question whether a written DHDx has led to higher quality patient treatment and documentation were mixed with 50% (n=89) of the respondents indicating "yes," 6%(n=10) "no," and 45% (n=80) "unsure." When asked to provide an example of how writing a DHDx has led to higher quality, responses included: better communication with patient/importance of explaining treatment to patient; more thorough patient individualized treatment planning/treatment plan refers back to DHDx; student more focused on patient needs/problems; clearer informed consent; better documentation; and, better understanding for clinician/increased critical thinking.

Student Challenges with the Dental Hygiene Diagnosis

Faculty respondents were questioned whether students had difficulties in determining the DHDx. Responses were mixed with nearly half, (49%, n=84) answering "yes", 47% (n=84) answering "no," and 4% "unsure." When asked to

explain the “yes” responses, most commented initial challenges with the DHDx, but indicated that students gain confidence with experience; the level of critical thinking required for the DHDx is challenging; American Dental Association and American Academy of Periodontology case types and classifications can be confusing; difficulty with the care plan/treatment plan associated with the DHDx; learning to put it all together; and, faculty are unsure how to formulate a DHDx.

Mixed responses were noted regarding whether formulating a DHDx statement was confusing for students with a little more than half of respondents, 53% (n=96), indicating “yes,” 38% (n=69) stating “no,” and 9% (n=16) were “unsure.” Reasons for selecting “yes” responses included: initially the DHDx can be confusing until more practice and experience is obtained; differentiating between dental and DHDx, confusion with the term “diagnosis” or fear of using the word “diagnosis”; difficulty with the actual writing of the DHDx statement; difficulty with the terminology; and lack of faculty calibration or deficient teaching skills on DHDx. Lastly, respondents were asked if a standardized list of dental hygiene diagnostic terms would be helpful when teaching the DHDx to students. A majority, 91% (n=162), of the respondents to this item indicated “yes” while 1% (n=2) stated “no,” and 8% (n=14) were “unsure.”

Respondent Comments Regarding Dental Hygiene Diagnosis

The final survey item provided participants an opportunity to provide additional comments regarding DHDx and their teaching experiences with this topic. Responses were numerous and too voluminous to report within the limitations of this paper. However, in general, respondents felt the topic was political and controversial; faculty calibration was needed regarding DHDx, and that the ADPIED model was easier to implement than other theoretical models. Three comments highlighting the spirit of the responses are represented.

“I redesigned the curriculum to include a very heavy component in regards to the DHDx. This really helped our students develop a “provider” mentality as well as understand the need for comprehensive and individualized patient care. We will continue the new changes next year as a result.”

“It was/is a challenge to get clinical faculty on board with the DHDx terms. Faculty calibration is needed constantly on this topic.”

“Until dentists accept this concept, it is hard to teach it. Our state is very “backwards” and dentists want to and DO control hygienists. They believe all diagnoses are THEIR area of expertise alone (my opinion).”

Discussion

The purpose of this study was to investigate how the DHDx is incorporated into current entry-level dental hygiene curriculum. Programs are primarily teaching the DHDx in the first year of education. The study results showed that dental hygiene programs teach students to write an individualized DHDx for each patient. Some programs indicated that the written DHDx has led to higher quality patient care because of improved communication, increased focus on patient needs, clearer informed consent, and better documentation. These outcomes support the purpose of the ADHA Standards for Clinical Dental Hygiene Practice¹ which serve to facilitate comprehensive patient-centered care.

Additionally, dental hygiene programs teach the difference between a dental diagnosis and a DHDx. Although programs differentiate between these types of diagnoses, one pattern of responses emerged from this study. Some respondents indicated a degree of fear or hesitation in using the term “diagnosis.” While it is clear that a DHDx is not the same as a dental diagnosis or any other diagnosis, clarification is needed regarding what diagnosis is, and how each profession’s diagnosis relates to their scope of practice. Dental hygiene students need to be taught to confidently develop a DHDx without political or territorial implications. Dentists also need to be educated regarding these distinctions.

The concept of arriving at a diagnosis is an intellectual and clinical exercise involving critical thinking, problem-solving, and deductive reasoning. Historically, Gurenlian described this diagnostic reasoning process for health professions.¹⁶ In medicine, physicians use observation and examination of the patient, generation of diagnostic hypotheses concerning clinical data, laboratory tests to further evaluate clinical problems, and use of cues to verify hypotheses when formulating diagnoses. Nursing diagnoses consist of direct observation of patient behaviors, history and examination, information collection, interpretation, clustering and naming the cluster.

The dental model involves identifying symptoms of dental disease using history taking related to the chief complaint, physical and radiographic examination of the patient, creating a working diagnosis, and using laboratory tests to help determine a definitive diagnosis. Gurenlian proposed a diagnostic decision making process for dental hygiene that included an initial review of data gathering, hypothesis formulation or working diagnoses, inquiry strategy to run additional tests as needed, problem synthesis in which all facts are summarized, diagnostic decision in which the diagnosis is determined.¹⁶ Learning from the process, the final step, includes analyzing how the decision

was made and the accuracy of the diagnosis in order to gain expertise in diagnostic decision making.¹⁶

Discussions regarding the evolution of diagnostic decision making process and teaching methodologies on this topic in the health professions are limited.¹⁹ It is understandable that there is confusion regarding diagnosis if the concept for formulating a diagnosis is not well articulated in schools. Dental hygiene students need to appreciate the “how” and “what” of diagnosis in order to understand the distinctions between a DHDx and other types of diagnoses. Other health professions operate within their own concept of a diagnosis. Paramedics are taught to assess and treat patients on the scene of an emergency, which is referred to as a field diagnosis.²⁰ Nurses formulate a nursing diagnosis in regards to the human response to actual or potential health problems and life processes.² A medical diagnosis focuses on specific diseases or medical conditions. A dental diagnosis refers to dental diseases or conditions. A DHDx includes health behaviors and attitudes in addition to the oral health care needs that dental hygienists are educationally prepared and licensed to treat. There are multiple examples in the literature demonstrating that these DHDx are within the dental hygiene scope of practice.^{12,21}

Germane to this discussion is that many of the diagnostic terms cross disciplines and have applicability among various health professions with each profession applying their expertise to specific health problems within their scope of practice. Therefore, a DHDx is not a dental diagnosis. Dental hygienists are not performing treatment specific to the practice of a licensed dentist, however, a dental hygienist cannot execute appropriate patient-centered dental hygiene care without formulating the DHDx that the care addresses. For example, a DHDx may include the word “caries.” While the dental hygienist is not licensed to perform advanced restorative procedures to treat caries, preventive and restorative care that is within the dental hygiene scope of practice includes oral health education, caries risk assessment, fluoride treatments, sealants, and minimally invasive procedures. Similarly, nurses and physicians share the diagnostic term “caries” and may perform a caries risk assessment and apply fluoride varnish.²² Each individual health care provider is performing functions that ultimately contribute to a positive health outcome. Appreciating these concepts makes it easier to recognize value how terminology for various states of disease can be utilized across the various health care professions and that diagnostic terms are not owned by a health care discipline. Therefore, dental hygienists should not fear utilizing a DHDx.

Although dental hygiene programs are teaching DHDx, there appears to be wide variation in exactly what is taught.

Respondents expressed concerns about faculty calibration regarding standardization of terms, presentation of information to patients, and evaluation of the utilization of the DHDx. In addition, study respondents focused the DHDx in regards to periodontal issues versus a more comprehensive diagnosis for patients. The ADHA Standards for Clinical Dental Hygiene Practice indicate that multiple dental hygiene diagnoses may be appropriate for each patient.¹ If students are taught to only focus on periodontal diseases in the DHDx, they are not considering the entire oral cavity or the whole person. This is a self-limiting practice that does not represent comprehensive care, however it may be related to the political concerns about diagnosis and/or misunderstandings of what constitutes a DHDx. This limitation on diagnosis may also be impacted by CODA standards focusing on periodontal classifications of patients, treatment of patients with various levels of periodontal disease, and the deletion of DHDx from the accreditation standards. Accreditation hearings are currently ongoing regarding updating CODA Standard 2-13 to include the DHDx. If approved, this standard may provide dental hygiene educators the impetus or sense of authority, to teach students a more comprehensive DHDx.

Limitations of this study include the lack of a previously validated survey instrument. However, content validity was established and opportunities for comments were offered throughout the survey. Respondents used this option and shared many comments. Furthermore, inferential statistics were not employed due to the small size of respondents from baccalaureate programs and the type of responses received.

This study serves a starting point for understanding the meaning of a DHDx and how it is implemented in dental hygiene education programs. Further research is warranted to assess the knowledge, attitudes and behaviors of dental hygiene students as well as practicing clinicians regarding the DHDx. Examining how models of the DHDx are taught and utilized for curriculum development, as referenced in the ADHA White Paper, should be included in future qualitative and quantitative studies.¹⁰

Conclusion

An exploratory study assessed the extent to which DHDx is taught in entry-level dental hygiene programs. Findings confirm that the DHDx is an integral component of dental hygiene education, however there is a need for standardization and faculty calibration on the concepts and terminology related to the DHDx. Results of this study support the addition of the DHDx to the CODA accreditation standards.

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Effectiveness of an Educational Module on Dental Hygiene Students' Attitudes Towards Persons with Disabilities

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Abstract

Purpose: Persons with disabilities (PWDs) perceive gaps in health care providers' understanding of their health care needs are more likely to delay or not seek health care as compared to persons without disabilities. Oral health is considered an essential component of overall health, however, disparities exist in the United States, especially for persons with disabilities. Improving the education and training of dentists and dental hygienists may contribute to reducing oral health care barriers for PWDs. The purpose of this study was to investigate whether offering an education module about individuals with disabilities would change dental hygiene students' attitudes and capacity for informed empathy for PWDs.

Methods: An educational module utilizing a DVD featuring authentic representation of PWDs, along with student discussions and self-reflection was developed and delivered to 165 (n=165) dental hygiene students attending a 2-year community college and a 4-year university. Students consenting to participate in the study were assessed regarding their attitudes and comfort towards caring for PWDs prior to, and following the educational module. Pre- and post-assessment measures included the validated Attitude Toward Disabled Persons, and Attitudes toward Patient Advocacy Microsocial (AMIA) scale. The Interpersonal Reactivity Index (IRI) was used as a pre-assessment measure.

Results: A total of 58 (n=58) dental hygiene students, 35 (n=35) from a 4-year university and 23 (n=23) from a 2-year community college, consented for this study, for an overall participation rate of 35%. Scores increased significantly for both student groups after delivering the education module on the AMIA patient advocacy scale. Differences in IRI scores between the 2-year and 4-year dental hygiene programs approached statistical significance.

Conclusion: An education module based on informed empathy with a focus on the experiences of PWDs can result in improved attitudes toward advocacy for this population.

Keywords: special needs patients, access to care, dental hygiene education, patient advocacy, empathy

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Introduction

According to the 2015 United States (U.S.) Census Bureau's American Community Survey, an estimated 12.6% of all non-institutionalized males and females of all ages and races, regardless of ethnicity or level of education, have some form of mental, physical, or emotional disability.¹ The Institute of Medicine (IOM) reports that persons with disabilities (PWDs), individuals who are underinsured or publicly insured, and people of lower socioeconomic status commonly lack access to oral health care.² PWDs have to overcome multiple barriers in order to access quality oral health care including transportation issues, a lack of experienced health care professionals trained to work with populations with special

needs, and dental offices that are not accessible.² Improved education and training in dentistry and dental hygiene could address these barriers and decrease disparities in oral health care. Students who are given the opportunity to work with PWDs develop an increased comfort level and are more likely to care for this population in their future careers.^{2,3} Dental hygiene professionals, who routinely provide oral assessments and patient education, perform non-surgical periodontal debridement, take radiographs, are likely to encounter PWDs in clinical practice and therefore can benefit from developing an awareness of the needs of this population.

The IOM defines patient centeredness as health care that establishes a partnership between practitioners, patients, and their families, so that health care decisions respect patients' wants, needs, and preferences.⁴ Patient centeredness has been identified by the IOM as a core component of quality health care.⁴ Patient-centered care requires good provider-patient communication to ensure that patients' needs and wants are both understood and addressed.⁵ However, having a disability has been found to negatively affect provider-patient communication.⁶⁻⁸ PWDs frequently report faulty communication, and express the need for better communication with health care providers.^{9,10} PWDs desire to be treated as equals in the patient-provider relationship and contend that a lack of education regarding disabilities is a major contributor to miscommunication.⁹

Compassion and empathy are additional components of patient-centered care. Empathy is considered a vital aspect of any helping and healing relationship and is a core component of humanistic health care.¹¹⁻¹⁵ The manner in which health care providers express empathy for PWDs may contribute to the perception that the individual's disability is not fully appreciated.^{16,17} Health care providers need a better understanding and greater awareness of needs and desires of PWDs, as well as increased knowledge of the attitudinal and environmental challenges they face. This awareness may lead to students considering ways to safeguard patients' rights and autonomy, act on behalf of patients, or be involved in championing social justice issues. Ultimately, health care professionals need to learn how to adequately convey empathy. Empathy towards PWDs has been linked to positive patient outcomes overall, including reduced physiological distress, improved self-concept, reduced anxiety, and increased satisfaction with treatment.^{13,16,17}

Many people find it easier to be empathic toward others that are similar to themselves, in part because, personal experiences shape an individual's empathic understanding.^{15,18} Consequently, a training program that conveys the perspectives of specific groups, such as PWDs, may be effective in developing *informed* empathic care. For the purposes of this study, "informed empathy" refers to knowledge about the impairments, activity limitations, and participation restrictions associated with having a disability as well as an appreciation of the personal impact these issues can have on individuals, their families, and those who provide their care.^{19,20} PWDs report attitudinal barriers when trying to access healthcare.^{9,21,22} Manifestations of attitudinal barriers are negative stereotypes, condescending or patronizing remarks, and the inability of others to see beyond an individual's impairment.²³ Such barriers may contribute to inadequate communication between

patients and health care providers, lack of thoroughness when gathering patient data,^{21,24,25} and suboptimal care and health inequities for PWDs.

The Commission on Dental Accreditation (CODA), Accreditation Standards for Dental Hygiene Education Programs state that graduates must be competent in providing dental hygiene care for children, adolescents, adults and geriatric patients, as well as assessing the treatment needs of patients with special needs.²⁶ Research has shown educational experiences involving PWDs are strongly related to one's confidence in treating such individuals as well as one's attitudes toward them.³ An educational module, consisting of a 60 minute DVD, was designed by Miller²⁷ to create authentic representations of patients' experiences and to evoke reflection about attitudes, empathy, and the role of advocacy for health care professionals. The module included the written or recorded narratives of 11 men and 7 women, (aged 21–72 years), with diagnoses including spinal cord injury, lower extremity amputation, peripheral neuropathy, blindness, vasculitis, and cancer. Participants were asked to relate experiences that would enable listeners to put themselves in their place and understand how they felt and were perceived by others, along with any stereotyping they encountered. In addition to the narrative, participants were encouraged to provide an artistic interpretation (e.g., a drawing, a poem, or photographs) of their experiences which were linked to their personal story.

The purpose of this study was to investigate whether offering an education module focused on patient centered care for PWDs would change attitudes and promote advocacy for this population group among dental hygiene students. The study also sought to determine whether attitude assessment scores differed between students enrolled in a 4-year programs versus those enrolled in a 2-year program.

Methods

This study was declared exempt by the institutional review board of the University of Michigan. Study participants were dental hygiene students enrolled in core courses in one of two dental hygiene programs. Site 1 was a 4-year Bachelor of Science degree program affiliated with a large dental school; Site 2 was a 2-year Associate of Arts degree program in a community college. Neither site included empathy training for PWDs in their curriculum prior to beginning the study. The educational module, consisting of the DVD created by Miller²⁷ and a facilitated class discussion was offered to the same, 2-year community college and a 4-year university each year for five years, 2010 to 2015. Due to administrative decisions and time restraints, the selected schools did not choose to participate every year. Convenience samples were

used; students were primarily recruited to participate through Web-based course sites. One class was recruited in person because the course lacked a website. A total of 165 students, 128 (n=128) from Site 1 and 37 (n=37) from Site 2, were invited to participate in taking the pre- and post-module surveys. Students completing both surveys were entered in a random drawing for a \$100 Visa gift card; one gift card was awarded per class. Students were given approximately two weeks to complete each survey.

Implementation

The educational module was taught in dental hygiene undergraduate courses at a large Midwestern university (Site 1) and a local inner-city community college (Site 2). All presentations of the DVD and discussion sessions were conducted by the same facilitator, acting as a guest speaker. The module was introduced in the second-year course, "Special Needs Patients," at the community college (Site 2), and it was introduced during the third-year courses "Community Dentistry" or "Special Patients," at the university (Site 1), depending availability of the facilitator. This educational module was the only curriculum content about the psychosocial aspects of PWDs included in the coursework. Faculty at both institutions were required to make the pre- and post-tests available and to act as hosts for the facilitator during class time. A brief history of society's changing views of PWDs and the prevalence of disabilities were discussed at the beginning of each session, along with an explanation of the DVD.

The module lasted approximately one hour at Site 1; while the module at Site 2 was three hours spread over two sessions. In order to build trust and create a safe environment for discussing sensitive topics, students were first asked low-risk questions related to their future career intentions. They were then asked if they had a family member or knew of someone with a disability, had worked with this population, or would like to share their personal feelings on this topic. Definitions of terms including but not limited to "disability," "health," and "advocacy" were discussed. Students were also asked about their experiences with PWDs and about advocating for patients requiring extra time or accommodations when receiving dental care. It was emphasized to the students prior to viewing the DVD, that the narratives were the speakers' own words and that the concepts discussed were chosen by the speakers to share with health care providers.

Class sizes varied from 18 to 29 students and the students viewed multiple segments of the DVD during the class session. After viewing 7 – 10 minutes of the DVD, the facilitator initiated the discussion by asking questions such as, "Which reaction/response did you understand the most or

least?" and "Which accommodations are reasonable and how much is enough?" Students discussed their impressions and reactions in small groups followed by the whole class coming together for the small groups to present a summarization of their discussions. More detailed discussion of topics involving multiple members of the class followed the group presentations. Additional segments of the DVD were viewed and the discussion process was repeated.

Assessment Instruments

Assessment measures in this study included the Attitude Toward Disabled Persons - Form O (ATDP), the Attitude Toward Microsocial Advocacy (AMIA), and the Interpersonal Reactivity Index (IRI).²⁸ The ATDP, created to measure attitudes toward PWDs in general, rather than toward persons with specific types of disabilities, has been shown to provide an objective and reliable measure of attitudes toward persons with physical disabilities ($\alpha = .80$).²⁸ Developed in 1960, the ATDP continues to be one of the most widely used instruments to measure attitudes toward PWDs,²⁹ serving as a reliable measurement of attitudes of persons with and without disabilities.²⁸ Validation and replication studies of the ATDP have identified differences in responses by gender.²⁸ Responses of persons without disabilities are assumed to reflect either acceptance of PWDs or rejection/prejudice, depending on whether they perceive PWDs as similar to themselves or different and inferior.³⁰ Conversely, responses of PWDs are based on the assumption that most PWDs will respond to the questions on the ATDP by using themselves as a frame of reference, providing information about their self-perception and perception of others with disabilities.³⁰ The ATDP is a self-report 20-item survey; respondents use a six-point Likert scale, from (-3) *I disagree very much* to (+3) *I agree very much*, to indicate the extent of their agreement or disagreement with each item. There is no neutral point and higher scores indicate a more favorable attitude. Individual item responses on the ATDP cannot be interpreted; only total ATDP scores are meaningful.³⁰

The Attitude Toward Patient Advocacy scale was developed to evaluate nurses' attitudes toward patient advocacy.³¹ For this scale, patient advocacy is conceptualized as a process or strategy consisting of a series of specific actions for preserving, representing, or safeguarding patients' rights, best interests, and values. Based on this conceptual framework, patient advocacy includes safeguarding patients' autonomy, acting on behalf of patients, and championing social justice.³¹ This scale has two subscales, the Attitude Toward Macrosocial Advocacy (AMAA) and the Attitude Toward Microsocial Advocacy (AMIA). However, the educational module focuses on the

individual and his/her health care challenges and needs on a micro social advocacy level.³¹ Therefore, only the AMIA subscale was used in the current study. The AMIA contains 45 items and responses are scored on a 6-point Likert scale ranging from (1) *strongly disagree* to (6) *strongly agree*; high scores reflect strong support for advocacy. In the original validity and reliability studies, the mean for the AMIA (45 items) was 244.67 (SD = 18.17) ($\alpha = .92$)³¹ with scores ranging from 45 to 270. For the purposes of this study, the AMIA wording was modified to address patients with disabilities. Two questions, “Health care providers should remind other health providers of the wishes of patients with disabilities,” and “Health care providers should remind health providers of the needs of patients with disabilities,” were combined to read, “I believe that health care providers should remind other health providers of the wishes and needs of patients with disabilities.” Combining the two statements reduced the total number of items to 44, with scores ranging from 44 to 264.

The Interpersonal Reactivity Index (IRI), designed to capture individual variations in cognitive and perspective-taking tendencies along with differences in the types of emotional reactions experienced, was developed to assess the multidimensional nature of empathy.³² The IRI consists of a 28-item, self-report questionnaire comprised of four 7-item subscales, each tapping into some aspect of the global concept of empathy and has been found to be one of the most reliable and valid measures of self-assessed empathy.³² IRI subscale scores range from 0 to 28; higher scores indicate a stronger manifestation of that dimension of empathy. Responses are scored on a five-point scale from: (0) *does not describe me well* to (4) *describes me very well*.³² The four subscales are: (a) fantasy (FS), which measures the tendency of the respondent to identify strongly with fictitious characters in books, movies, or plays; (b) perspective-taking (PT), measuring the ability to adopt the point of view of other people; (c) empathic concern (EC), measuring the tendency to experience feelings of warmth, compassion, and concern for others undergoing negative experiences; and (d) personal distress (PD), measuring the tendency to experience feelings of discomfort and anxiety when witnessing the negative experiences of others.³² Significant differences between males and females on all subscales have been identified, with females having higher scores.³²

Data Analysis

Paired *t*-tests were performed to evaluate the extent of change in students' performance on the pre- and post-module ATDP scores and AMIA scores. The IRI was administered pre-module only as the aspects of empathy measured by the IRI were not a focus of the curriculum and were not expected to change.

Pearson Correlations were performed to assess for associations between the IRI subscales and pre- and post-ATDP scores; and the IRI subscales and pre-and post-AMIA scores. Independent *t*-tests were performed to compare pre-module ATDP, AMIA and IRI scores between the two course sites.

Results

The outcomes represent the total number of students involved in the study, from the two sites, over a five year period, 2010 to 2015. Of the 165 students invited to participate (n=165), a total of 58 students (35 from Site 1 (n=35); 23 from Site 2 (n=23)) provided informed consent and completed the IRI, ATDP and AMIA pre-module survey, for an overall participation rate of 35%. Fifty students (n=50) from Site 1 and 15 students (n=15) from Site 2 completed the ATDP and AMIA post-module survey. Students were required to submit both the completed pre and post surveys to be included in the study. The majority of the participants at Site 1 were white females aged 20-25 years and did not identify themselves as having a disability. Site 2 had higher number of participants who were 31 years and older, identified as black/African-American or Arabic and were male. Site 1 had a higher participation rate. Participant demographics are shown in Table I.

Prior to instruction, there were no statistically significant differences in the students' ATDP or AMIA scores ($p > .05$) providing the justification for aggregating students across courses into one group due to the small samples at each individual site.

The pre-educational module AMIA mean was 219.10 (SD = 29.24) and the ATDP mean was 77.73 (SD = 15.29). Following the educational module, the AMIA mean was 226.49 (SD = 24.93) and the ATDP mean was 80.63 (SD = 14.72). Paired *t*-tests showed a statistically significant increase in AMIA scores ($t(56) = -3.06, p = .003$) however there were no statistically significant increases in the ATDP scores ($t(58) = -1.73, p = .087$) as shown in Table III. Independent *t*-tests showed a statistically significant difference between Sites 1 and 2 on the IRI empathic concern subscale (Table IV). However, after Bonferroni corrections ($.05/9 = .0056$), the differences were not statistically significant.

Discussion

This study established the feasibility of an educational module utilizing a DVD featuring authentic representation of PWDs, along with student discussions and self-reflection. The active engagement of students encouraged self-reflection and consideration of the challenges PWDs face in general and

Table I. Participant Demographics

Age (years)	Site 1 n (%)	Site 2 n (%)	Combined Site 1 and 2 n (%)
20-25	26 (74.3%)	9 (60.0%)	35 (70.0%)
26-30	6 (17.1%)	2 (13.3%)	8 (16.0%)
31 and over	3 (8.5%)	4 (26.7%)	7 (14.0%)
Total responses	35	15	50
Race/Ethnicity			
Asian/Asian-American	4 (11.4%)	2 (8.7%)	6 (10.3%)
Black/African-American	1 (2.8%)	5 (21.7%)	6 (10.3%)
Native American	1 (2.8%)	0 (0.0%)	1 (1.7%)
White	26 (74.3%)	11 (47.8%)	37 (63.8%)
Other*	3 (8.6%)	5 (21.7%)	8 (13.8%)
	35 responses	23 responses	58 total responses
Gender			
Female	36 (63.2%)	21 (36.8%)	57 (96.6%)
Male	0 (0.0%)	2 (8.7%)	2 (3.4%)
	36 responses	23 responses	59 total responses
Identifies as Having a disability			
No	34 (97.1%)	6 (15.0%)	40 (97.6%)
Yes	1 (2.9%)	0 (0.0%)	1 (2.4%)
	35 responses	6 responses	41 total responses

* Site 1: 1 American, 1 Arabic/Arabic-American, 1 Multiracial;

Site 2: 4 Arabic, 1 Lebanese

when obtaining health care. The module serves as an example of authentic patient-centered education resulted in a significant increase in participants' AMIA scores, possibly due to the process of students gaining informed empathy.

The composition of the DVD contributed to the overall effectiveness of the module. PWDs played a vital role in creating the DVD; without their participation, the education module would not have been possible. Each of the eighteen scenarios described a different disability, relating the experiences and perceptions unique to the person with that disability, and contributed to the likelihood of the students' ability to identify with various aspects of the narratives. Developing empathy is an initial step in developing advocacy for PWDs. In many group discussions, students stated that sympathy, or pity, were their first reactions at the beginning of the scenarios because they did not understand or could not relate to the experience of the speaker. However, as the students learned more about the individual and their disability, they were able to make connections and began to understand how they would feel if they were in the individual's place. Feelings that began as sympathy became empathy.

Narratives in the DVD conveyed generalized perceptions, not limited to medical scenarios. Consequently, class discussions were not limited to the interactions that a person with a disability might have with medical personnel or a health care system. Students were encouraged to consider and discuss interactions (experienced or observed) with PWDs and the attitudes expressed, reactions witnessed, and barriers and opportunities identified. This is important consideration because health care and its delivery are influenced by more than a diagnosis and most assessment tools, such as the ATDP and IRI, are not specific to medicine. Although the AMIA is specific to health care, classroom discussions about

Table II. Mean performance on attitude and empathy measures across modules

Survey	Mean of aggregated modules*	ANOVA across modules
Attitude Toward Disabled Persons (ATDP)	77.73 (SD=15.29)	F(6) = 1.02, $p = .42$
Attitude Toward Patient Advocacy, Microsocial (AMIA)	219.10 (SD=29.24)	F(6) = 1.04, $p = .408$
Empathy subscales		
Fantasy	17.00 (SD=5.53)	F(6) = .66, $p = .68$
Perspective-Taking	19.05 (SD=4.88)	F(6) = 0.66, $p = 0.68$
Empathic Concern	21.71 (SD=4.58)	F(6) = 1.03, $p = 0.42$
Personal Distress	12.05 (SD=4.07)	F(6) = 0.69, $p = 0.66$

*95% CI

Table III. Paired t-tests comparing the Attitudes Toward Disabled Persons scale and Attitudes Toward Microsocial Advocacy scale scores

Scale	Pre-module mean	Post-module mean	t-test equation
ATDP	77.73 (SD=15.29)	80.63 (SD=14.72)	$t(58) = -1.73$ $p = .087$
AMIA	219.10 (SD=29.24)	226.49 (SD=24.93)	$t(56) = -3.06$ $p = .003^*$

* $p < .05$ statistically significant

Table IV. Independent t-test comparing the Interpersonal Reactivity Index sub-scale scores between Site 1 and 2.

Sub-scale	Site 1 mean	Site 2 mean	t-test equation
Fantasy	16.56 (SD=5.63)	17.70 (SD=5.40)	$t(48.46) = -0.78$ $p = .441+$
Empathic Concern	20.69 (SD=5.17)	23.30 (SD=2.88)	$t(56.19) = -2.48$ $p = .016+$
Perspective-Taking	18.17 (SD=5.23)	20.43 (SD=4.00)	$t(55.06) = -1.88$ $p = .065+$
Personal Distress	11.75 (SD=4.54)	12.52 (SD=3.23)	$t(56.24) = -0.76$ $p = .449+$

+ After Bonferroni corrections (.05/9=.0056)

no statistical significance

advocacy extended beyond medicine. Students were asked to discuss ways to advocate for the DVD speakers, what actions could be taken, and how they would feel in the same situation, creating an opportunity to teach about advocacy, an identified component of professionalism in many health professions, including dental hygiene.^{34,35} Advocacy is a common thread throughout the dental hygiene curriculum and included in curriculum competencies. A patient-centered approach to advocacy education allowed the students to discern examples of advocacy that may be especially pertinent to PWDs. Knowledge about the multiple approaches and aspects of patient-centered care is critical for dental hygiene students as they provide individualized treatment for each patient including individual assessments, a dental hygiene diagnosis, treatment planning, and expected outcomes. Students who are able to better understand the psychosocial aspects of an individual, should be able to perform more accurate assessments, individualize and adapt the patient's dental hygiene treatment, and optimize patient care.

The DVD focused on eliciting participants' experiences with the health care they received, and any life experiences they felt

were important for current or future health care professionals. Participants were encouraged to tell their stories in their own words allowing for an emphasis on the actions, attitudes, and feelings of personal importance. Besides voicing their verbal perspectives, participants also conveyed meaning through their tone, inflections, and passion in their speech allowing for the speakers to be regarded as individuals with unique concerns, not merely a disability or illness to be "fixed." Stories, art, paintings, and images, guided discussions about shared experiences and feelings, and self-reflection were used to assist students in understanding people who may be very different from themselves. This study demonstrates, as shown in previous research, that literature, film, and art are effective means for developing and enhancing informed empathy,^{15,16} which may in turn, influence attitudes and advocacy towards PWDs.

Trends of the Interpersonal Reactivity Index (IRI) warrant further discussion. The empathetic concern subscale, a sub-component of empathy, measures the tendency to experience feelings of warmth, compassion, and concern for others undergoing negative experiences.³² Higher scores suggest a greater degree of empathy. Empathetic concern, as measured by the IRI, was higher at Site 2. Differences in empathetic concern scores between Site 1 and Site 2 approached statistical significance. The difference in student demographics (Table I) may have played a role in the scores. Students from Site 1 (4-year program) were predominantly white and from backgrounds of higher socioeconomic status. However, the two-year program (Site 2) typically enrolls students who are older, and from racial and ethnic backgrounds that are historically underrepresented in dental hygiene. A higher rate of student participation from Site 2 may lead to higher empathetic concern scores. Future studies with larger sample sizes may also demonstrate that higher empathetic concern scores are associated with more positive attitudes toward advocating for PWDs.

Future studies could use qualitative research methods to better understand the process that contributes to improved scores on empathetic measures among dental hygiene students. Creating broader educational experiences for dental hygiene students including working directly with a community of PWDs or working in clinical spaces that are designed to allow for interprofessional collaboration with other health care providers and PWDs could serve as key steps for developing increased empathy and understanding the challenges of PWDs. Another consideration for future study could be the longitudinal effect of this module on future clinical practice. Providers who were trained as students using this module might develop better communication with PWDs, resulting

in a more therapeutic relationship and improved patient / provider satisfaction. Lastly, studies involving a more balanced number of males and females might determine the effect of gender, if any, on assessment scores.

Strengths of this study include the use of well-established, validated assessment measures, and the matched pre- and post-education comparisons. Limitations include the relatively small number of participants, the cross-sectional methodology, and the use of questionnaires, which may have resulted in socially desirable answers. Student discussion questions varied between the groups of students, and may have affected the results. Participation of students from each site varied, with 62% participation from Site 1 and 27% participation from Site 2 suggesting a need for further research to determine the reasons for the variance. Additionally, students were recruited from only two sites. The majority of the participants were white females without disabilities. Therefore, the results may not be generalized to other populations.

Conclusion

The purpose of this study was to analyze the effectiveness of an innovative teaching approach used to develop dental hygiene students' understanding of and ability to work with patients with disabilities, at a 2-year and a 4-year teaching institution. The module was composed of pre- and post-surveys, a DVD presenting individual narratives by and about PWDs, and classroom discussions. The introduction of this approach, based on informed empathy with a focus on the experiences of PWDs, resulted in improved attitudes toward advocacy for PWDs among the dental hygiene students at both institutions. The ability to recognize and effectively fulfill patient advocacy needs is a vital component of dental hygiene education for optimizing patient oral health care. This educational module, and others like it, can improve attitudes toward PWDs.

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Dental Hygienists' Knowledge, Attitudes and Practice for Patients with Dental Anxiety

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Abstract

Purpose: The purpose of the study was to assess the knowledge, education, attitudes, confidence, and practice of dental hygienists providing dental care to adult patients with dental anxiety (DA).

Methods: A purposive sample of dental hygienists, using a snowball sampling technique, were recruited through social media sites. Inclusion criteria were limited to actively practicing, registered dental hygienists in the United States (U.S.). The validated survey had 29 questions regarding dental hygienists' knowledge, education, attitudes, confidence, and practice in regards to patients with DA. Regression analysis and chi square tests were performed on the data with research outcomes represented through frequency tables and percentiles.

Results: A total of 417 participants attempted the survey; 355 participants (n=355) completed the survey yielding a participation rate of 87%. A majority, 73%, of the respondents reported DA as a "somewhat serious" to "extremely serious" issue when treating patients. Forty-eight percent of the respondents indicated that their education had prepared them to address DA but also reported the need for additional education in this area. Dental hygienists indicating higher levels of confidence in addressing DA in their patients also allowed for extra time in their schedules to treat patients with DA.

Conclusion: Increased DA education in the undergraduate dental hygiene curriculum as well as post-graduate education opportunities may increase dental hygienists' confidence and capability in the management of DA.

Keywords: dental hygienists, dental anxiety, dental phobia, dental hygiene education

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Introduction

Odontophobia, or dental anxiety (DA), is a psychosomatic condition¹ causing anxiety related to prior pain and/or distressing emotional responses during dental treatment.² Dental anxiety is defined as a fear and extreme anxiety towards dental stimuli marked by distress, poor compliance, or avoidant behavior towards regular dental appointments, which ultimately may influence overall health.³⁻⁸ This anxiety may also influence the individual's prevention regimen including self-care and maintenance.^{3,9,10} Dental anxiety may also impact general health by triggering emotional and physical symptoms including: negative thoughts and feelings,¹¹ general anxiety and depression,¹² overuse of medications, recurrent sleep disturbances, unexplained pain, and poor social and occupational functioning.^{13,14} Individuals who avoid dental care may also be at increased risk for systemic diseases including diabetes and cardiovascular disease.¹⁵

Dental anxiety affects 10-20% of adults in the United States (U.S.).^{2,16-19} An estimated 5-10% of the adult population in the U.S. avoids seeing the dentist²⁰ and one out of ten U.S. adults do not visit the dentist due to DA.²¹ Dental phobia is a more severe form of DA that may profoundly affect a person's overall health.^{7,13,14,22-24} Dental phobia leads to higher rates of avoidant behavior and decreased quality of life (QOL).^{7,22-24} The most severe forms of DA require treatment by a specially trained psychologist.^{22,25} Control of DA is also critical in the prevention and development of dental phobia.^{25,26}

Dental anxiety can be caused by certain dental stimuli (extractions, sounds, emotions, etc.), two or more previous traumatic dental experiences,^{3,27} and the relayed experiences of others.²⁷ Dental anxieties can also be triggered either before or during a dental hygiene appointment.²⁸ Procedures including

polishing, periodontal probing, manual and ultrasonic scaling, and local anesthesia are known to trigger DA.²⁹ Among all triggers, the administration of local anesthesia, is reported to be the most anxiety provoking dental hygiene procedure.^{3,29,30}

Oral health care providers need to understand the origin of a DA in order to select the appropriate DA management technique to provide optimal patient care^{27,31}. Validated DA screening tools are available to assist the provider in recognizing the severity of the DA.¹² Dental hygienists can identify DA triggers through the use of anxiety screening tools such as State Form of the State-Trait Anxiety Inventory (STAII),^{3,28} Marks-Sheehan Phobia Scale,³ Dental Fear Survey (DFS),³² Dental Anxiety Scale (DAS), or by simply asking the patient about their dental fears.²⁹

A variety of management techniques are available to help with DA patients, and oral health care professionals should be educated in these techniques for the provision of optimal patient care.³³ Management techniques include cognitive behavioral therapy (CBT), relaxation therapy, computer-assisted relaxation learning (CARL), hypnotherapy (HT), group therapy (GT), individual systematic desensitizing (ISD), pre-medication, flooding (implosion), and swallowing relaxation.²⁷ CBT teaches patients skills in modifying their thinking and behavior; relaxation therapy and hydrotherapy eliminate tension in the body and reduce stress; CARL is a computer program designed to reduce a patient's fear of injections, and pharmacological management.²⁷ Some of these management techniques may have a lasting effect, however, they must be delivered by specially trained individuals such as licensed psychotherapists.³⁴⁻³⁶

Previous research studies regarding dental practitioners and their understanding of DA, have identified a lack of prior in-depth DA education,^{33,37-39} along with a need for more DA training in both undergraduate and graduate education programs.^{33,37,39,40} Research has shown that dental providers were better equipped to address anxiety in a patient after receiving prior training in DA during undergraduate or post-graduate education.^{38,41} Coursework in the area of DA has been shown to increase attentiveness to the prevention and control of dental fear development, resulting in increased levels of confidence among dentists when treating patients with DA.³⁸ Additional studies of dentists indicate a desire and willingness for more post-graduate courses to compensate for their lack of undergraduate education regarding DA.^{33,37} Provider anxiety was also experienced by dentists treating patients with DA.^{33,42} Research conducted with practicing dental hygienists also indicates the need for more education in the area of DA as part of the dental hygiene curriculum.^{39,41}

Previous studies have suggested that general dental practitioners are ineffective in managing patients with DA⁴³ due lack of expertise,^{40,44} lack of confidence,⁴⁰ and inadequate education^{33,45} and training.^{40,44} Additionally, both the patient and the provider may experience anxiety when a patient presents with DA.^{33,40} However, studies have shown that providers who have gained experience in treating patients with DA, are able to decrease anxiety levels for both the patient and for themselves.^{33,40,45} A review of the literature shows a lack of recent research regarding associations between dental hygienists' experience and education in the area of DA. The purpose of the study was to assess the knowledge, education, attitudes, confidence, and practice of dental hygienists when providing dental care to adult patients with DA and to evaluate the need for more formal education on anxiety in dental hygiene curricula.

Methods

This study was approved by the MCPHS University Institutional Review Board (IRB) and was assigned IRB protocol number 050917G. An exploratory, cross-sectional survey design was chosen, using a purposive and snowballing sampling technique ($n=417$) via dental hygiene related social media sites across the U.S. to access a large population of dental hygienists at minimal expense. Snowballing technique was employed to increase the study population and to target and recruit dental hygienists who were current members of these social media sites. The Facebook sites accessed included: "Dental Hygiene Network", "RDH," "Dental Hygiene Life with AndyRDH," "UNE Dental Hygiene Program," "Maine Dental Hygienists' Association," "Dental Hygienist Talk," "Massachusetts Dental Hygienists Connect," "RDH-netWORK," "Dental Hygiene with Kara RDH," and "Dental Hygienists are Awesome." A target participation rate of 152 participants, determined through a statistical power analysis, was sought to in order to generalize the results. Inclusion criteria were limited to actively practicing registered dental hygienists (RDHs) in the U.S.

Survey Instrument

The instrument used was a modified web survey developed from the previous work of Brahm et al. and Armfield et al.^{33,37} Permission was granted by the respective authors to use a modified form of the surveys. Participant knowledge was measured regarding DA patient management techniques, confidence in treating patients with DA, and the participant's ability to supplement their lack of knowledge in DA. The modified survey was comprised of 29 questions with dichotomous, 5-point Likert scale, and fill-in-the-blank

questions. The Likert scale questions offered response choices ranging from “always” to “never.” Questions collected demographic information, the participant’s dental anxiety knowledge/attitudes about DA, and the participants’ DA practices. The last section of the survey included an open-ended question, allowing for the opportunity to share additional information.

The survey was validated prior to data collection with a content validity index (CVI). A panel of 6 dental professionals rated each question according to its relevance, CVI outcomes were averaged and set to 83%.⁴⁶ Questions scoring below 83% were deleted. The expert panel also provided comments and their rationale, and final revisions were made.

Data Collection

An introduction to the study was posted on the selected social media websites, and a survey link was provided. Participants were asked to share email contact information for additional prospective participants meeting the inclusion criteria. An invitation and survey link, was sent by email to the potential participants to help increase the participation rate. The invitation and survey link were reposted twice weekly through the data collection period to increase participation. The opportunity to receive a \$100 Amazon gift card was offered as an incentive for survey completion; and a participant’s name was randomly drawn at the close of the study. Data collection was carried out over a 30-day period.

The password protected data was imported into the IBM® STATA/SPSS software; only surveys completed in full were included in the analysis. Data was analyzed using both a chi-square test and regression analysis, with results represented through frequency tables and percentiles. Demographic information and variables of interest were examined for statistical assumptions, including normality of all summary statistics. The chi-square test of independence was used to determine whether significant relationships existed between the variables of interest. The phi coefficient was

calculated for all significant chi-square tests to demonstrate the effect size of the relationship (small=0.1, medium=0.3, and large=0.5). A Bonferroni correction was used for all tables larger than 2x2 to control for familywise error. Ordinal regression was employed to examine age, years in practice, confidence, and provider anxiety while caring for anxious patients as predictors of practice behaviors.

Results

A total of 417 participants attempted the survey; of those potential participants, 355 (n=355) completed the survey, resulting in a participation rate of 87%. The average age of the study population was 41 years (SD 12.68). The vast majority, 99.7%, of the participants were female, 85% were employed in a general dentistry practice, and 59% reported their highest level of education was an associate’s degree. The average number of years participants were actively practicing was 15 (SD 12.84) and the 69% were certified to administer local anesthesia. Participants saw an average of 29 adult patients per week (SD 10.44) while the average number of adult patients with DA per week was 7.59 (SD 6.72). The average number of adult patients experiencing DA during routine prophylaxis per week was reported to be 20 (SD 19.96). Descriptive demographic information is shown in Table I.

Table I. Demographics Descriptive Statistics (n=355)

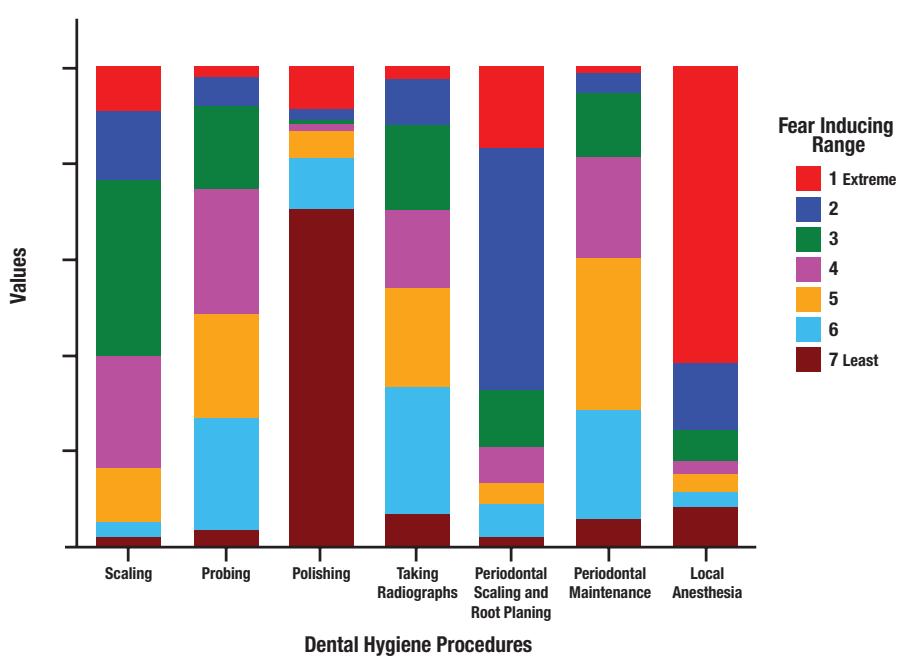
Variable	Mean	SD	
Age	41.28	12.68	
Number of years in practice	15	12.84	
Number of adult patients per week	29.05	10.44	
Number of adult patients per week with anxiety	7.59	6.72	
	n (%)	LCI 95%	UCI 95%
Gender			
Male	1(0.3%)	0%	5.5%
Female	354(99.7%)	94.5%	100%
Practice Type			
General	301(85.3%)	80.1%	90.5%
Periodontist	9(2.5%)	0%	7.7%
Pediatric	8(2.3%)	0%	7.5%
Other	35(9.9%)	4.7%	15.1%
Education			
Associate’s	209(59%)	53.8%	64.2%
Bachelor’s	132(37.3%)	32.1%	42.5%
Master’s	12(3.4%)	0%	8.6%
Doctorate	1(0.3%)	0%	5.5%
Certified to administer local anesthesia			
Yes	246(69.3%)	64.1%	74.5%
No	109(30.7%)	25.5%	35.9%

Most participants, 73%, reported DA to be a “somewhat serious” to “extremely serious” issue while treating patients. Of these respondents, 72% felt a need for more formal education on anxiety issues during their dental hygiene education. Thirty-eight percent of participants did not feel prepared to treat patients with DA. Just over half, 57%, of dental hygienists reported experiencing personal anxiety while treating patients with DA. The majority, 99%, did not report using one of the published screening tools for DA, and 67% reported not using a screening tool due to the lack of knowledge about these tools. Sixty-three percent of participants reported “sometimes” to “never” asking patients about DA when reviewing the medical history, while 37% of participants stated that they “often” or “always” ask about DA. A little more than one third, 37%, of the respondents reported “sometimes” allowing extra time for patients with DA, followed by 20% indicating “often,” and 19% who “rarely” allow additional time.

Respondents indicated that most feared dental hygiene related procedure was the administration of local anesthesia (62%) while polishing was rated the least DA-provoking hygiene procedure (71%). Respondents ranking of fear inducing dental hygiene procedures are displayed in Figure 1.

Despite the participants’ acknowledgement of dental hygiene procedures known to produce fear and anxiety for patients, 43% of the respondents reported they felt very confident treating patients with DA. The majority of participants, 74%, were knowledgeable in the use of nitrous oxide sedation and 68% were familiar with distraction to manage patients with DA. Nitrous oxide sedation (59%) was the DA management technique used by over half the dental hygienists trained in its use. Most of the dental hygienists reported performing prophylaxis on adult patients with the use of nitrous oxide (64.2%) and about half (49.3%) used distraction. Dental hygienists’ knowledge of DA management techniques is shown in Table II.

Figure 1 Dental Anxiety Provoking Dental Hygiene Procedures, Ranked by Participants



A chi-square test of independence was performed to examine the relationship between DA preparedness and the need to include DA education in the dental hygiene curriculum. The relationship between these variables was significant ($\chi^2(4, 354) = 53.615, p < 0.001, \varphi = 0.39$). Individuals reporting that their education did not adequately prepare them to address DA were more likely to endorse the need for increased DA education; however, 48% of the self-reportedly prepared individuals also believed that there is a demand for more education in DA.

Responses regarding the relationship between attending postgraduate/continuing education courses in the field of DA/care delivery since graduating and referring a patient with an extreme case of DA, dental phobia, for general anesthesia for dental treatment, were tested using a chi-square test of independence and found to be significant ($\chi^2(0.203) = 12.874, p = 0.002, \varphi = 0.19$). Individuals who had not attended postgraduate courses in DA/care delivery since completing their education were more likely to refer DA patients for dental care with general anesthesia; however, 27% of those with additional post-graduate coursework in DA still referred anxious patients for treatment with general anesthesia.

Ordinal regressions were used to test whether age, number of years in practice, confidence level, and provider anxiety would predict the frequency of a dental hygienist directly inquiring about DA, modification of the dental hygiene treatment plan, and allowing for extra treatment time. A test of parallel lines for the three regression models demonstrated the assumption regarding multicollinearity was met ($p > 0.05$).

Practitioner’s age, number of years in practice, and personal confidence levels were all significant predictors of whether the dental hygienist would inquire about a patient’s DA ($p = 0.001$). For every 1-year

Table II. Knowledge of Dental Anxiety Management Techniques

Variable	n (%)	LCI95%*	UCI95%**
Nitrous oxide			
Yes	263(74.1%)	68.9%	79.3%
No	92(25.9%)	20.7%	31.1%
Distraction			
Yes	240(67.6%)	62.4%	78.2%
No	115(32.4%)	27.2%	37.6%
Relaxation therapy			
Yes	105(29.6%)	24.4%	34.8%
No	250(70.4%)	65.2%	75.6%
Questionnaires			
Yes	77(21.7%)	16.5%	26.9%
No	278(78.3%)	73.1%	83.5%
Cognitive Behavioral Therapy			
Yes	59(16.6%)	11.4%	21.8%
No	296(83.4%)	78.2%	88.6%
Flooding			
Yes	3(.8%)	0%	6%
No	352(99.2%)	94%	100%
CARL			
Yes	3(.8%)	0%	6%
No	352(99.2%)	94%	100%
Swallowing relaxation			
Yes	12(3.4%)	0%	8.6%
No	343(96.6%)	91.4%	100%
Group therapy			
Yes	15(4.2%)	0%	9.4%
No	340(95.8%)	90.6%	100%
ISD			
Yes	28(7.9%)	2.7%	13.1%
No	327(92.1%)	86.9%	97.3%

*Lower confidence interval

**Upper confidence interval

increase in age, the likelihood of a dental hygienist reporting inquiring about DA increased by 1.05 times. Regarding practitioners' reported confidence levels, a one-unit increase in confidence predicted that the dental hygienist was 1.46 times more likely to ask directly about DA.

Age of the dental hygienist was a significant predictor for modifying the dental hygiene treatment plan/appointment for anxious patients ($p=0.009$). It was estimated that for every year of the dental hygienist's age in this study, the participant was 1.04 times more likely to report a higher frequency of

modification to the treatment plan to accommodate the patient's DA. The remaining predictors were not significant ($p>0.05$).

Dental hygienists' confidence levels ($p=0.006$) were significant. It was estimated that an increase in the dental hygienist's confidence resulted in being 1.36 times more likely to have a higher frequency of modifying the treatment plan and allowing extra time for anxious patients. All other predictors were not significant ($p>0.05$).

Discussion

Dental hygienists are not as effective as licensed psychologists in the management of patients with DA⁴³ due to a lack of expertise,^{40,44} confidence,⁴⁰ education^{33,45} and training^{40,44} in the area of DA. However, this study aimed to survey dental hygienists about their current knowledge, education, confidence, attitudes, and practices surrounding the treatment of adult patients with DA to determine whether practicing clinicians felt the need for more formal education in DA.

While most participants reported knowing that nitrous oxide analgesia and distraction were management techniques for DA, the majority also lacked sufficient knowledge, education or training in using other existing techniques. Similar to findings of Armfield et al.,³⁷ the majority of these participants had not used a validated DA screening tool due to a lack of knowledge regarding these resources. Less than half of the participants felt very confident treating patients with DA. However, provider confidence levels were shown to be significant relative to increased frequencies of treatment modification to accommodate anxious patients. Participants with lower confidence levels were less likely to modify their treatment approach and increased knowledge, education and training was associated with higher confidence levels.

This study also demonstrated a widely recognized need for more formal training in DA in dental hygiene education. Results of this study were consistent with the findings of Armfield et al.,³⁷ who reported inadequate training in the identification and management of patients with DA during dental education.³⁷ Dental hygienists from this study also believed their undergraduate education did not adequately prepare them to address the needs of anxious patients and reported a need for more education focused on DA. Even those participants who reported being prepared in addressing anxiety issues still felt the need for more DA education. The importance of DA training for DH's has also been based on the premise that DHs are typically the first providers in the dental setting to encounter a patient with DA.^{39,41} Increased confidence levels in caring for DA patients would also benefit the overall dental practice.

Study results also showed that increased confidence towards caring for DA patients, resulted in allowing additional time for dental hygiene care appointments to accommodate for DA. These findings are similar to the results of Brahm et al., with over half of the participants reporting that they allowed extra time when treating patients with DA.^{33,37} Most dental hygienists in this study reported a preference towards referring patients with DA to receive general anesthesia when needing dental treatment, also similar to the outcomes from Brahm et al.³³

Limitations of this study include the non-probability nature of snowball sampling, self-report bias, and recall bias. A virtual snowball sampling technique using social media was utilized for this study to more effectively capture the opinions of DH professionals. While this method is useful in identifying experts and professionals for survey research it limits the ability to generalize the findings. The results may also be biased by individuals with more social media connections or individuals who use social media versus those who do not. Study conclusions may be best conceptualized by taking into consideration that the respondents were individuals who had social media accounts, read their news feeds/notifications, and use read their accounts with some frequency. Traditional phone or mail survey techniques may have also resulted in differences due to the affinity of older generations to use more traditional communication pathways versus the younger generations' use of electronic and social media platforms. However, the age range of this study sample was wide and significant differences based on age are unlikely to significantly change interpretation. Self-reporting bias and recall bias may have influenced participant responses, especially in regards to details on past educational experiences.

Conclusion

Dental anxiety is widespread in the U.S., affecting a large segment of the adult population. Oral health care providers need to be able to identify effective treatment approaches for anxious patients. Study results indicate that practicing dental hygienists are not adequately equipped to effectively treat patients with DA and suggests the need for more formal undergraduate education focused on DA in addition to post-graduate courses. Increased education experiences and the development of skills addressing DA, could increase the dental hygienists' confidence levels and in turn improve oral health care experiences and outcomes for patients suffering from dental anxieties.

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Assessment of Michigan Dentists' and Dental Hygienists' Perceptions Toward Obtaining Continuing Education Credits for Volunteering in Community-Based Clinics

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Abstract

Purpose: The purpose of this study was to assess dentists' and dental hygienists' current motivation, attitudes, and knowledge regarding volunteering in a non-profit dental setting and the opportunity for earning continuing education (CE) credits.

Methods: This cross-sectional study surveyed a convenience sample of dental and dental hygiene professionals from the state of Michigan. A 20-question paper survey was developed and pilot tested. The survey was disseminated to attendees at various component meetings of the dental and dental hygienists' associations in southeastern Michigan.

Results: Out of the 274 surveys that were distributed, 182 (n=182) were completed, yielding a 66% response rate. Eighty percent of the participants were unaware of the opportunity for earning CE by volunteering and 79% were unaware of the volunteering site approval requirement by the Michigan Board of Dentistry. Thirty percent of participants were unable to determine how many unpaid days per year they were willing to volunteer and a similar percentage, (28%), were unable to determine how many paid days. The most common motivating factor to volunteer was to give back to the community (60%) while the greatest barrier was lack of time (62%).

Conclusion: The opportunity to earn CE credit for volunteerism is seen as a benefit, however, it needs to be better promoted to potential volunteers, through dissemination of information by professional associations and in educational settings. Community-based clinics also need to be made aware of how to become a CE provider. Further research on the longitudinal impact of CE for volunteerism in community-based clinics is warranted.

Keywords: access to care, community clinics, continuing education, volunteering, dental hygienists, dentists

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Introduction

Oral health care is not uniformly attainable by all in the United States (U.S.).¹ Individuals lacking access include those living in poverty, people with special needs, older adults, pregnant women, children, and racial minorities. Unfortunately, these underserved populations consistently have the most need for dental care.¹ Consequences of these disparities have significant influence not only on oral health, but also on overall health. Poor oral health can lead to poor health outcomes,² and has been associated with diabetes, cardiovascular disease, and premature/low birthweight births.² Oral disease in pregnant women and young mothers can be transmitted to their children, perpetuating a cycle of disease.² Adverse effects of oral disease present an economic burden to

the patient and society in lost productivity and missed days from work or school.³

The U.S. Surgeon General issued a call to action in 2003 addressing all levels of public health policy makers and practitioners.⁴ Several objectives were outlined to improve access to oral health care including a focus on the promotion of programs designed to improve access to care.⁴ The call to action also addressed exploring policy changes that would result in increased provider participation in public health insurance programs, empowering the public to implement solutions to meet oral health care needs, and evaluating effectiveness of access to care programs.⁴

Access to Care in Michigan

The *2020 Michigan State Oral Health Plan* was developed by the Michigan Oral Health Coalition and the Michigan Department of Health and Human Services with the goal of creating a plan to promote health, prevent disease, and improve access to health care for Michigan residents.⁵ In the area of improved access to oral care, five objectives were outlined, three of which were specifically related to improving access. These objectives included decreasing the number of underinsured and uninsured people; reducing barriers to oral care; and increasing comprehensive care services among young people, those with disabilities, and pregnant mothers.⁵ It was envisioned that by attaining these objectives, oral health disparities should decrease in the state of Michigan.⁵

In 2014, a little more than half (55%) of Michigan residents with a household income of less than \$20,000 reported not having had a dental visit that year, compared with only 14% among those with household incomes of \$75,000 or more.⁵ There are several factors, most of which originate from the social and economic environment, impacting the ability of an individual with low socioeconomic status (SES) to access services for oral preventive care and treatment. Shortages of providers practicing in low-income communities, shortages of dentists willing to accept public insurance reimbursement such as Medicaid, high rates of unemployment, jobs that do not offer dental insurance, and limited or no transportation services are just a few of the barriers to oral health care faced by individuals with low SES.⁵

These circumstances leave very few options for over 1.89 million people in Michigan living at or below 200% of the federal poverty level.⁶ Persons with low SES in every age group are more likely to have had a history of dental caries and more than twice as likely to have untreated dental caries when compared to those with annual income above 200% of the poverty level.⁷ These individuals must most often seek oral care from Federally Qualified Health Centers (FQHCs) provided they have dental benefits through Medicaid; those without insurance benefits often need to find a non-profit community-based clinic. Increased competition for funding has presented challenges for community-based clinics to find operating capital; particularly since a large percentage of the costs go to paying dental professionals to treat the patients.⁸ It has become common for these community-based clinics to rely on volunteer dentists and dental hygienists for patient care; however, it can be difficult to find oral health care providers willing to volunteer their valuable time and skills.⁸

Continuing Education

Continuing education has been promoted as a means to maintaining clinical competence with a focus on improving patient health outcomes, dating to the 1960's. In recent years, Boards of Dentistry have begun to explore obtaining continuing education credits for providing care in underserved areas as an avenue for increasing the number of providers available to care for vulnerable populations in response to the Surgeon General's call for action to investigate innovative plans to reduce health disparities.^{10,11} Currently, 49 states and the District of Columbia, have practice act rules requiring CE for licensure renewal for dental hygienists,¹² and 19 states allow for clinical volunteering in access to care settings as a means of obtaining CE credits.¹²

Wilkie et al. studied the knowledge and attitudes of dental hygienists in the Idaho, a state granting CE units for clinical volunteering, as compared to dental hygienists in Utah, a state that does not offer a CE option for volunteering.¹³ Results showed that nearly half, 43%, of the dental hygienists expressed uncertainty whether time spent volunteering in a clinical setting was an option for earning CE credits toward license renewal in their respective state.¹³ It was concluded that amendments to Administrative Rules, which are intended to encourage volunteerism in access to care settings, may have little to no bearing on the actual number of volunteer hours performed.¹³

Motivation to Volunteer

Volunteerism is defined as an altruistic activity where an individual or group provides services for no financial gain.¹⁴ Nearly half of the respondents, 44%, in the Wilkie et al. study stated that the CE credits to satisfy state licensing requirements was the greatest motivating factor to volunteerism.¹³ Wilkie et al. further concluded while the respondents had positive attitudes toward volunteerism, the actual willingness to participate may have been influenced by outside forces, such as encouragement by colleagues or professional organizations.¹³ Study results also indicated that dental hygienists respond positively to opportunities that simulate intrinsic motivation, allow for self-initiation, and are interesting and challenging; suggesting that simply increasing awareness of oral health needs and ways to meet them, may provide adequate encouragement for volunteering.¹³

Participants in a survey conducted by Patel et al., reported that dental professionals were motivated to volunteer by intrinsic factors such as giving back to the community, helping others in need, having the opportunity to travel to other countries, and collaborating with other health professionals.¹⁵ In contrast, Rovers et al. found that medical and physician's assisting students were motivated to volunteer by extrinsic factors such as a means

to build a curriculum vitae, earn academic credit, improve clinical skills, and experience other cultures.¹⁶

Service-learning is defined as, “any carefully monitored service experience in which a student has intentional learning goals and reflects actively on what he or she is learning throughout the experience.”¹⁷ As part of an educational curriculum, service-learning has shown to improve students’ attitudes toward community service by increasing perceptions of connectedness to a community, obligation to help the community, benefits, and intention.¹⁸ Coe et al. found that by exposing dental students to existing health disparities in the community, and providing opportunities to provide care to underserved populations, students are more likely to develop a stronger awareness of needs in the community and a willingness to offer their skills once their career begins.¹⁸ These results suggest that a positive attitude toward the delivery of care to an underserved population should be a fundamental part of professional training.

Level of education may also be a factor affecting volunteerism. Dental hygienists with a bachelor’s, master’s, or a doctoral degree have been found to have more positive attitudes toward community service, a greater sense of patient need, and were more likely to volunteer in underserved populations than those with an associate’s degree.¹⁹ Studies surveying surgeons with doctoral and post-doctoral degrees, found a significant frequency related to past volunteer experiences.^{20,21}

Volunteer Opportunities and Barriers

Oral health care professionals must be able to know where find volunteer opportunities; limited awareness presents significant challenges for not-for profit community clinics. Potential volunteers are also unaware of the tangible benefits such as CE associated with donating their time and skills.¹³ Lack of awareness of opportunities to volunteer has been cited in multiple studies,^{13,21,22} while the most frequently cited barriers include time constraints due to family, work, or school.^{13,15,19-21} Obligations, such as needing to work to pay off student loans and/or cover practice overhead, may outweigh the benefit of giving back to the community.¹⁸ Other identified additional concerns include the risk of causing harm to patients, not being able to meet the needs of the patients, language barriers, lack of transportation, and in one case, familial disapproval.^{15,16,22,23}

Michigan Dental Professional Data

Dentists licensed in Michigan must complete 60 hours of continuing education credits within a three-year licensing period.⁹ Up to twenty of the required continuing education credits may be obtained by volunteering in a community-

based clinic approved by the Michigan Board of Dentistry at the rate of one credit hour awarded for 120 minutes of patient care.⁹ Dental hygienists licensed in Michigan are required to complete 36 continuing education credits within a three-year licensing period. Up to 12 credits may be awarded as clinical volunteerism from a program or clinic approved by the Michigan Board of Dentistry.⁹ Data from September 2016, indicates 5,839 actively licensed dentists in Michigan,²⁴ and 9,870 registered dental hygienists as of May 2015.²⁵ Obtaining continuing education credits through seminars, programs, and lectures are most often paid for by the professional. However clinical volunteerism may be a more cost-effective method to supplementing one’s continuing education requirements while also addressing access to care issues. Given the total number of oral health care professionals in Michigan, utilizing these volunteer services could be a part of a comprehensive approach to making a significant impact on oral health care access in the state.

The Michigan Board of Dentistry amended the Administrative Rules, providing dentists and dental hygienists the option to provide care on a volunteer basis in approved community-based facilities in exchange for continuing education (CE) credits in December of 2015.⁹ Given the recent adoption of this rule, many oral health care professionals may be unaware of this opportunity. The purpose of this study was to assess dentists’ and dental hygienists’ current motivation, attitudes, and knowledge regarding volunteering in a non-profit dental setting and the opportunity for earning continuing education credits.

Methods

This cross-sectional study surveyed a convenience sample of dental and dental hygiene professionals from southeastern Michigan and was granted Institutional Review Board (IRB) exemption status by the University of Michigan Health Sciences and Behavioral Sciences IRB.

The paper survey consisted of 20 multiple choice, close-ended, partially close-ended, and Likert Scale questions focusing on personal and career characteristics, knowledge of current state regulations, previous volunteering experience, and attitudes regarding volunteerism. Content validity was determined through pilot tested of the survey by three registered dental hygienists and one licensed dentist. Survey modifications were made based on their feedback.

The final paper-based survey was distributed at Michigan Dental Association (MDA) and Michigan Dental Hygienists’ Association (MDHA) component meetings held during the months of September-October 2016. Component societies

included: Washtenaw District Dental Society, Livingston District Dental Society, Capital District Dental Hygienists' Society, Greater Detroit District Dental Hygienists' Society, and South-Central District Dental Hygienists' Society. The survey included an introduction describing the purpose and intended significance of the project, along with informed consent.

Data analysis was performed with the Statistical Package for the Social Sciences (IBM SPSS[®], Armonk, NY), version 24. Descriptive statistics, specifically the number and percentage of respondents, for each survey item were obtained. Paired samples t-test was used to evaluate the difference between paid days versus unpaid days dentists and dental hygienists were willing to volunteer, as well as the overall difference between paid days and unpaid days. Independent samples t-test was used to determine the difference between American Dental Hygienists' Association (ADHA) and American Dental Association (ADA) member and non-member participants willing to take off paid days versus unpaid days to volunteer. Statistical significance was set at $p<0.05$.

Results

Out of the 274 surveys that were distributed, 182 ($n=182$) were completed, yielding a 66% response rate. Of those who participated, 57% were dentists, 38% were dental hygienists, and 5% were dental specialists. The majority of the participants, 76% ($n=138$), were male and 88% ($n=159$) identified themselves as White. Thirty-two percent of respondents ($n=58$) were in practice over 30 years and 18% ($n=32$) had been practicing 0-5 years. Over half, 55% ($n=99$), were between the ages of 46-65 years. Forty-two percent ($n=76$) were members of the ADA and 30% ($n=54$) were members of the ADHA. Complete demographic information is provided in Table I.

When asked about current knowledge of the 2015 amendment to the Michigan Board of Dentistry Administrative Rules allowing for dental professionals to earn continuing education credits in exchange for volunteered clinical hours for underserved patient care, over three quarters of the respondents were unaware of the amendment or that the clinical setting for earning these CE required approval by the Michigan Board of Dentistry. Over two-thirds of the respondents saw a benefit to volunteering at a not-for-profit community-based clinic, while slightly less than one quarter of the respondents were either unsure or did not see it as a benefit. Additionally, respondents were asked to share how important volunteerism was to them. Nearly half viewed volunteerism as important, a little more than one quarter expressed neutrality, while the remaining quarter of the respondents did not view volunteerism as important.

Table I. Participant Demographics

Gender	Frequency n (%)	Race	Frequency n (%)
Female	43 (24%)	White	159 (88%)
Male	138 (76%)	Black/African-American	4 (2%)
		Hispanic/Latino	3 (2%)
		Asian	9 (5%)
		American Indian or Alaskan Native	1 (0.5%)
		Native Hawaiian or other Pacific Islander	0 (0%)
		Two or more races	1 (0.5%)
		Other	4 (2%)
Age	Years in Practice		
20-25	1 (0.5%)	0-5	32 (18%)
26-35	37 (20%)	6-10	18 (10%)
36-45	28 (15.5%)	11-15	12 (7%)
46-55	45 (25%)	16-20	19 (10%)
56-65	54 (30%)	21-25	15 (8%)
66-75	13 (7%)	26-30	27 (15%)
Over 75	4 (2%)	Over 30 years	58 (32%)
License	Professional Membership		
Dentist	103 (57%)	ADA	76 (42%)
Dental Hygienist	70 (38%)	ADHA	54 (30%)
Dental Specialist	9 (5%)		

Regarding time commitments, participants were asked how many unpaid and paid days per year they would be willing to volunteer and about two categories of time commitments (Figure 1). "Unpaid days" were defined as regularly scheduled days off and "paid days" were defined as scheduled work days that would be taken off by the clinician in order to volunteer. The most frequent answer for both questions was "unable to determine," 28% and 30% respectively, followed by "4 or more days per year," 25% and 18% respectively. Nearly twice as many dental hygienists than dentists were willing to volunteer four or more unpaid days per year. Similarly, more than twice as many dental hygienists as compared to dentists expressed an unwillingness to volunteer any paid days.

Participants were asked to share the most significant factor motivating them to volunteer (Figure 2). Over half indicated "giving back to the community," followed by "volunteerism is a professional responsibility," "religious or spiritual reasons,"

Figure 1. Number of Days Willing to Volunteer Per Year (n=180)

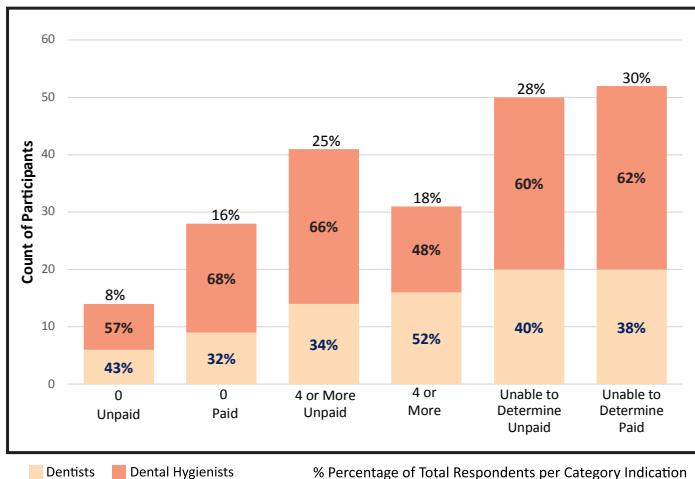


Figure 2. Greatest Motivating Factor to Volunteer (n=170)

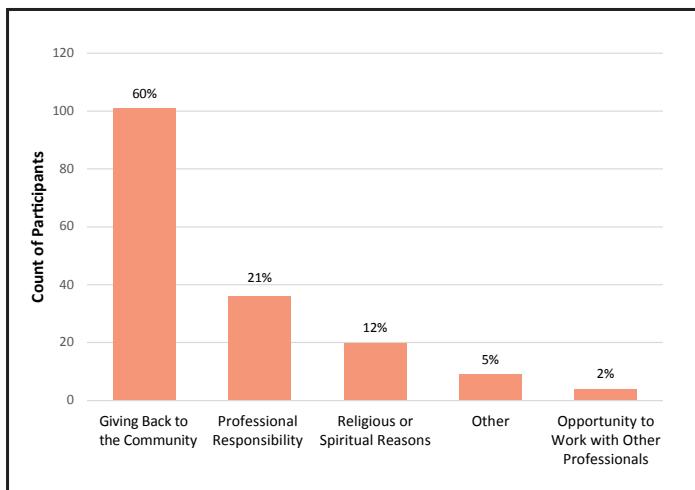
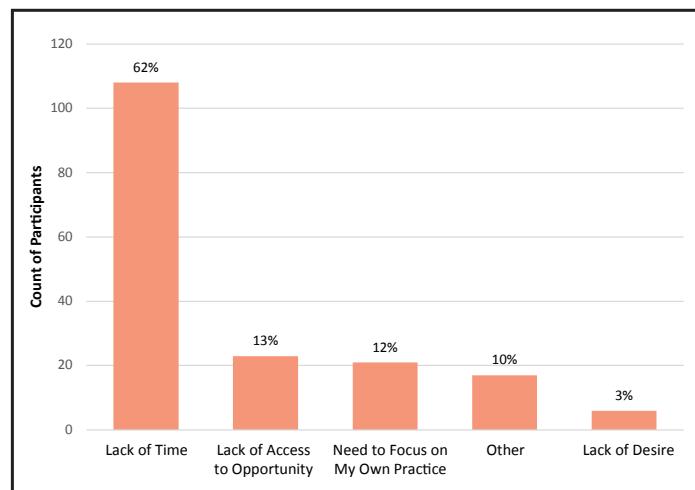


Figure 3. Greatest Barrier to Volunteering (n=175)



and "other" which included answers such as an opportunity to teach or learn. Several respondents were motivated by "the opportunity to work with other professionals."

Regarding the most significant barriers to volunteering, over half indicated "lack of time" followed by a "lack of access to opportunity to volunteer," "need to focus on my own practice," and "other" which included answers such as "chronic injury, health problems, family obligations, and current volunteerism as part of the practice." Several respondents expressed a "lack of desire to volunteer entirely" (Figure 3).

Differences between demographic variable responses regarding type of days off respondents would be willing to volunteer are shown in Table II. Findings were statistically significant ($p = 0.002$) that, in general, dentist and dental hygienist respondents were willing to volunteer more unpaid days than paid days, per year. There was no statistical significance in dental hygienists' willingness to volunteer unpaid days versus paid days; however, dentists were willing to volunteer more unpaid days than paid days per year ($p = 0.004$). Among ADA/ADHA members and non-members respectively, differences in willingness to volunteer between the number of unpaid days versus paid days was not statistically significant. When comparing ADA/ADHA members versus non-members willingness to volunteer paid days, it was found that professional association members were, on average, willing to sacrifice more paid days ($p=0.005$). No statistical significance was found when comparing member versus non-member unpaid days.

Discussion

The majority of the respondents were unaware of the opportunities for earning CE by volunteering their services at not-for-profit community-based clinics nor were they aware of the site approval requirement by the Michigan Board of Dentistry. These results were similar to those of Wilkie et al. who found that nearly half of the dental hygienists surveyed were unaware of the opportunity to earn CE by volunteering in the state of Idaho.¹³ Similarly, McGlinigle et al. found that over a quarter of the members of the American College of Surgeons were not aware of the "Giving Back Program," an altruistic outreach program founded by their own professional association.²¹ These findings suggest an overall lack of knowledge among health care professionals about opportunities available for clinical volunteerism, including those that offer CE. It is recommended that professional associations consider improving communication about any changes in practice act/administrative rule information, as well as clinical volunteer opportunities, to their members. Furthermore, it is recommended that

Table II. Demographic Variables and Types of Days Willing to Volunteer

	Type of Days Willing to Volunteer	n	Mean (\pm SD)	p-value
DDS**	Paid	70	2.82 (\pm 1.41)	0.004*
	Unpaid	72	3.84 (\pm 1.42)	
RDH**	Paid	48	3.15 (\pm 1.52)	0.224
	Unpaid	49	3.28 (\pm 1.41)	
ADA/ADHA Member**	Paid	87	3.93 (\pm 1.77)	0.037
	Unpaid	89	4.16 (\pm 1.60)	
Non-member**	Paid	31	3.71 (\pm 2.12)	0.07
	Unpaid	32	4.14 (\pm 1.83)	
Overall DDS/RDH**	Paid	118	2.95 (\pm 1.46)	0.002*
	Unpaid	121	3.32 (\pm 1.41)	
ADA/ADHA Member vs Non-Member***	Paid			0.005*
ADA/ADHA Member vs Non-Member***	Unpaid			0.156

professional schools and dental educational programs, focus on the importance of having an ongoing working knowledge of the state's practice act. It would also be appropriate to emphasize how service-learning activities align with the concept of volunteerism for CE.

Results in this study indicated that the greatest motivating factor to volunteerism was giving back to the community, which are similar to the findings of Patel et al.¹⁵ The greatest barrier to volunteering among the participants was lack of time, which was consistent with results from five other studies.^{13,19-22} While study participants indicated a generalized positive attitude and intention to volunteer, a perceived lack of time may still inhibit an oral health care professional from committing to work as a volunteer. Although service-learning is a part of most dental and dental hygiene curricula, opportunities to enhance student involvement should be investigated. As students develop into professionals they should be provided opportunities to increase their understanding of their responsibility as health care providers to help the community.¹⁸ Additional emphasis on community outreach should be a special focus in associate degree dental hygiene programs in order for students to achieve attitudes toward volunteerism similar to cohorts who have earned a bachelor's degree or higher.¹⁹

Almost a third of participants were "unable to determine" how many paid or unpaid days they would be willing to volunteer. Close to one quarter were willing to devote four or more paid or unpaid days per year to volunteer; and there were twice as many dental hygienists as dentists willing to do so. Additionally, more dentists were willing to volunteer unpaid days, but were significantly less likely to take off paid days for volunteering. These findings combined with the observation that the majority of participants recognized

the benefits of receiving CE for volunteering and the perception that volunteerism is an important activity, well positions oral health care professionals for providing care in not-for-profit community clinics, once awareness is raised.

The majority of participants in this study were members of ADA and ADHA and were found to be more likely to volunteer paid days than non-members; however, there was no statistically significant difference in willingness to volunteer on non-paid days related to professional membership. A study by Marsh identified that members of professional associations are more likely to be involved with community service than non-members.¹⁹ Based on these findings, professional associations can play a critical role in communicating volunteer opportunities and benefits to their members. Since the new Administrative Rule has gone into effect in Michigan, 12 sites have been approved as volunteer CE sponsors.²⁶ With approximately 107 not-for-profit community dental centers in Michigan,^{27,28} this accounts for utilization of only 11% of the available clinics, speaking to the need for the development of a means to disseminate this Administrative Rule change along with the steps to become a CE provider. Professional associations could play a role in encouraging these community-based clinics to become CE providers via application to the Michigan Board of Dentistry.

Granting CE through volunteering to provide dental care for vulnerable and underserved populations, was established to assist in addressing the access to care crisis. Although this is one means for doing so, it is only a small contribution toward resolving the access to care crisis. Given the barriers identified in this study, this method of increasing the volunteer work force may not provide a long-term solution for a shortage of volunteers in community-based dental clinics. Several limitations of this study should be noted. This study had a small sample size from Southeast Michigan only. Nearly three quarters of participants were members of a professional association, and consideration should be given to disseminating this survey

to a cross-section of professionals that better represents all licentiates. In addition, further research should focus on the specific opportunities available for clinical volunteer involvement and the long-term effects.

Conclusions

Access to oral health care for uninsured/underserved populations is an ongoing problem in the U.S. Community-based dental clinics rely heavily on volunteers for patient care. Reliance on volunteers is challenging to sustain as it cannot be guaranteed that professionals will be available or willing to provide care. While the incentive of earning CE in exchange for volunteerism will not solve the access to care crisis, it may serve as a useful means of providing care for underserved populations. Opportunities to earn CE credit for volunteerism is seen as a benefit; however, foundations for this concept should be addressed in professional educational programs. In addition, knowledge of changes to state practice acts and volunteer opportunities should be promoted by professional associations and other organizations. Community-based clinics also need to be made aware of the process for becoming a CE provider. Further research on the longitudinal impact of CE for volunteering care in not-for-profit community-based clinics is warranted.

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Two-Year Randomized Clinical Trial of Adjunctive Minocycline Microspheres in Periodontal Maintenance

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Abstract

Purpose: The purpose of this study was to evaluate the effects of repeated scaling and root planing (SRP), with or without locally-delivered minocycline microspheres (MM) on residual pockets in patients undergoing periodontal maintenance (PMT).

Methods: Patients on PMT were randomized into two groups for treatment of one posterior interproximal inflamed pocket (≥ 5 mm) with a history of bleeding on probing every 6 months: SRP plus MM (n=30) or exclusively SRP (n=30). Baseline and 24-month measurements included radiographic interproximal alveolar bone height, probing depths (PD), clinical attachment level (CAL), bleeding on probing (BOP), gingival crevicular fluid (GCF), and salivary interleukin (IL) - 1 β , (24 month only). Results were analyzed for baseline data or change in measurements after 24 months of treatment between different treatment groups, as well as whether significant changes occurred after 24 months of treatment for each treatment group individually.

Results: Alveolar bone height and GCF IL-1 β remained stable over the 24 months. The SRP + MM and SRP groups each demonstrated reduced PD (0.8 ± 0.9 mm and 1.1 ± 0.6 mm, respectively, $p < 0.001$ each), CAL (0.8 ± 0.9 mm and 1.0 ± 0.6 mm, respectively, $p < 0.001$ each) and BOP (55% and 48%, respectively, $p = 0.001$ each). However, there were no differences between groups over the 24-month study period.

Conclusion: Scaling and root planning alone, of moderately inflamed periodontal pockets at 6-month intervals, produced stable interproximal alveolar bone height as well as sustained improvements in probing depths, clinical attachment level, bleeding on probing over 24 months; minocycline microspheres were not shown to enhance these results.

Keywords: periodontal disease, periodontal pockets, non-surgical periodontal therapy, periodontal maintenance, scaling and root planning, chemotherapeutics

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Introduction

Dental hygienists in clinical practice often face challenges managing residual inflamed periodontal pockets during periodontal maintenance therapy (PMT). Periodontal pockets with residual or recurrent signs of inflammation during PMT have been shown to be more likely to progress and deserve additional treatment.¹ Repeated scaling and root planing (SRP) is often performed in these sites, however, locally applied chemotherapeutics are popular adjuncts to SRP. Minocycline (MM), microencapsulated in a bioabsorbable polyglycolide-co-dl lactide polymer, is commercially available (Arestin®, Orapharma; Bridgewater, NJ, USA) and is inserted into the periodontal pocket in a powder form. Immediately following contact with the gingival crevicular fluid, the polymer begins

to hydrolyze and release the minocycline. Administration of MM results in a localized, sustained release of the antibiotic at concentrations of 340 μ g per ml into gingival crevicular fluid (GCF) for 14 days, much higher than minimum inhibitory concentrations.²

While MM has been used during PMT since the early 2000's, most studies have investigated clinical outcomes following the application of minocycline microspheres during initial SRP.²⁻⁴ The initial investigations demonstrated that SRP plus MM provided greater reductions in probing depth as compared to SRP alone. Application of MM was also shown to reduce measures of inflammation, including interleukin (IL)-1 in gingival crevicular fluid (GCF) over the short term.⁵

Few studies have evaluated SRP + MM protocols during periodontal maintenance. Meinberg et al.⁶ studied the difference in clinical parameters between conventional periodontal maintenance and SRP with MM. The authors concluded that SRP and MM resulted in greater PD reduction and few incidences of radiographic bone height loss than in conventional periodontal maintenance. In the Meinberg et al. study, MM was applied at baseline, 1, 3, and 6-month appointments following SRP at the baseline appointment only; control patients received conventional PMT at 3-month intervals for 1 year.⁶ An additional study by van Steenberghe et al., evaluated the clinical and microbiological outcomes of repeated application of 2% minocycline ointment subgingivally.⁷ SRP was performed at baseline, 6, and 12 months; minocycline ointment was applied at baseline, 2 weeks, 1, 3, 6, 9, and 12 months. The authors concluded that repeated application of subgingival minocycline ointment resulted in improvement in both clinical and microbiologic variables over 15 months when compared to SRP alone.

Long-term studies involving the measurement of clinical parameters and inflammatory bio-markers following SRP+MM during conventional PMT protocols are lacking in the literature, yet are important to determine whether adjunctive applications of MM are cost-effective. The purpose of this study was to determine whether repeated application of SRP+MM to a moderately inflamed periodontal pocket at 6-month intervals during PMT would stabilize alveolar bone height, improve clinical parameters, and decrease the level of inflammatory biomarkers when compared with SRP alone a period of 2 years.

Methods

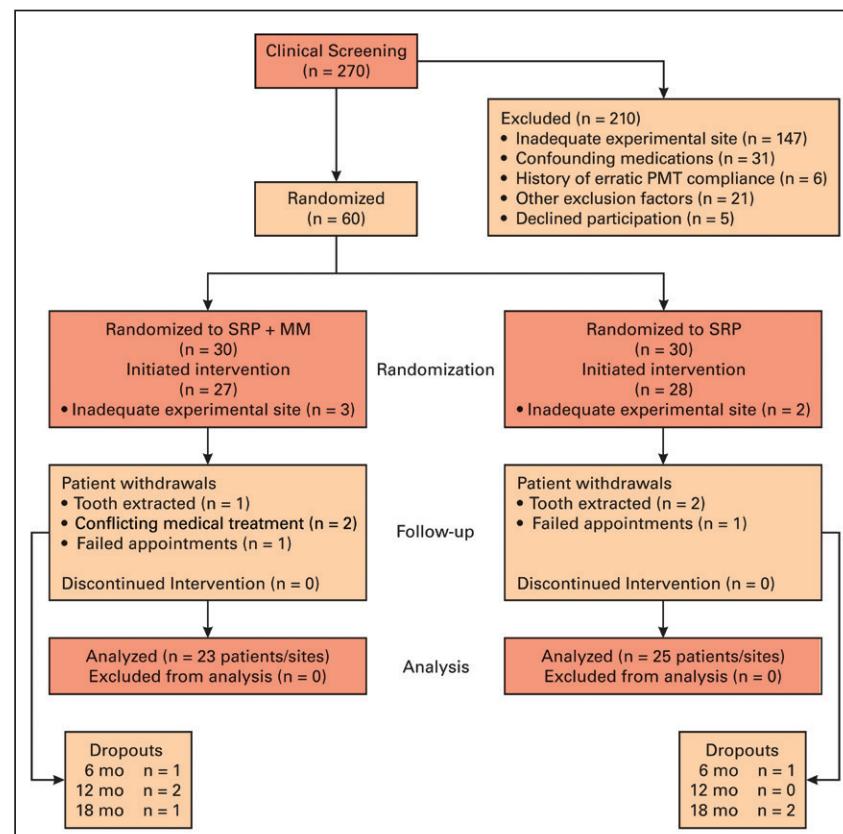
Patient Population and Study Design

This study received Institutional Review Board approval (IRB #314-12) from the University of Nebraska Medical Center. Patients regularly attending the University of Nebraska Medical Center (UNMC) College of Dentistry for periodontal maintenance therapy were screened for the following inclusion criteria: individuals between 40-85 years of age, a

periodontal diagnosis of moderate-severe chronic periodontitis, a history of regular periodontal maintenance therapy (≥ 2 /year), a ≥ 5 mm posterior interproximal pocket with a history of BOP, no systemic diseases (e.g. rheumatoid arthritis, osteoporosis), and not currently taking medications with a significant impact on periodontal inflammation or bone turnover (e.g. chronic nonsteroidal anti-inflammatory drugs, steroids, bisphosphonates, calcitonin, methotrexate, antibiotics). Individuals with tetracycline allergies were also excluded. Patients meeting the inclusion criteria were invited to participate, provided informed consent and then stratified by gender and smoking status. Participants were randomly assigned to test (SRP+MM) or control (SRP) groups by coin toss by a clinician not involved with clinical measurements. (Figure 1).

The same clinician also identified the most posterior ≥ 5 mm interproximal pocket with a history of BOP as the experimental site. A power analysis was performed for detecting bone loss (primary outcome) at 24 months, based on a previous study of Payne et al.⁸ and additional clinical data from maintenance populations in the UNMC clinic. It was assumed that the standard deviation of the change in average bone loss at 24 months was 0.57 mm. The significance level was set at $0.05/2=0.025$ based on the Bonferroni method to adjust for two tests conducted under the two treatments separately. If 23-25 subjects per group completed the study it would provide at least 80% power to detect a difference of 0.4 mm (threshold based on two times the standard deviation of replicate measurements)⁸ in average bone loss at 24 months after treatment in each group at a two-sided significance level of 0.025 via one-sample t test. Therefore, 30 subjects randomized to

Figure 1. Randomization flow chart



each group with a 16% drop out rate would yield a sufficient number of participants. Probing depths, CAL, BOP and inflammatory biomarkers in GCF and saliva were secondary outcomes. Saliva collection was added to the protocol after trial commencement and completed at the final (24 month) maintenance appointment.

Full-mouth periodontal maintenance therapy, along with SRP+MM or SRP as well as all repeated measurements at the experimental site were performed at baseline, 6-month, 12-month, 18-month, and 24-month appointments. All clinical, radiographic and laboratory examiners were blinded to the treatment randomization. The study, conducted between October 2012 and October 2015, was also registered with ClinicalTrials.gov (NCT01647282).

Data Collection and Treatment Protocol

A modified radiographic positioning ring (Dentsply-Rinn, Chicago, IL, USA) was used while exposing radiographs at baseline and 24-months, allowing the rectangular radiographic cone to lock into a standardized film-to-source geometry. Measurements were made using digital imaging software (MiPACS Dental Enterprise Solution, Medicor Imaging; Microtek, Hsinchu, Taiwan). Measurements were made from the cementoenamel junction (CEJ) of the test and control sites to the base of the bony defect by two blinded examiners in order to detect interproximal alveolar bone levels (IBL). Measurements were repeated in 10% of samples; intra-class correlation revealed that repeated measurements at baseline was 0.937 (95% CI = 0.538 to 0.993) and at 24 months was 0.983 (95% CI = 0.858 to 0.998), indicating excellent reliability.

Clinical data were collected at the experimental site by one of two calibrated, blinded periodontists (RR or AK)⁹ and reported at baseline and 24 months. Data collection at one year has been described previously.⁹ During data collection, supragingival plaque was removed from the test and control teeth with a dental explorer; if any plaque deposit was visible on the explorer tip after the first pass across the tooth surface it was recorded as "positive." Following the recording of visible plaque, an absorbent paper strip (Periopaper, ProFLow; Amityville, NY, USA) was inserted into the experimental site sulcus for 30 seconds to collect the GCF sample. Strips contaminated with blood were discarded and a second sample was taken. The paper strip was placed into a coded sterile vial and frozen at -80° C. Gingival recession was then measured at the test and control sites using a University of North Carolina (UNC) 15 probe (Hu-Friedy; Chicago, IL, USA). Probing pocket depths (PD) were then measured at the same site and clinical attachment level (CAL)

was calculated. BOP was recorded as positive for sites that bled within 30 seconds. Full-mouth pocket measurements and periodontal maintenance therapy were then completed by the dental student assigned to the case. At the end of the periodontal maintenance therapy appointment, a licensed dental hygienist (JH) performed SRP at the experimental sites and inserted 1 mg of MM into the test site pockets. (Figure 2) Participants returned for 6-month, 12-month, 18-month, and 24-month periodontal maintenance appointments. Because longer recall intervals may increase periodontitis risk,¹⁰ the intervals were extended to six months to determine if MM provided more periodontal stability compared as compared to repeated SRP alone in moderate periodontitis patients. At each maintenance appointment, scaling of shallow sites (≤ 4 mm) plus root planing of sites ≥ 5 mm was provided. Saliva collection was accomplished at the 24-month appointment, using a variation of the technique described by Navazesh.¹¹ Patients rinsed with water and expectorated into a sterile collecting tube for five minutes while in a seated position. Saliva samples then were centrifuged at 2,000 RPM for 5 minutes and the supernatant was pipetted into coded sterile vials. Vials were then frozen at -80° C before further testing. Salivary sampling was a protocol change added after the initial informed consent; therefore, all of the subjects re-consented at the beginning of the 24-month appointment.

Figure 2. Application of MM into test site



Analysis of GCF and Salivary Samples

GCF samples from test and control sites and saliva samples were analyzed for IL-1 β using quantitative sandwich ELISA kits according to manufacturer's instructions (R&D Systems, Human IL-1 β /IL-1F2 Quantikine® ELISA; R&D Systems, Minneapolis, MN, USA). Samples were allowed to thaw at room temperature and GCF strips were placed in 1 ml of phosphate buffer saline and gently agitated for 1 hour during the thawing process. Standard calibration curves were generated. The minimum detectable concentration for the ELISA was 1

pg/ml and the maximum detectable concentration was 262 pg/ml. All samples were analyzed in duplicate. Cytokine levels higher than the maximum detectable level were re-tested; 1:10 dilution. The average of each sample's duplicate was used to determine the total IL-1 β , and the total IL-1 β was calculated after adjusting for dilutions.

Statistical Analyses

The continuous data at baseline were compared between two treatment groups using two-sample t-test or Wilcoxon rank sum test when the data was normally distributed. Categorical data, at baseline, were compared between groups using a chi-square test. Generalized estimating equations (GEE) with compound symmetry correlation between repeated measures were used to evaluate and compare the treatment effects on different clinical measures separately. The considered clinical measures include continuous measures 1 (alveolar bone height loss, PD, CAL, GCF or saliva total IL-1 β), and categorical measures (presence of BOP or presence of plaque). GEE has been shown to model data without assuming the outcome variable is normally distributed, allowing for the accounting of any correlations between repeated measures at baseline and 24 months on the same subject. The research model contained covariates of treatment (SRP+MM vs SRP), time (24 months versus baseline) and interaction between treatment and time. Identification of link, or logit link were specified for modelling continuous or binary clinical measures over time. A significant interaction between treatment and time indicated significantly different treatment effects on the corresponding clinical measure. Additionally, the time effects for each treatment arm quantified change in the continuous clinical measures or logit scale of the risk of having categorical clinical measure event. Significant time effects under some treatment implied that there was a significant treatment effect on the clinical measure for the corresponding treatment arm. Bonferroni method was used to address multiple comparisons issue. Saliva IL-1 β was only available at 24-month appointments. Values were log transformed and compared using two-sample t test between groups. Spearman correlation coefficients and p values testing for non-zero correlation were also calculated between GCF and saliva total IL-1 β measurements at baseline or 24 months and the changes in the clinical outcome values at 24 months.

Results

Patient Characteristics

Of the 60 participants randomized for this study, intervention was initiated on 55 subjects due to experimental sites in 5 patients falling below the inclusion criteria of ≥ 5 mm PD at the time the baseline measurements were performed. Forty-eight patients with one experimental site each completed the

24-month study (13% dropout rate). Dropouts were similarly distributed between groups (Figure 1).

All patients were asked to report any symptoms or problems experienced during the study. No adverse events were reported. There were no significant differences between the two groups. Patients generally had probing depths ≤ 4 mm except for one 5-7 mm posterior interproximal site with bleeding on probing. Baseline characteristics of patients initiating the study are displayed in Table 1.

Table I. Patient Demographics

	SRP+MM* (n=27)	SRP** (n=28)
	mean \pm standard deviation	mean \pm standard deviation
Age (years)	67.3 \pm 10.5	66.8 \pm 12.1
	n (%)	n (%)
Male	22 (81.5%)	16 (57.1%)
Female	5 (18.5%)	12 (42.9%)
Current Smokers	8 (29.6%)	4 (14.3%)

* Scaling and root planing and minocycline microspheres

** Scaling and root planing

Radiographic and Clinical Measures

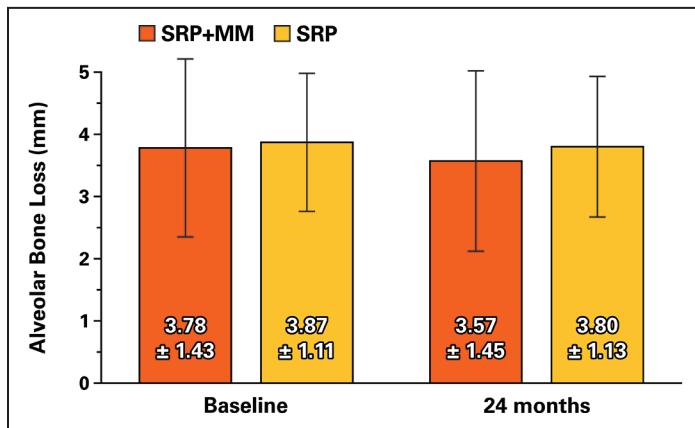
Both groups had stable interproximal alveolar bone height over 24 months at experimental sites with PMT at 6-month intervals. Only one site in each group lost 0.5 mm and no sites lost ≥ 1 mm (Figure 3). Both the SRP+MM and SRP groups each demonstrated significantly reduced PD and CAL from baseline to 24 months (Figure 4). Neither group demonstrated a difference in the amount of plaque accumulation in the experimental site. There were no differences in vertical bone loss between groups at experimental sites.

Inflammatory Measures

BOP decreased significantly in each group between baseline and 24 months; however, there were no differences between groups (Figure 5). The mean baseline and 24-month measurements of GCF total IL-1 β are shown in Figure 6. No differences were noted at baseline or 24 months between groups. In addition, GCF total IL-1 β did not change over time.

A significant Spearman correlation was found between GCF total IL-1 β at baseline and change in alveolar bone height at 24 months ($r=0.34$, $p=0.017$). A concurrent correlation was found between salivary total IL-1 β at 24-months and change in PD site over 24 months ($r=0.34$, $p=0.031$), and a trend toward a change in CAL site ($r=0.31$, $p=0.055$).

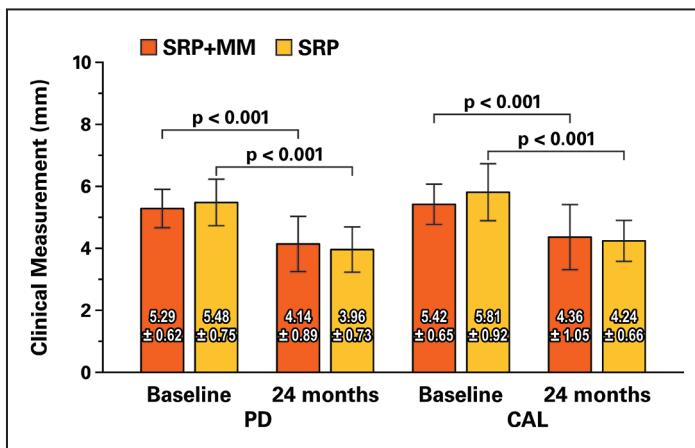
Figure 3. Interproximal alveolar bone height from cementoenamel junction at test and control sites



mean \pm standard deviation

No significant differences were noted between groups or time points.

Figure 4. Probing depth and clinical attachment loss at test and control sites



mean \pm standard deviation

A significant reduction in both measurements was noted between baseline and 24 months for both groups.

No significant differences noted between groups.

Figure 5. Percent bleeding on probing at test and control sites

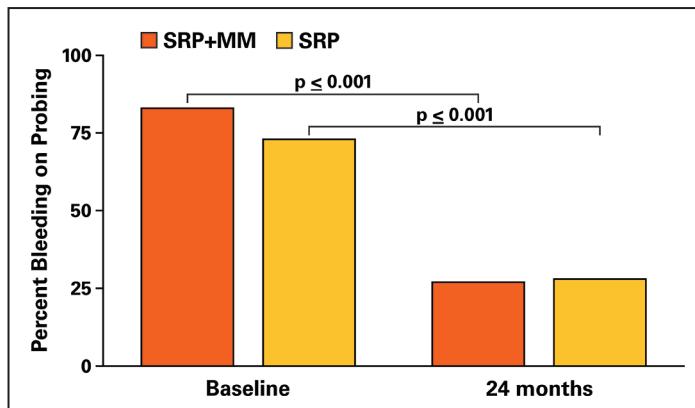
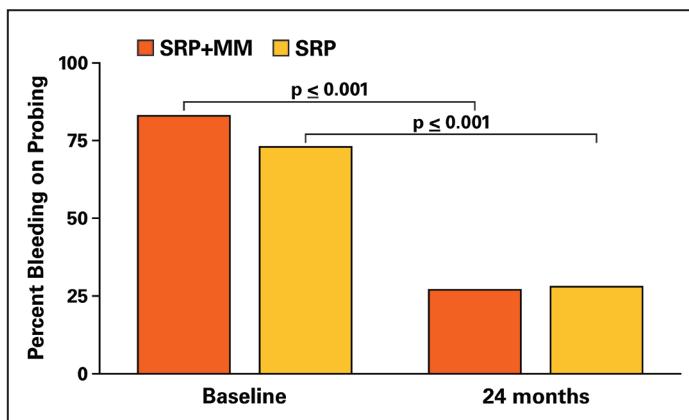


Figure 6. Log transformed IL-1 β in test and control site gingival crevicular fluid or saliva



mean \pm standard deviation

No significant differences were noted between groups or time points.

Discussion

The aim of this study was to determine the effect of repeated MM when used in conjunction with SRP in patients receiving regular periodontal maintenance therapy (6-month intervals) compared to performing SRP alone during periodontal maintenance. All patients had received periodontal treatment and regular periodontal maintenance therapy prior to enrolling in the study. Each patient was analyzed at one posterior pocket ≥ 5 mm with a history of BOP.

The primary outcome measure in this study was change in interproximal alveolar bone height. Neither group demonstrated a significant change from baseline to 24 months even though the study was powered to detect changes of 0.4 mm mean bone loss. Results showed that only one site in each group lost 0.5 mm alveolar bone height over the duration of the 24-month study. Payne et al.¹² reported that in post-menopausal women receiving sub-antimicrobial doses of doxycycline or placebo and 3 to 4-month periodontal maintenance therapy, alveolar bone height remained stable in both groups. At the end of 2 years, approximately 90% of sites showed no significant change (≤ 0.4 mm) in alveolar bone height, based on two times the standard deviation of replicate measurements. In the current study with periodontal maintenance therapy performed every 6 months, 96% of subjects showed no change in alveolar bone height over 24 months. Results in the present study indicate the stability of the alveolar bone height at the experimental sites, is presumably supported by repeated SRP.

When evaluating the baseline and 24-month clinical and inflammatory measurements, no significant differences were found between the two groups. However, both groups experienced a statistically significant decrease in PD, CAL,

and BOP. No changes were found from baseline to 24 months in IL-1 β levels in either group. Meinberg et al.⁶ reported improvements in PD of 0.9 ± 0.1 mm in their SRP+MM group at one year compared with 0.4 ± 0.1 mm in the conventional periodontal maintenance group. CAL was not reported. Meinberg et al. also administered 4 doses of MM over a 6-month period with only one session of SRP in contrast to the current study which administered 4 doses of MM, in combination with SRP at each session, every 6 months for 2 years.

The current study protocol may better approximate a more feasible situation clinically. In this study, PD reductions of 0.8 ± 0.9 mm in the SRP+MM and 1.0 ± 0.6 mm in the SRP groups were shown at 24 months. Performing SRP every 6 months appeared to promote greater PD reduction over two years than a single episode of SRP at one year. When evaluating recently-published, one-year data from this clinical trial,⁹ the PDs were shown to numerically reduced further, although not statistically significant, at 24 months following the initial improvements at 6 months. These outcomes also are consistent with previous reports showing that a 1 mm decrease in PD can be expected following acceptable SRP without adjunctive therapy, one year post-initial treatment.¹³

When considering CAL, the current study demonstrated significant gains in CAL in both groups with the SRP+MM group gaining 0.8 ± 0.9 mm and the SRP group gaining 1.0 ± 0.7 mm at the conclusion of 24 months. This CAL improvement aligns with previous data regarding post-treatment responses to SRP.¹³

Results from this study showed that both the SRP+MM and SRP groups demonstrated significant decreases in the incidence of BOP but continued to have high levels of explorer-detectable plaque. The high plaque levels may be due to focusing exclusively on posterior interproximal sites and using a very sensitive positive threshold (any deposit visible on the explorer tip after the first pass across the tooth surface). The SRP+MM group showed that 59% of subjects with BOP at baseline did not have BOP 2 years later and the SRP group showed 52% subjects with BOP at baseline did not exhibit BOP 2 years later. This reduction in BOP following therapy is consistent with previous findings.¹³ While the presence of BOP is not a reliable predictor of disease activity, reduction and elimination of BOP may be used as a criterion for stability.¹⁴ Considering BOP as an indicator for periodontal stability, results from this study would reinforce the concept that periodic SRP can lead to long-term reduction in BOP, thus periodontal stability, regardless of the addition of MM and, in spite of persistent supragingival plaque. Miyamoto

et al.¹⁵ also showed that patients who were compliant with periodontal maintenance therapy demonstrated a greater decrease in BOP levels (to 38%) when compared to patients with poor compliance (43%).

Periodontal disease and disease severity have been associated with GCF IL-1 β levels.¹⁶ Neither group in our study experienced significant changes from baseline to 24 months in total GCF IL-1 β . Previous studies, following patients at 6 and 24 weeks respectively, report that SRP produces a reduction in GCF IL-1 β at various time periods.¹⁶ Additionally, these studies followed patients after initial SRP rather than patients in ongoing periodontal maintenance therapy. Current findings from this study suggest that baseline IL-1 β levels were already lowered by previous periodontal maintenance therapy and that BOP may be a simpler and more sensitive measure of local inflammation than measures of GCF IL-1 β .

Salivary levels of IL-1 β have been shown to reflect periodontal disease severity.¹⁷⁻¹⁹ In the current study, total IL-1 β was measured at the 24-month periodontal maintenance therapy appointment. Results were similar between the SRP+MM group (13.2 ± 1.2 pg, log transformed) and SRP group (12.8 ± 1.2 pg, log transformed). Similar to GCF IL-1 β , evidence shows that periodontal therapy may reduce the amount of IL-1 β in saliva.¹⁸ These findings again suggest that salivary IL-1 β at 24 months may have already been lowered by previous periodontal therapy.

Current smokers were included in both the SRP+MM group (n=8) and SRP group (n=4). Tobacco use has been shown to affect the severity of periodontitis and the individual's response to therapy. Cigarette smoking has been shown to be associated with a 2-8 times increased risk for CAL and alveolar bone loss.²⁰ Bergstrom²¹ found that over a 10-year period, smokers lost more periodontal bone height (0.74 ± 0.59 mm) than non-smokers (0.27 ± 0.29 mm). Labriola et al.²² found that PD ≥ 5 mm were reduced more in non-smokers when compared to smokers during SRP by an average of 0.433 mm. Previous data published from the current study found no difference between the clinical outcomes of smokers and non-smokers at one year, as was the case with the current results at two years (data not shown).⁹

There are several limitations to this study. Study participants were already receiving regular periodontal maintenance therapy and were considered to be compliant patients and periodontally stable. Perhaps, different findings would have been observed in a population with evidence of progressive periodontitis at the baseline visit. In addition, the majority of the experimental sites were of moderate depth (5 mm and

6 mm), and the use of MM in deeper pockets may be more effective. However, it has been demonstrated that deeper pockets are reduced more effectively with flap surgery.²³ Several patients also dropped out of the study for various reasons. Since the primary outcome, interproximal bone loss, had only two time points (baseline and 24 months), traditional intent-to-treat analyses were not straightforward. However, dropouts were similar between groups and the remaining patient numbers retained adequate power.

Results obtained from this study would encourage a more judicious use of MM in periodontal maintenance patients. Perhaps the use of MM would be most cost-effective and clinically-relevant in periodontal maintenance patients with deep, inflamed periodontal pockets but who either refuse or are unable to have periodontal surgery. Further study could enlighten oral health care providers on the most appropriate use of this drug within the periodontal maintenance population.

Conclusion

The small-sample size of the current study does not allow for the conclusion that scaling and root planning and minocycline microspheres and scaling and root planing alone are equivalent therapies. Repeated scaling and root planing alone of inflamed moderate periodontal pockets, at 6-month intervals, produced stable interproximal alveolar bone height as well as a long-term improvement in bleeding on probing, probing depths, and clinical attachment levels over 24 months. Repeated application of minocycline microspheres was not found to enhance scaling and root planing results.

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Abstracts: Research Posters

Abstracts from the Research Poster Session presented on June 21, 2018 at the Annual Conference of the American Dental Hygienists' Association, Columbus, Ohio.

*Indicates presenter

Readiness and Attitudes of Dental Hygiene Students Towards Interprofessional Teamwork and Education: A Homeless Veteran Simulation

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showed students were satisfied with the event. Almost all students reported increased knowledge and understanding of a homeless veteran's healthcare needs; demonstrated higher levels of readiness for interprofessional practice; reported higher levels of knowledge regarding roles of other professions; and demonstrated integration of patient and families within the team. Open-ended responses indicated positive results with students valuing and desiring further interprofessional simulation activities. Data will be further analyzed to identify how DH students compare with the other disciplines.

Conclusion: Dental hygiene students were respected for their expertise regarding the oral health needs of the homeless veteran and were considered an integral member of the team. All students gained significant insight into other professional roles and demonstrated improved collaboration especially within non-traditional futuristic teams.

Collecting Oral Health Data and Providing Care to Nursing Home Residents

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Purpose: Residents of long-term care facilities experience barriers to receiving oral health care including financial, the priorities of caregivers, reduced access to professional dental providers, and even resistance from the residents themselves. In an attempt to address these barriers, Senior Charity Care Foundation and the Utah Dental Hygienists' Association received a grant from Civil Money Penalty Funds to provide comprehensive oral health services to residents in 10 certified nursing homes along the Wasatch Front of Utah. This pilot project addresses the oral health need of residents, trains staff and administration on daily oral healthcare, collects data for further advocacy, and demonstrates the use of a dentist/dental hygienist collaborative agreement.

Significance: Data is lacking in Utah to demonstrate to stakeholders and legislators the dental need of nursing home residents. Previous screenings of residents residing in assisted living residence have presented with substantial oral debris,

Purpose: The purpose of this study was to assess if dental hygiene (DH) students would report increased knowledge and understanding of a homeless veteran's healthcare needs. In addition, we hoped to show that DH students demonstrated higher levels of readiness for interprofessional practice; reported higher levels of knowledge regarding roles of other professions; and demonstrated integration of patient and families within the team in comparison to other healthcare professions over a two-year period.

Methods: A convenience sample of graduate and undergraduate students from two universities were used for this mixed-methods study. Students from eight disciplines were invited including: dental hygiene (n=43), social work (n=24), nursing (n=72), physician assistant (n=31), physical therapy (n=46), and medicine (n=6). Speech pathology and pharmacy had no participants in the study's first year. All students participated in the same simulation from year one to year two using a standardized patient who was a homeless veteran, accompanied by a family member. Quantitative data was collected with a pre-and post-test using the Readiness for Interprofessional Learning Survey (RIPLS). A change score was computed by subtracting post RIPLS scores from pre RIPLS scores. Independent samples *t* test was used to compare change scores for each discipline.

Results: Change scores did not increase in the second year in dental hygiene or nursing. Post simulation comments

need for periodontal care, untreated decay, root fragments and broken teeth, severe dry mouth, poor fitting dentures, and suspicious lesions. It is expected that the oral health of residents in nursing homes will be similar or worse given lack of patients' ability for self-care. In addition, lack of understanding of oral health by the staff and administration is addressed with training by dental hygienists participating in the project. Finally, collaborative agreements are relatively new to the profession of dental hygiene and this project will further provide experience and education to dental hygienists providing care in long-term care facilities.

Key features: Implementation of the project includes creating contracts with nursing homes, collaborative agreements between dental hygienists and dentists, and designing training programs for both the collaborative agreement dental hygienists and the staff/administration of the long-term care facilities. Collaborative agreement dental hygienists obtain experience in providing place-based care in the nursing home environment. Importantly, the residents receive much needed dental and dental hygiene care at no cost, which previously has not been available.

Evaluation plan: To evaluate staff and administration, a researcher-designed pre and post-test questionnaire will be used for quantitative and qualitative data collection. Recommended oral health indicators from the ASTDD will be utilized to collect the resident's oral health data for the surveillance and reported with descriptive statistics. At completion of the project, a qualitative study of dental hygienists utilizing collaborative agreements will be designed and proposed. Funding for this project is provided by the Civil Money Penalty Fund.

Does Equine Assisted Pediatric Dental Health Education Improve Learning Outcomes?

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assist in HPSA. Equine Assisted Learning (EAL) is a model that uses purposeful equine-assisted activities to educate individuals and groups. EAL has the potential to assist the inter-professional team to enhance knowledge, change behavior and improve outcomes in pediatric oral health.

Purpose: The objective of this pilot study was to provide foundational information as to the efficacy of delivery of nutrition and oral health care information, by dental hygienists, registered dietitians and the horse, especially in HPSA.

Methods: A convenience sample of two groups of children, ages 5 – 17 years, (n=36) were recruited from Valley Pediatric Dental Office, Endicott, New York and Unity Stables, Binghamton, New York. The study was a cross-sectional design utilizing the Health Belief Model to highlight susceptibility, severity and benefits of good oral care. EAL was used to highlight the same in horses. Group one received nutrition and oral health education at the dental office and group two received theirs at Unity Stables. Group two was also educated on the oral care and practices of horses. Pre-and post-testing to examine change in nutrition and oral health knowledge and attitude was conducted at baseline and again at six months.

Results: Using the Statistical Package for the Social Sciences (SPSS) vs. 24, demographic characteristics of the children showed no significant differences between groups. Group one participants did have more siblings and group two was composed of more girls but neither was significant. When asked how the children felt about having their teeth cleaned at the dental office, there was a significant Timex group effect ($p=0.05$), as the Equine Group, who received dental education at Unity Stables, answered "like" significantly more often than the control group, who received education at the dental office (specific at time 3, Chi-square = 0.007).

Conclusion: Results from this pilot study indicate a need for further research in the area. As a result, a research study has received a two-year grant from the Colgate Palmolive Fellowship in Nutrition, Oral Health/Dental Education and the principal investigators are currently recruiting.

Associate Degree Dental Hygiene Students' Attitudes Toward Service-learning

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Problem: Service-learning has been shown to provide students with experiences so they can gain learned skills and abilities. Incorporating service-learning into a dental hygiene

curricula, allows dental hygiene students to see a wider variety of patients as well as providing treatment services and working in clinical settings that they may not experience in their own institutional clinic.

Purpose: The purpose of this study was to evaluate associate degree dental hygiene students' attitudes toward service-learning.

Methods: The study used a cross-sectional survey design with quantitative and descriptive statistical methods. Methods included an on-line survey emailed to the 288 associate degree dental hygiene programs in the United States. The inclusion criteria included all associate degree dental hygiene students in an associate degree dental hygiene program in the United States. The criteria for exclusion included all dental hygiene students who were currently not enrolled in an associate degree dental hygiene program. These students would include students enrolled in baccalaureate dental hygiene programs, bachelor dental hygiene completion programs, and master dental hygiene programs in the United States. The survey was sent to program directors of associate degree programs. Program directors forwarded the survey to their students and was completed by 550 associate degree dental hygiene students. The survey assessed variables associated with service-learning dental hygiene didactic education and variables associated with value of service-learning in the treatment of patients.

Results: The service-learning input variables were correlated with the output variable of overall service-learning providing knowledge using the Pearson Correlation test. The strongest positive correlation was the descriptive variable of helps with critical thinking ($r=.743$) $p<.05$. The weakest positive correlation was the descriptive variable of helps treat special needs ($r=.583$) $p<0.5$. The correlation analysis demonstrated a significant correlation with the relationships of both the variables of service-learning dental hygiene didactic education and service-learning in the treatment of patients to the output variable of overall attitudes of service-learning.

Conclusion: Results indicate that associate degree dental hygiene students have an overall positive attitude of service-learning. Additional research may be found beneficial to include dental hygiene faculty perceptions of service-learning in the dental hygiene curricula. Other research could also identify how service-learning can be incorporated into the dental hygiene curricula.

A Comparison of Dentists' and Dental Hygienists' Opinions on Dental Therapists

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Problem: As the United States (U.S.) continues to face an increasing demand for oral health care, many states are examining alternative provider models as well as the role of the dental hygienist (DH) to meet their access to care needs.

Purpose: The purpose of this study was to assess the acceptance of incorporating a dental therapist (DT) into Willamette Dental Group (WDG), a regional corporate dental group.

Methods: A survey tool using a cross-sectional study design was adapted from a previous study of DHs in Oregon and approved by Pacific University's IRB. The survey link was emailed via Qualtrics in March of 2017 to all dentists (220) and DHs (187) employed by WDG.

Results: Responses were received from 172 individuals, 85 dentists and 86 DHs, for a response rate of 42%. Dentists and DHs differ significantly on their opinion of the need of a DT ($p<0.001$), the level of supervision necessary for a DT ($p<0.001$), their scope of practice ($p<0.001$), and appropriate tuition for potential DT programs ($p<0.001$). Seventy-five percent of DHs at WDG are either very or somewhat interested in becoming a DT. Dentists and DHs differed significantly on their opinion on the appropriate salary of a dental therapist ($p<0.001$). Dentists reported a mean salary of \$78,766.67 and dental hygienists' reported a mean salary of \$108,434.48 was appropriate. The majority of dentists and DHs agreed that a DT should be an existing registered dental hygienist (RDH) (61% and 89% respectively). The majority of DHs and dentists were open to having a DT on site (63% and 76% respectively, $p=0.017$).

Conclusion: Although analysis of the data collected showed that dentists and DHs at WDG differed significantly in their opinions about DTs, the majority of dentists and DHs at WDG are open to having a DT as part of their dental team. Additionally, a large number of DHs at WDG are interested in becoming DTs.

North Carolina Nurses' and Dental Hygienists' Knowledge Regarding Electronic Cigarettes

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Dental Hygiene and Dental Student Knowledge of HPV-related Oropharyngeal Cancer and HPV Vaccination

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Problem: E-cigarettes have become popular among teens and adults, but little is known about health professionals' knowledge and practices regarding patient education on e-cigarette safety and efficacy in place of tobacco products.

Purpose: To assess North Carolina (NC) dental hygiene (DH) and nursing students' and practitioners' knowledge, opinions, and behaviors regarding e-cigarette use.

Methods: A convenience sample of DH students and registered dental hygienists (RDHs) in attendance at the NC Dental Hygienists' Association 2017 Annual Fall Scientific Meeting and nursing students and registered nurses (RNs) in attendance at the 2017 NC Nursing Association Annual Convention completed anonymous surveys designed for the respective student and practitioner group. Following pre-testing, the final surveys contained 36 questions across domains of practice behaviors, knowledge, opinions, curriculum/training, and demographics. Data were analyzed using Cochran-Mantel-Haenszel tests.

Results: There were 146 completed student surveys (65 nurse/81 DH) and 144 completed practitioner surveys (90 nurse, 54 DH). After controlling for status (practitioner or student), there was an association between status and knowledge that e-cigarettes frequently deliver less nicotine per puff than cigarettes ($p=0.003$). Practitioners answered correctly more often. There was an association between status and knowledge regarding FDA's regulation of e-cigarette use in the United States ($p=0.04$). Practitioners answered correctly more often. After controlling for status, there was a significant average difference in comfort level discussing tobacco cessation with patients between the two groups ($p=0.005$); however, there was not a significant average difference in comfort level discussing alternative tobacco products (snus, dip, chew, Hookah, etc.) with patients between the two groups ($p=0.09$).

Conclusion: To improve NC DH and nursing providers' knowledge about the health impact of e-cigarettes, impacting their patient tobacco education efforts, DH and nursing curricula and continuing education programs need to address e-cigarettes, their health effects, and how to deliver tobacco and alternative tobacco product cessation counseling.

Problem: Oropharyngeal cancer (OPC) caused by human papilloma virus (HPV) is dramatically increasing across the United States (US). An estimated 16,500 people will be diagnosed with OPC this year, and 70% of those will be attributed to HPV. HPV vaccination, although effective, remains underutilized. Oral healthcare professionals (OHP) should play a direct role in educating patients on HPV-OPC and the importance of vaccination.

Purpose: This cross-sectional study assessed dental and dental hygiene students' knowledge and perceptions regarding HPV, HPV-OPC, and HPV vaccination.

Methods: Final year dental hygiene (DH) students and 3rd or 4th year dental students (DS) from 15 schools (6 dental hygiene and 9 dental) in the US were surveyed using a validated online 153-item data collection tool to determine HPV, HPV-OPC and HPV vaccination knowledge, as well as perceived scope of practice regarding patient education, and role in recommending and administering the HPV vaccination. A total of 120 DH students and 1245 DS were eligible to participate. For DH the response rate was 69% ($n=83$) and for DS the response rate was 22% ($n=276$). The overall study response rate was 26%. Descriptive statistics were calculated using SAS.

Results: The acceptable knowledge level was a minimum of 70% correct answers. Overall knowledge was poor for DH (34%) and DS (37%). Adequate knowledge of HPV was lower for DH compared to DS (57% vs. 75%) while adequate knowledge of vaccination was slightly higher in DH (46%

to DS 44%). More DH students (99% vs. 57%) felt a head and neck exam (HNE) should be conducted each office visit. 94% of all students communicate with patients about the purpose and results of the HNE, yet 80% of both student groups cited not feeling comfortable discussing HPV-OPC etiology and sexual history. Insufficient appointment time was another critical factor in lack of willingness to discuss HPV-OPC. Fewer students said they had insufficient time to discuss vaccines (DH 37% vs. DS 54%). 77% of both groups cited lack of vaccine information as a barrier to communication. Interestingly, a high percentage of students (DH 82%, DS 86%) are willing to be trained to administer the HPV vaccine.

Conclusion: The world has vastly benefited from vaccine programs to control the morbidity and mortality of infectious diseases. Dental education curricula emphasis on HPV disease management through vaccination holds great potential for decreasing HPV-OPC rates. OHPs must play a major role in addressing the public health cancer crisis associated with HPV.

Dental Hygienist's Knowledge, Attitudes, and Practice for Patients with Dental Anxiety

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Problem: There is a lack of recent research regarding the association between dental anxiety (DA) education and dental hygienists (DHs), suggesting a high demand for updated research implicating DHs experiences regarding their approach to patients with DA.

Purpose: The objective of the study was to assess the knowledge, education, attitudes, confidence, and practice of DHs providing dental care to adult patients with DA.

Methods: The cross-sectional study used a purposive sample of DHs (n=412), using a snowball sampling technique, were recruited through dental hygiene social media sites. Inclusion criteria were limited to actively practicing RDHs in the United States (US) who completed the entire survey. The modified survey had 29 questions regarding DA knowledge, education, attitudes, confidence, and practice. A regression analysis and chi square tests were performed on the data with research outcomes represented through frequency tables and percentiles.

Results: Dental hygienists reported DA as a “somewhat serious” to “extremely serious” issue when treating patients (72.7%). Those reporting their education had not prepared them to address DA were more likely to report the need for greater DA education. Those who reported their education prepared them to address DA, 48% reported the need for additional education in DA. Dental hygienists who reported a higher level of confidence in addressing DA in their patients resulted in giving themselves extra time during their appointment to treat patients with DA.

Conclusion: Increased DA education in DH undergraduate curriculum, and post-graduate education opportunities may increase confidence and capability for management of DA.

Implementation of Oral Health Education in Nursing Curriculum

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Problem: Nurses are part of the primary care team and are in a perfect position to complete oral health assessments and provide counseling and referrals for their patients using current oral health content for nurses.

Purpose: The objective of the study was to evaluate the knowledge, confidence, practice behaviors, and perceived barriers of nursing students regarding preventive oral health services.

Methods: Using a pre-post survey study design, 64 Accelerated Bachelor of Nursing (ASBN) first-year students at the University of North Carolina at Chapel Hill were asked to complete oral health related questionnaires following a didactic and hands-on small group training workshop on principles of oral health, oral health screening, counseling, and referral to a dentist. A post-survey following clinical rotations was completed testing the long term effectiveness of the oral health training. Questionnaires were pilot tested prior to study initiation. Descriptive statistics were completed on pre-post surveys. Inferential statistics will be completed to compare pre-post questionnaire data.

Results: Fifty-five ABSN students completed the pre-survey, 49 completed the post-survey; 44 completed both surveys. Participants' that completed both surveys showed an

increase in knowledge scores from pre-post surveys for four of five questions. Confidence scores showed an increase in performing oral screenings (34% to 91%) and counseling patients about their oral health (91% to 98%); scores decreased in confidence regarding dental referrals (89% to 86%). Following intervention and clinical rotations, 45% of post-survey respondents indicated that they provided oral health counseling, 37% performed oral health screenings, and 8% provided dental referrals. Post-survey respondents reported that the oral health training increased their willingness to perform oral screenings (96%), provide oral health counseling (98%), and refer patients to a dentist (96%). One hundred percent of post-survey respondents recommended the oral health training for future nursing students.

Conclusion: Interprofessional didactic and simulated oral health educational opportunities increased knowledge, confidence, and willingness among ABSN students in delivering preventive oral health services in the medical home.

Efficacy of Glycine Air Polishing for the Maintenance of Dental Implants and Treatment of Peri-Implant Diseases: A Systematic Review

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Problem: Due to their biological composition, peri-implant diseases have become a challenge in the maintenance of dental implants. Glycine air polishing (GAP) is used for dental implant maintenance. There is no standardized protocol for the use of GAP in the maintenance of peri-implant diseases.

Purpose: To evaluate the clinical effectiveness of GAP for the maintenance of dental implants with or without peri-implant diseases including peri-implant mucositis and peri-implantitis.

Methods: PubMed and Medline were used to identify clinical trials that assessed the effectiveness of GAP in reducing clinical indices of inflammation. The authors utilized key terms such as; dental implants, implant maintenance, peri-implantitis, peri-implant mucositis, randomized control trial, glycine, and air polishing. Search limitations included human studies, published in the English language between 1995–2018. One hundred sixty-three (163) titles and abstracts were independently screened by two reviewers. Differences between the reviewers regarding included articles were discussed, and decisions were made to include or exclude the disputed articles. Articles with abstracts that were not relevant to the topic were eliminated.

Results: Eleven articles were identified, and nine were included in the analysis. A meta-analysis could not be performed due to the heterogeneity of the studies. Instead, a descriptive, systematic review was performed. Studies evaluated the effects of a variety of professionally applied treatments: GAP, ER:YAG laser, mechanical debridement, ultrasonic device, and localized application of chlorhexidine. All studies reported periodontal pocket depths (PPD), and bleeding upon probing (BOP). Other primary outcomes analyzed were plaque index/score (PI, PS), bleeding index/score(BI, BS), mucosal recession and overgrowth, clinical attachment level (CAL), bone height, implant crevicular fluid, and bacterial counts. All studies found GAP to have comparable results with other treatments in producing clinically beneficial outcomes. Data from two studies showed areas treated with GAP to have a significantly higher reduction in BOP, while one study determined a decrease in PPD when using GAP vs. mechanical debridement. Both the Er:YAG laser and glycine air polishing treatment methods were shown to reduce bacterial count one month after therapy, however failed to reduce bacterial load at six months. Follow up periods ranged from one week to 12 months.

Conclusion: The use of GAP has beneficial effects in the maintenance of dental implants by significantly decreasing clinically relevant measures. Furthermore, GAP is effective in non-surgical treatment of peri-implant diseases. More clinical studies are needed to evaluate and develop standardized protocols for the use of GAP for the maintenance of dental implants and non-surgical treatment of peri-implant diseases.

Integration of Forensic Dentistry/Catastrophe Preparedness Course in Dental Hygiene Curricula: A Twelve-Year Study

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Purpose: The study sought to measure students' perception of gaining advanced knowledge in core content and the effect this knowledge has on the decision to become more involved by furthering education or participation in community efforts in forensic dentistry and catastrophe preparedness. It also sought to relate the reasons for students taking the course and if it effected their future plans to seek further education and participation in forensic dentistry and catastrophe preparedness.

Significance: A Forensic Odontology/Catastrophe Preparedness course is uncommon in dental hygiene program curricula. The addition of these types of courses has the potential to raise

professional awareness and effect participation and professional development. Using these as a guideline, a Forensic Dentistry/Catastrophe Preparedness course is offered at New York University College of Dentistry.

Key features: Core Content of Forensic Odontology courses are in place and published by the American Board of Forensic Odontology (ABFO). The research received IRB approval from NYU and consisted of a survey with eighteen questions. A total of 85 students in the bachelor degree track completed the surveys, which represents 100% participation. The survey asked questions about gaining knowledge from each of the modules. This study cumulates twelve years of surveys taken by dental hygiene students upon completion of the course from 2005 to 2016.

Evaluation plan: A descriptive analysis was completed and the surveys indicate significant acceptance and satisfaction with the course objectives, content and experiences. Results: Fifty-nine percent of the students stated they are interested in furthering this type of education. Fifty-two per cent stated they planned to join a forensic team and thirty-five per cent stated they plan to join a reserve corps for preparedness and response. This study found that students are accepting in expanding their knowledge and experience in this field of study.

Glycine Powder or Sodium Bicarbonate Powder Air-Abrasive Debridement Around Implants: Which Is More Effective and Safer in Reducing Biofilm and Inflammation?

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Problem: Dental hygienists need to make evidence-based decisions when treating the bacterial infections associated with mucositis or peri-implantitis. Dental hygiene educators need to prepare students for clinical practice and licensing examinations and to present evidence-based course material.

Purpose: In patients with dental implants showing clinical signs of mucositis or peri-implantitis, will air-abrasive debridement using glycine-based powder compared with sodium bicarbonate powder, reduce more biofilm and inflammation without damaging the implant surface?

Methods: This systematic review sought to determine which agent to use in an air-abrasive debridement handpiece to treat signs of inflammation of mucositis or bone loss associated with peri-implantitis around titanium dental implants without damaging the implant surface. The literature review included peer-reviewed clinical trials and laboratory research

that compared the use of glycine-based powder and/or sodium bicarbonate in reducing inflammation and biofilm scores using recognized clinical indices, and implant morphology using scanning electronic microscopy. The NSU Health Professions Division Library, Cochrane Library, MEDline, PubMed, and the sub-specialty dental database of the U.S. Medical Databases were used. Resource information was used from the American Academy of Prosthodontics for best practices for implant maintenance instrumentation.

Results: Criteria included: confidence assessment, high quality of reporting, hierarchy of evidence, researcher credibility, timeliness, and suitable research designs in studies fewer than five years old. Twelve articles meeting the criteria supported glycine-based powder as a better choice than sodium bicarbonate to use in an air-abrasive handpiece when treating patients with mucositis or peri-implantitis. The surface of the titanium implants showed no damage with either agent; sodium bicarbonate-treated implant surfaces harbored more salt deposits.

Conclusions: The results indicate that air-abrasive debridement on ailing implants with glycine-based powder (a) reduces biofilm equally to sodium bicarbonate, (b) produces a greater reduction in inflammation, (c) does not damage the implant surface, and (d) could be a better choice for patients with sodium restrictions.

*Funding for this project was provided by the National Center for Dental Hygiene Research and Practice.

Perceived Barriers to Academic Success for International Students Studying at Dental Hygiene Programs in the United States

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Problem: Academic difficulty can often be a significant problem for students in health professions programs, including dental hygiene. International students often encounter various barriers to their academic success, yet little is known about this phenomenon. International students may face a higher attrition rate due to their English language skills, adapting to a new educational system, and adjusting to different cultural norms. International and native dental hygiene students also need to learn the language of dentistry. Although research has been done in this area, there are no studies looking at the discipline of dental hygiene.

Purpose: The purpose of this study was to investigate international students' perceptions related to the barriers that

interfere with their academic success as students in a U.S. dental hygiene program.

Methods: This qualitative study utilized a purposive, sample of 12 dental hygiene students, from 3 baccalaureate level dental hygiene programs. Students participated in blended methodology research consisting of focus groups or interviews. A semi-structured interview guide was utilized. Demographic information was also collected. Data was gathered in a face-to-face focus group or through ZOOM© video conferencing. IRB approval was obtained from Simmons College and MCPHS University.

Results: The most significant barrier, for all 12 participants, was a lack of understanding of the English language. Differences in customs, especially classroom behaviors, and adjusting to a different educational system were also found to present challenges.

Conclusion: The findings of this study were similar to those in other disciplines, with language literacy and communication skills presenting the biggest challenges. A new finding was the level of respect, or lack thereof, between students and faculty. Some international students overcome these barriers and are ultimately successful others are not so fortunate. Future research should address study habits of international students and how interventions/recommendations have aided international students in achieving academic success.

Dental Hygiene Student Perceptions Regarding Loupes and Headlights

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Problem: The use of magnification loupes and coaxial illumination, commonly known as headlights, in dentistry has been dramatically increasing in past years. Research has discussed the benefits to ergonomics that the use of this technology offers to dental professionals during patient care. Based on this research, some dental hygiene programs are requiring the use of magnification loupes and headlights. There is limited research regarding the use of this technology in the educational setting to support whether these should be mandated for student and faculty use as part of patient care.

Purpose: The purpose of this study was to determine the perceived value of using loupes and headlights among dental hygiene students. Objectives included determining the perceived impact on the ergonomics, accuracy and efficiency of patient care. The study also assesses the attitudes toward the required use of this technology by dental hygiene students and faculty.

Methods: This IRB approved study was conducted using an online Qualtrics survey. The 24-question survey was distributed through university email to all dental hygiene students at 7 of the 13 dental hygiene programs in Ohio who chose to participate. The 148 responses from this convenience sample were collected anonymously.

Results: Of the respondents 90. 5% reported wearing loupes and 86% reported using a headlight. Those who agreed or strongly agreed that loupes improves accuracy and efficiency of patient care were 94% and 91%, respectively, with a slight drop to 92% and 90% regarding a headlight. 98% perceived improved ergonomics with loupes, 81% with a headlight. Only 5.1% felt that they would be as comfortable providing patient care without loupes while 23. 4% would be comfortable without a headlight. 67% agreed or strongly agreed that loupes should be required of students, 82% of whom indicated that this equipment should be introduced during pre-clinical courses. The number of positive responses dropped to 48% regarding a headlight mandate. The students felt less strongly that faculty be required to use loupes and a headlight at 55% and 31%, respectively.

Conclusion: Although 61% were mandated, the results between those within a program mandating loupes and those that did not were similar regarding improved ergonomics, accuracy and efficiency of patient care. Loupes were perceived as more valuable for patient care than headlights. Respondents indicated that they would feel compromised in providing patient care without magnification or a headlight. Respondents who were not mandated to purchase loupes or headlights were less supportive of a mandate.

A Way with Words: A Pilot Study Using Tailored Provider-Patient Communication to Advance Oral Health Literacy

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Problem: Poor oral health literacy (OHL) can lead to unnecessary oral disease, which has been associated with systemic diseases like cardiovascular disease, diabetes, some cancers, and pre-term low birth weight. More study is needed concerning practical ways to improve OHL in dental clinical settings.

Purpose: The purpose of this pilot study was to determine if an oral health education intervention, using a tailored provider-patient communication technique called the teach-back method, could affect OHL levels in adults; and, to determine

the practicality and acceptability of the intervention's delivery model in the dental clinical setting.

Methods: A pilot study, pre-experimental one-group pretest-posttest design, was implemented at a FQHC. The Health Literacy in Dentistry (HeLD) (Parker et al., 2012) assessment tool was used pre/post intervention to assess participants' OHL levels. The intervention consisted of a 30-minute, single face-to-face patient education module using the teach-back method covering the oral/systemic link and proper oral hygiene. Changes in total score from pre/post-intervention OHL data were analyzed via a paired samples Student's t test to determine a statistical significant mean change post intervention. Study participants' age and self-efficacy were also assessed for effect post intervention. All statistical testing was two-sided with $p<0.05$ considered statistically significant. Effectiveness of tailored provider-patient communication and patient understanding of information presented in the intervention was evaluated through the use of a learning outcome rubric and tracking log specifically developed for this project. The instrument was used to assess patient understanding of the face-to face oral health education intervention encounter.

Results: Of the 36 participants who participated in pre-assessment and the initial portion of the intervention, 29 returned for the 2-week follow-up and post assessment. Although there was a positive change in the overall mean HeLD score from pre to post intervention by 3.5 points, the calculated p value was 0.435 indicating no statistical significant improvement of OHL levels post-intervention. The intervention did not have a statistical significant effect on self-efficacy among study participants. A significant negative association was noted between change in HeLD total score and age ($R_s=-0.292$, $p=0.033$) indicating the positive change in HeLD score decreased with increased age; linear regression indicated younger participants tended to increase their HeLD total score more than older participants. Test parameters (i.e., established time limits for module delivery) were met concerning the practicality and acceptability of the intervention's delivery model. The teach-back data was scored according to the learning outcome rubric and tracking log. A dichotomous measure of whether the participants met the learning objective was assessed. Subjects meeting the learning objective were to be compared to those who did not, to determine whether age may influence meeting the learning objective; however, 100% of all post study time point participants met pre-established learning objectives at posttest analysis.

Conclusion: While OHL levels in adults who participated in the intervention did not increase, the second objective of this study was met. The use of tailored provider-patient

communication and the constructs of the teach-back method for oral health instruction were well received by participants and education assessment results indicated the method can enhance the receiver's oral health practices. Likewise, tailored provider-patient communication via this method can be delivered consistently and practically in the clinical setting.

Assessing Emerging Pediatric Dental Workforce Preparedness to Improve Oral Health Outcomes for Infants and Young Children in Hawai'i

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Problem: Children 0-5 years of age in Hawaii experience the worst childhood oral health outcomes nationally: 7 out of 10 3rd graders experience tooth decay, 7% need urgent dental care and 60% lack dental sealants. Workforce data indicates 80% of local dentists practice in general dentistry, less than 4% serve the pediatric population and only 36% of dentists participate in Medicaid. In addition, the only BS Dental Hygiene Program in Hawai'i currently offers students <1% of their clinical experiences with children. To improve pediatric outcomes, DH students must be better prepared to meet the oral health needs of 143,075 children on Medicaid.

Purpose: The aim of this study was to understand current employment settings, practice type and percent of pediatric patients served by recent BS DH graduates. Secondly, the survey assessed comfort in providing pediatric oral health care services such as dental sealants, fluoride varnish and oral health education to parents as well as gauge interest in a post-bachelors pediatric expanded function dental hygiene certificate program.

Methods: The sample for this cohort study consisted of the last three BS DH classes (2014-2016). Convenience sampling was used with survey distribution to sixty DH graduates using Google Forms. Survey questions asked for demographic information, pediatric experiences, practice patterns post-graduation and interest in a future pediatric DH program.

Results: The survey results from (N=29, 49% response rate), using descriptive statistics, revealed that only 10% of the graduates worked in a pediatric practice and overall, 10% of patients seen were 0-5 years of age and 11-25% were 5-18

years of age. Graduates described comfort with providing pediatric dental care as developing but not proficient. In addition, 97% of graduates would consider obtaining a post-BS pediatric expanded function DH certificate.

Conclusion: Limited pediatric didactic and clinical educational experiences for BS dental hygiene students may affect the choices of dental practice settings following graduation, as well as the graduates' comfort level in providing pediatric care. Curriculum changes should be considered in order to improve the comfort and skill level of future BS students in the area of pediatric dental care.

Does Dental Hygiene Student Engagement While Enrolled in the Dental Hygiene Program Influence Academic Achievement?

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Problem: Dental Hygiene Programs are concerned with dental hygiene student success. Expansion of the scope of dental hygiene responsibilities, reflected in Dental Hygiene Practice Acts, has led programs to intensify curriculum with more robust and demanding dental health instruction. Therefore, concern over students' abilities to progress and graduate has prompted dental hygiene programs to investigate ways to improve student success.

Purpose: Utilizing Alexander Astin's, Student Involvement: A Developmental Theory for Higher Education, this study investigated national trends of dental hygiene student engagement, both in the dental hygiene program, and in student chapters of the American Dental Hygienists' Association (ADHA). The study investigated dental hygiene student involvement and its association with student success, as measured by cumulative GPA. The intent of this study was to present results that provide dental hygiene educators with a better understanding of how dental hygiene student involvement impacts academic achievement.

Methods: The ADHA electronically distributed the researcher's originally prepared 40-item questionnaire to 12,000 dental hygiene students in accredited US dental hygiene programs. The response rate was 22% and a completion rate of 94%. The research design was quantitative non-experimental and adapted Astin's I-E-O model as a data analysis framework. Student demographics represented inputs (I), dental hygiene student-interactions represented environments (E), and cumulative grade point average (GPA) represented the output (O). The goal for this procedure was to control and adjust for student input variable

effects, to determine their influence on the student's GPA. The survey data were analyzed using causal analytical modeling via blocked regression analysis (CMBRA). Regression analysis was used to investigate if any correlations existed between the independent variables and the dependent variable.

Results: Three positive predictors were found to influence student success. The statistically significant predictor variable describe the quality of interactions with faculty (0.087^{**} P-value < 0.01), indicated the higher students rated the quality of interactions with dental hygiene faculty, the higher their GPA. Holding a higher education degree ($\beta = 0.063^{**}$, $p < 0.001$) was found to be a significant predictor. Thirdly, self-report of quality of interactions with program director ($\beta = 0.017$), indicated the higher students rated the quality of interactions with program directors, the higher their GPA.

Conclusions: There is little research on dental hygiene student engagement in dental hygiene programs, or in student chapters of the ADHA. This study's data may promote future educational program policy changes to enhance dental hygiene student engagement activities, leading to improved student success.

Enhancing the Public Health Education of Dental Hygienists through an Interprofessional BSDH/ MPH Degree Program

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Problem: Public health is inherently an interdisciplinary field. The achievement of the goal of *Health for All* requires the intellectual and creative contributions of professionals from a multitude of fields. Students in the dental hygiene profession, a discipline with prevention at its core, will be faced with multiple opportunities to engage in public health during their careers. The American Dental Hygienists' Association defines five professional roles for a dental hygienist. As such, whether a hygienist chooses a career in clinical practice, education, administration, research and/or advocacy, public health will be at the core and focus of their role. The purpose of the accelerated program is to provide a dental hygiene student the ability to begin graduate coursework while still a baccalaureate degree student, and enhance the role of a dental hygienist with a graduate degree in public health.

Significance: Advanced educational programs that enable dental hygienists to assume public health leadership roles, support the need to prepare a diverse healthcare workforce tasked with solving unmet oral and general health problems. These programs facilitate interprofessional education as students from many disciplines on campus (medical, nursing, social work, dental, pharmacy, law) take public health graduate courses. This collaboration between baccalaureate dental hygiene and graduate public health programs sharing a similar emphasis on health promotion and disease prevention, monitoring of population health status and needs, and strategic efforts to plan evidence-based, effective and efficient, comprehensive, equitable and sustainable healthcare initiatives, provides an innovative approach to empowering healthy individuals and communities. We have developed an accelerated program for undergraduate dental hygiene students desiring a graduate degree.

Currently there are 21 masters in dental hygiene programs in the United States. Dental hygiene baccalaureate programs lacking a masters degree in dental hygiene can collaborate with other graduate programs on campus enhancing a dental hygienist's graduate experience beyond dental hygiene—creating a collaborative provider, be it clinical, research, administrative, leadership or education. The creation of an accelerated BSDH to graduate program can “jump start” an undergraduate's path to graduate school. Students can choose in the spring of their first year in dental hygiene if they would like to pursue an MPH through our innovative accelerated BSDH-MPH program. If so, they apply and can be “conditionally accepted” by the MPH graduate program and allowed to take 2 graduate courses (one in the fall and one in the spring of their senior year), in lieu of 2 undergraduate dental hygiene courses. These courses count for the BSDH and the MPH degrees. In the winter/spring of their senior year they formally apply to the MPH program. After BSDH graduation in May, they are fully enrolled graduate students. While starting out small (2 students are currently graduate students from the DHYG graduating class of 2017), this program has been innovative and exciting to potential dental hygiene students and proved to be a great fit to the professional objectives of expanding the dental hygiene knowledge base. This presentation describes the program, identifies challenges faced in implementation and how they were addressed and shares outcomes of the inaugural class.

Key features: At the University of Maryland, Baltimore, we have developed a pipeline program for undergraduate dental hygiene students who are interested in careers in public health. Key features are a formal MOU collaboration between School of Dentistry (SOD) and the School of Medicine (SOM)

Master of Public Health program. Upon BS graduation and fulfillment of contingent admissions criteria for the MPH program, DH graduates matriculate seamlessly into the MPH graduate program having completed 2 core MPH courses. This accelerated program increases the cadre of public health educated RDH-BS, MPH graduates; expands the capacity of dental hygienists to address public health issues and serve local, national and global communities.

Evaluation plan: The academic calendar provided challenges for coursework. The calendars of the MPH and the BSDH differ; the MPH program had to move a summer course to the fall so that the tuition of the undergraduate student would be in effect. Otherwise our BSDH student would be charged graduate credit fees. Furthermore, the dental hygiene program created a one credit “Special Topics” course so that required learning objectives were achieved to meet the dental hygiene program competencies. The Special Topics course provided dental hygiene program-specific content needed for completion of the BS degree that was not present in the 2 MPH graduate courses.

Successful BS to MPH matriculation and retention and graduation rates of BS to MPH students will be used to evaluate effectiveness of the accelerated BS to MPH program. Currently there are 2 students that applied and successfully entered the program and are currently in graduate school for the MPH. These inaugural students will complete their first year of graduate school this year. They were successful taking the graduate coursework while in our undergraduate program and the MPH Director stated that they brought in a dental perspective to an interprofessional cadre of MPH graduate students. Evaluation will monitor the successful transition of further students in the future into this accelerated program and the completion of our inaugural two students.

Promoting Discussion and Peer-Learning with Student Response System

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Problem: Formative assessment, including low-stakes quizzing, is essential to monitor student progress. Quizzes can be conducted using student response systems (SRS), otherwise known as ‘clickers’. Demonstrated advantages of SRS include increased student participation, interactivity, promotion of class discussion, instant availability of results, and immediate instructor feedback. SRS can be also used in peer-learning activities. However, faculty may hesitate to incorporate SRS

due to perceived difficulty in learning and using the system by their students.

Purpose: This study (CUNY IRB approval #2015-0464) evaluated the students' perceptions about incorporating SRS and peer-learning activities using clickers in the first-semester dental hygiene course Oral Anatomy (DEN1112).

Methods: Two hundred forty-two students (n=84, 2015; n=76, 2016; n=82, 2017) participated in the primary longitudinal cohort study by completing an anonymous paper-based survey about their experiences with clickers in DEN1112 and their views about SRS as an assessment tool for quizzes. All students in DEN1112 were eligible to participate and survey response rates were 96.6%, 96.2%, and 100% in 2015, 2016, and 2017, respectively. The SRS (ELMO, New York, USA) has been used for weekly quizzes in DEN1112 since fall 2015. In fall 2016, peer-learning activities were introduced in quizzes using clickers. Peer-learning method allowed the students to discuss selected quiz questions in small groups after submitting their initial answers and then answer the question again with only their second answer recorded for grading. Following the introduction of peer-learning activities in fall 2016, the students were also asked about their opinions about the peer-learning method. Results were analyzed by descriptive statistics.

Results: Although the majority (73.97%, n=179) of all respondents were not familiar with clickers before DEN1112, at the completion of the course 56.42% of them felt 'very comfortable' and 33.52% were 'somewhat comfortable' using SRS. Overwhelming majority of all students felt that weekly quizzes were helpful in motivating them to study for each session and students valued the interactivity, user-friendliness, and immediate feedback and discussion provided by the SRS. Since the introduction of the peer-learning activities in Fall 2016, majority of respondents (85.44%, n=135) found peer-learning small group activities using clickers 'very helpful' and fifty students explained in the optional comments how peer-learning was beneficial to them. Most respondents (92.86%, n=143) estimated that they changed their initial answer 50% of times or less following small-group discussions.

Conclusion: The majority of students easily adapted to clickers and embraced the interactivity, discussion, and feedback enhanced by the SRS. Students appreciated the small-group interactions during clicker-based quizzes and noted the benefits of peer-learning.

Student Perceptions of Adaptive Quizzing

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Problem: Dental hygiene education programs are faced with challenges such as student retention, ensuring students' competence to provide care to diverse patient populations and successful completion of standardized examinations required for licensure. Many the Fones School of Dental Hygiene students require educational support due to culturally and linguistically diverse backgrounds and financial constraints leading to employment demands. Student perception and use of adaptive quizzing which was integrated into courses to assess knowledge, develop test-taking skills, and provide educational support, was evaluated via an anonymous survey to determine its impact on confidence and content preparedness for coursework and taking the National Board Dental Hygiene Exam (NBDHE).

Purpose: The purpose of this study was to determine student utilization and perceptions of Elsevier Adaptive Quizzing (EAQ), and focused modular testing, within dental hygiene courses during the 2016-2017 academic year. Additionally, modular content testing related to the three major NBDHE areas as well as an exit exam were conducted with the class of 2017. The descriptive survey assisted with program evaluation of the value of this resource to students' reported academic confidence and success.

Methods: An electronic link to a descriptive survey, created in SurveyMonkey®, was provided to 82 potential participants, with a response sample of 61 students (74%). Participants (N=61) from the classes of 2017 (n=28) and 2018 (n=33) utilized adaptive quizzing for required classwork, assigned quizzes and academic remediation. Additionally, students could self-initiate quizzing, exam preparation, evaluate reading comprehension and pre/post lecture review of content. Survey accessed by all participants consisted of 21 EAQ-based questions. Participants from the Class of 2017 were provided four additional questions related to Health Education Systems Incorporated (HESI) Modular Exams. This testing evaluates student content competency at predetermined intervals throughout the program. Descriptive statistics were used for calculating and reporting results.

Results: Twenty participants (33%) identified English as a second language, 74% (n=45) used EAQ for self-quizzing and

56% (n=34) used it for test prep. Participant's strongly agreed/agreed adaptive quizzing improved knowledge of course content (57%), improved confidence with material (54%) and identified weaknesses during exam preparation (61%). Class of 2017 participants (n=28) strongly agreed/agreed modular testing improved confidence with question formatting (57%) and was beneficial in board exam preparation (53.5%).

Conclusion: Adaptive quizzing and NBDHE modular content testing are viewed by a majority of students as beneficial component to the educational process. Further study of the outcomes of these resources is needed.

Attitudes and Access Patterns of Michigan Veterans not Eligible for Veterans' Affairs Oral Health Care: A Cross-Sectional Study

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Problem: One dental visit annually is a key oral health objective of Healthy People 2020 to reduce oral health disparities. The veteran population is at increased risk of oral health disparities due to chronic health conditions, mental health disorders, unique social/cultural contexts, and significant socioeconomic challenges. While veterans qualify for health care through the Veteran Affairs (VA) system, oral health care is not included, leaving millions of socioeconomically challenged veterans without access to oral health care.

Purpose: The purpose of this study was to assess Michigan veteran's attitudes toward oral health care, access to oral health care services, and how they pay for those services.

Methods: A 24-question survey was developed and pilot tested. A paper survey was disseminated to a convenience sample of 300 veterans from Michigan affiliated with various veteran organizations including VFW and American Legion Posts, and student veteran organizations. Frequency distributions, means, and standard deviations were analyzed to provide an overview of the data. The Pearson chi-square test was used to investigate the association of having a service connected disability and VA medical and oral health care, dental benefits, and challenges of receiving oral health care. Significance was set at $p<0.05$.

Results: A total of 193 surveys were completed for a response rate of 64%. Forty-five percent of respondents reported a service-connected disability qualifying them for VA health care. While 77% reported not being eligible for VA dental

care, respondents rated the importance of dental health as extremely important (4.56, $\pm .806$). One-third of respondents reported not having a dental home, with 35% reporting no dental care in the last 12 months. More than half of respondents reported cost as the greatest challenge to accessing care. Pearson chi-square test found statistical significance of a service-related disability and receiving medical care at the VA hospital (.000), qualifying for dental care at the VA hospital (.006), receiving dental care at the VA hospital (.006) and having dental insurance benefits (.032).

Conclusion: Veterans in Michigan value the importance of oral health care, yet are subject to disparities in access to care. Cost, ineligibility for VA oral health care, and lack of dental insurance are the greatest barriers to veterans accessing oral health care. Further studies should focus on the unique cultural and social contexts of veterans that impact oral health disparities in the veteran population.

Expanding the Pediatric Dental Workforce to Improve Oral Health Outcomes for Infants and Young Children in Hawai'i

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Purpose: The goal of this program is to increase access to dental services for children between 0 and 5 years of age residing in underserved areas of Hawai'i by enhancing the University of Hawaii at Manoa Bachelor in Science Dental Hygiene (DH) curriculum and implementing an Expanded Function Dental Hygiene (EFDH) certificate program.

Significance: Children in Hawaii experience the worst oral health outcomes nationally: 7 out of 10 third graders experience tooth decay, 7% need urgent dental care and 60% lack dental sealants. Currently, 80% of dentists are in general practice, less than 4% serve the pediatric population and only 36% participate in Medicaid. In addition, there is only one Bachelor (BS) Dental Hygiene (DH) Program available in Hawai'i which currently offers DH students <1% clinical experiences with children. The University of Hawaii at Manoa (UHM) School of DH will revise the current DH BS curriculum and develop an EFDH certificate program to prepare graduates to meet statewide oral health needs of 143,075 children on Medicaid.

Key features: Year 1, the BS curriculum will be revised and an EFDH program curriculum will be developed and Year 2, the curriculum will be implemented, community-based mobile clinical training sites will be identified and pediatric dental residents will be engaged. In Years 3-5 of the grant the program will further increase enrollment to the EFDH program, track the progress of both EFDH and BS students, in addition to increasing the number of sites located in designated underserved rural community to improve dental access for children.

Evaluation plan: The EFDH program and revisions to the BS DH curriculum, which includes increasing pediatric didactic and clinical experiences, will be evaluated utilizing a clinical tracking tool (Typhon), student evaluations, in addition to feedback obtained from key stakeholders in the community. Typhon will measure key indicators of the program's success including the number of children 0-5 year seen for dental assessments by BS/EFDH students; number of community based sites engaging in (mobile) oral health care by DH students; the number of DH students enrolled in the BS and/or EFDH from neighbor islands; in addition to the number children 0-5 years accessing dental homes. An annual DH graduate survey will also measure practice patterns and comfort in providing pediatric care upon completion of the program. Formal and informal presentations to community members and health care providers will be used to disseminate results and to gain further insight on the ongoing community's oral health needs.

The Role of Dental Hygienists in Teaching Pre-doctoral Dental Students**

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Purpose: The purpose of this research was to investigate the parameters of didactic, preclinical, and clinical instruction to pre-doctoral dental students by dental hygienist educators.

Methods: There were two components to this study. The first was a primary, quantitative cohort study comprised of a seven-question survey sent electronically to all deans of clinical or academic affairs of the 76 North American, ADEA-affiliated dental schools. The study was exempted by the university IRB. If respondents indicated that dental hygienists teach dental students, they were asked to complete an additional eight questions regarding the titles, roles, educational degrees, and content taught by the dental hygienists. Data was collected with REDCap electronic data capture tools. For the second component, 102 graduating dental students, in a curriculum with a history of dental hygienists educating dental students, completed a questionnaire evaluating the impact of dental hygienist educators. Categorical variables were summarized with frequencies and percentages. Continuous variables were analyzed with means and standard deviations.

Results: Dental hygienists instruct pre-doctoral students in 76% of responding schools. In most schools, the minimum degree required to teach didactically is a master's degree, while a bachelor's degree is required at the preclinical/clinical level. Common content taught by dental hygienists was periodontal instrumentation. Other concepts frequently taught by dental hygienists were instrument sharpening, oral hygiene education/motivation, infection control and electronic health records. Research design and ethics were taught least often by dental hygienist educators. In 17% of responding schools, dental hygienists also instruct graduate level residents. There was not a significant association between dental hygienists instructing pre-doctoral students and the school offering a dental hygiene educational program. In the dental student questionnaire, 87% of respondents found dental hygienists to be very effective educators in the components assessed. There were no significant differences in responses between the traditional and international dental students.

Conclusion: Dental hygienists educate predoctoral dental students, providing curricular content beyond periodontics. Their educational role is highly valued by dental students.

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Problem: Cross-professional educators are an example of interprofessional education. Non-dentist basic science academicians have traditionally taught in the dental curriculum. Dental hygienists also instruct dental students; the extent of this pedagogy is unknown.

The Effects of Fenucure Toothpaste on Patients with Gingivitis: A double-blind, randomized, placebo-controlled clinical trial

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Problem: Gingivitis is a common form of periodontal disease that causes redness, inflammation and bleeding of the gingiva, the part of the gum that surrounds the teeth. Fenugreek or *trigonella foenum-gaucum L.*, leguminosae is an herb that has been used as a spice and for its medicinal properties for thousands of years. The toothpaste utilized in the study utilizes fenugreek extract, which is obtained through a patented process.

Purpose: The purpose of this clinical trial was to study the efficacy of toothpaste containing fenugreek extract (*Trigonella foenum-graecum L.*) on patients with gingival inflammation.

Methods: This was a double-blind, randomized, placebo-controlled, clinical trial. Fifty-six patients with gingival inflammation were randomly assigned to either the study group or the control group by an investigator not involved in the clinical examinations. This investigator kept the group assignments in a sealed envelope in a locked cabinet until the statistical analysis was completed. Toothpaste tubes were placed in bags labeled 1- 56 by the same investigator who assigned participants to their study groups. The allocation ratio of control to study group was 1:1. The control group consisted of 28 patients who used generic fluoridated toothpaste not containing fenugreek and the study group consisted of 28 patients who used toothpaste containing fenugreek extract. Fenugreek or *trigonella foenum-gaucum L.*, leguminosae, belongs to the plant family fabaceae. It has been used in many countries, including Asia, Europe, India, Iran, and the United States as a spice, an anti-inflammatory, an antibacterial, and to treat numerous illnesses. Most commonly, its medicinal uses include lowering blood sugar; increasing milk supply in lactating women, and as a skin-soothing agent to heal burns.

Patients were followed weekly for 4 weeks, at which times bleeding, inflammation and plaque indices were recorded by utilizing the Papillary Index of Muhlemann, Gingival Index of Loe and Silness, and the simplified Oral Hygiene Index (OHI-S), respectively. Statistical analyses were performed using SPSS statistical analysis software to identify differences between the control group and the study group. Descriptive statistics and repeated measure ANCOVA were used to analyze the data. IRB approval was obtained from the University of New Haven.

Results: Bleeding upon probing decreased by a mean of 1.0 in the study group who used the fenugreek toothpaste, whereas, it decreased less significantly (0.852) in the placebo group. In week 1 of the study, almost half (48%) of the participants were described as having red gingiva, with the remaining (52%) described as having pink gingiva. By week 4, those with pink gingiva in both the study group and control group rose to over 80%, with more improvement observed in the control group (+3.7%) than the study group. Plaque levels decreased in the study group in weeks 2-4 as compared to the group that used the placebo toothpaste, although not enough to be statistically significant ($p > .05$) ($F = .054$). Gingival inflammation, as measured weekly by the Gingival Index of Loe and Silness, showed a consistent decrease weekly in the study group while in the placebo group the inflammation decrease was less significant in weeks 1-3 and inflammation increased in weeks 3-4. Therefore, the final decrease in the mean from weeks 1-4 in the placebo group was 0.48 whereas there was a 0.56 decrease in inflammation after week 4 in participants using the fenugreek toothpaste.

Conclusion: The study results demonstrated a decrease in gingival inflammation and bleeding after using the toothpaste containing fenugreek extract. It is recommended that a large-scale study be conducted.

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Dental Hygiene Student Perceptions of Interprofessional Relationships and Learning

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Problem: With practice act changes, emerging societal needs, and new technology, the future of dental hygiene is evolving. As healthcare programs develop and implement new curricula, student attitudes need to be measured in order to assess Interprofessional Education (IPE) curricular effectiveness.

Purpose: This research study assessed dental hygiene students' attitudes toward IPE to determine its value and effectiveness in the curriculum.

Methods: This IRB approved study consisted of a convenience sample of 43 first and second year dental hygiene students. A two-level, within-subjects, quasi-experimental design was used to determine change in attitudes toward interpersonal

cooperation through participation in Open School. Two cohorts of dental hygiene students took the Readiness for Interprofessional Learning Scale (RIPLS) prior to and after participating in Open School. The RIPLS is a 19-item questionnaire that measures attitudes toward interprofessional cooperation on four subscales: Teamwork and Collaboration, Negative Professional Identity, Positive Professional Identity and Roles and Responsibilities. A Likert rating of 1-5, with one being strongly disagree to 5 being strongly agree was used. Descriptive statistics and dependent t-tests with alpha set at .05 compared pre- and post- survey data to look for changes in interpersonal cooperation attitudes.

Results: Data from the first cohort (N=29) confirmed fourteen students who completed both surveys based on ID numbers. All 19 survey items had high means in both pre and post surveys. Students had similar positive opinions with statements prior to and after Open School. Significant change was evident from pre to posttest in 7 of the 19 survey items. Students gave more positive responses at the end of the event with statements regarding shared learning, communication skills with other health professionals and working in small groups. Conversely, students gave more negative responses at the end of the event with the statement of not knowing their professional role; thus being more confident in what their professional role will be.

Conclusions: Although less than half of the statements showed significant improvement in responses, students responded strongly on both pre and post surveys. Students were confident with many of the statements prior to the Open School event. Additionally, students became more confident in knowing what their role would be in an interprofessional environment as well as communicating with other healthcare professionals and patients. They also expressed greater ability in becoming a team worker upon graduation. Favorable attitudes are impacting the collaborative educational opportunities provided to the dental hygiene students with the Open School event.

Clinical Teaching Behaviors as a Predictor of a Dental Hygiene Instructor's Emotional Intelligence

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found to contribute to effective clinical teaching. Research also suggests individuals who possess a high level of emotional intelligence (EI) are more successful in building strong interpersonal relationships. Yet, the evaluation of clinical instructors' EI and its link to clinical teaching effectiveness (CTE) has not been extensively examined.

Purpose: The purpose of this study was to measure the CTE and EI of dental hygiene (DH) clinical instructors, and to identify any statistically significant correlations found between the CTE and EI assessment outcomes.

Methods: A cross-sectional quantitative study was conducted to assess the level of emotional intelligence, and the clinical teaching effectiveness, of DH clinical instructors. A purposive, convenience sampling technique was used to recruit participants from 43 dental hygiene programs across the US. Two online assessments, the Mayer-Salovey-Caruso Emotional Intelligence Test (MSCEIT) and a modified version of the Nursing Clinical Teaching Effectiveness Inventory (NCTEI), were used to measure EI and CTE. Demographic data collected from participants was also included in the exploratory data analysis, which used both regression analysis and Spearman's ranked correlation coefficient to analyze the data.

Results: Forty-two clinical instructors, from DH programs representing nineteen states, completed both the MSCEIT and the modified NCTEI. Strong correlations were found between negative clinical teaching behaviors and MSCEIT outcomes. The NCTEI variable regarding an instructor's promotion of student dependence was negatively correlated to their MSCEIT overall ability score of emotional intelligence ($r_s = -.356$, $Q = .021$). The NCTEI variable regarding instructors' unrealistic expectations of students had a negative correlation to two subset MSCEIT scores, i.e., using emotion (demonstrating empathy) ($r_s = -.313$, $Q = .044$) and managing emotion ($r_s = -.326$, $Q = .035$), and a strong negative correlation to overall EI ability ($r_s = -.431$, $Q = .004$). These correlations were significant, as the adjusted R² statistic indicated the model accounted for 36% of the variance in overall EI of the study's participants.

Conclusion: Dental hygiene clinical faculty who exhibit negative clinical teaching behaviors, may also possess a low level of emotional intelligence. Raising awareness of the link between CTE and EI, and developing EI skills in instructors, may diminish negative teaching behaviors, and improve the learning experiences of students in DH clinical settings. Future research should also include the participation of DH students when assessing the CTE of dental hygiene instructors.

Problem: The development of strong interpersonal relationships between clinical instructors and students has been

Patients' Oral Health Literacy, Motivation and Barriers Regarding Interdental Deplaqueing

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affected by poor levels of literacy and motivation in patients. Future investigations should focus on methods to increase patient motivation and consistency of use with interdental devices.

Arresting and Preventing Early Childhood Caries through a Silver Diamine Fluoride and Fluoride Varnish program

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Purpose: Children in the United States miss over 51 million hours of school every year due to dental pain and dental visits. In 2008, 4 out of 5 children in Arkansas had evidence of past caries or were currently experiencing caries. As of 2015, 1,884 children below the age of 5 were living below poverty level in Pulaski County. It is well known that income has a direct effect on one's ability to afford medical or dental care, especially in a county where over 11% of its residents do not have health insurance.

Significance: The significance of this project lies in increasing access to dental care by providing dental screenings during childcare hours and by providing treatment sessions after work hours. The program is intended to reduce the current caries rate among children who attend University of Arkansas for Medical Sciences (UAMS) Head Start or live in the 12th Street neighborhood.

Key features: Children enrolled at the UAMS Head Start facilities, or who are residents of the 12th Street neighborhood were screened for dental decay, and received fluoride varnish application in October and November, 2017. Children with need for treatment of carious lesions were treated at a scheduled "kid's nights" at 12th Street Health and Wellness Center (12th St. HWC). Those children with urgent non-symptomatic decay received application of Silver Diamine Fluoride (SDF) in November and those with non-urgent decay received SDF treatment in February, March, and April, 2018. Parent education was completed by dental hygiene students as part of a community dentistry course.

Evaluation: Screenings, and fluoride varnish was provided for 181 (20%) of the children ages 2-5 enrolled at UAMS Head Start facilities. Screenings consisted of decayed, missing and filled teeth (dmft). SDF treatment was provided for the 6 (3%) children with non-symptomatic decay. Parents were educated on proper oral hygiene methods and benefits and drawbacks of SDF application. The overall savings with the

Problem: Periodontal disease has been linked to systemic effects and is mostly preventable through proper oral hygiene care. Despite this knowledge, patient compliance with interdental deplaqueing remains a concern.

Purpose: The aim of this mixed methods study was to assess patients' oral health literacy, motivation level, and barriers regarding interdental deplaqueing.

Methods: In a larger study comparing two interdental home care devices, forty-nine participants completed daily diaries and 2 questionnaires regarding motivation, tiredness, confidence and satisfaction for their deplaqueing method. Mantel-Haenszel chi-square tests analyzed these results. All participants were invited to focus group discussions about their oral health behaviors, literacy, motivators and barriers regarding interdental deplaqueing. Discussions were digitally recorded, transcribed, and imported into ATLAS.ti 7.5.15 to apply codes and identify themes.

Results: Analysis revealed no statistically significant differences between the two groups in age, sex or ethnicity. There was a statistically significant higher agreement among the floss group about ability to remove food/debris interdentally ($p=.01$), cleaning thoroughly interdentally ($p=.02$), fitting easily interproximally ($p=<.001$), and clean feeling of the mouth ($p=.01$). There was statistically significant higher agreement among the Soft-Pick® group about ease and efficiency of use ($p=.01$), convenience ($p=.003$), easy to hold ($p=.0001$), and easy use away from home ($p=.008$). Daily diary revealed higher motivation and compliance rates in the Soft-Pick® group. Some focus group participants reported not feeling clean unless they deplaqed interdentally, however, most reported lacking motivation due to time constraints, lack of immediate or tangible rewards, lack of knowledge on proper use of interdental devices, or benefits of using them.

Conclusion: This study showed that barriers to interdental deplaqueing may hinder patients' motivation to perform this function daily. Interdental deplaqueing behavior may be largely

use of SDF in comparison to traditional preventive and restorative measures was \$4873.00⁵.

Conclusion: This program has helped parents whose children attend UAMS Head Start locations in Pulaski County by providing dental screenings and dental treatment during school hours or after work hours. This program has the potential to screen over 800 children yearly. As parents realize they no longer need to miss work to fulfill the screening required to attend UAMS Head Start more participants are anticipated. As screenings increase, SDF treatment will likely increase.

Utilizing an Oral Care Specialist and Teledentistry within Title I Schools to Improve Access to Care

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Purpose: Dental hygienists practicing within a school setting as an oral health specialist are helping many children to receive preventive dental care and oral health education. Collaborative practice between the dental hygienist and a dentist utilizing teledentistry allows dental concerns to be identified and addressed early. This ground-breaking practice is new to the state of Utah and is designed to address access to care while demonstrating to stakeholders the viability of place-based care.

Significance: Oral health pilot programs have been created in two schools that have a large number of students below the poverty level. Most of these children face barriers to receiving regular oral healthcare and a significant number are from refugee families who have never experienced a dental visit of any kind. The onsite dental hygiene clinic offers preventive dental hygiene care and oral health education to students enrolled in the program and all students receive oral health education within the classroom. Comprehensive dental hygiene care is enhanced by utilizing a teledentistry exam by a collaborating dentist. Data is collected on demographics, screening outcomes, preventive services provided, and referral for dental needs.

Key features: The programs have a dental hygienist onsite up to two times per week to provide students with oral health education, examination/assessment, x-rays, prophylaxis, sealants, fluoride varnish and silver diamine fluoride application. This provides an oral health resource to the school that can immediately address dental needs. Dental hygiene students are utilized to assist the program in the data collection, teledentistry exams, and oral health education. The experience may increase the likelihood a dental hygiene graduate will

seek future opportunities to provide place-based care. A daily tooth-brushing program for first grade students is used in one of the school programs to further improve oral health outcomes.

Evaluation plan: The pilot programs use the Child-Level Data Collection form adapted from Sealant Efficacy Assessment for Locals and States (SEALS) from the Center for Disease Control. Data is collected to evaluate demographics, screening outcomes, and services provided. Preliminary results show that only half of students see a dentist regularly. Thirty percent of the students have either never seen a dentist, or only see a dentist for emergencies, even though more than seventy percent of the children have some form of dental coverage. Follow-up data will be compared as the program continues. ADHA IOH has provided funding for these pilot programs.

Student Providers' Blood Pressure Recording Practices: Device matters

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Purpose: This study's purpose was to compare three different types of blood pressure (BP) recording devices (an automated arm cuff, an automated wrist cuff, and a manual cuff/stethoscope combination) for accuracy, patient comfort, and convenience.

Methods: During this cross-sectional study, three types of sphygmomanometers were tested on a convenience sample of 150 study participants. Participants were obtained from the patients presenting for dental hygiene services at a Midwestern urban dental school. Systolic and diastolic measures were collected for all three devices, as well as two 5-point Likert scales: clinician evaluated convenience (with a rating of one being "very inconvenient" and five being "very convenient") and patient evaluated comfort (with a rating of one being "very uncomfortable" and five being "very comfortable"). Descriptive statistics were calculated for all variables of interest by cuff type. Repeated measures ANOVA using the Greenhouse-Geisser adjustment and ETA-squared statistics were used to test for differences in means in BP and rating measure by cuff type. Post-hoc comparisons using Tukey's procedure were calculated to determine pair-wise differences. An association between the cuff type and convenience rating was evaluated using the Chi-square test, and between cuff type and convenience rating using Fisher's exact test.

Results: There was a significant difference in systolic BP by cuff type ($p<0.001$). The automatic wrist cuff recorded an average of 11.30 and 8.76 mmHG higher systolic BP than the standard cuff and the automatic arm cuff respectively

($p<0.001$ for both). There was not a significant difference in systolic BP between the standard and automatic arm cuff ($p=0.226$) nor was there a significant difference in diastolic BP by cuff type ($p=0.137$). There was a significant difference in patient comfort rating by cuff type ($p<0.001$). The comfort rating averaged 0.68 and 0.62 higher (more comfortable) in the standard and automatic wrist cuff (respectively) on the 5-point Likert scale than in the automatic arm cuff ($p<0.001$ for both). There was also a significant difference in clinician convenience rating by cuff type ($p=0.005$). Hygiene students rated the automatic arm and wrist cuff higher (more convenient) than the standard cuff by an average of 0.35 and 0.31 respectively ($p=0.005$ and 0.019 respectively) on the 5-point Likert convenience scale.

Conclusion: Blood pressure cuff readings with traditional sphygmomanometer and stethoscope or an automated brachial cuff are comparable while the wrist cuff reading deviated significantly. For the measurement of consistent blood pressure, the three cuff types are not interchangeable.

Dental Hygiene Diagnosis: A Qualitative Case Study of Dental Hygienists

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Methods: A qualitative case study research design was employed with purposive and snowball sampling methods. Data were collected from semi-structured interviews with dental hygienists actively practicing in California, Oregon, or Colorado ($n = 10$). The interviews were audio-recorded, transcribed verbatim and verified for accuracy. Data analysis included open and axial coding to determine themes regarding DHDx. Member checks and peer examination established validity of the data analysis. The study design underwent full IRB review from Idaho State University's Human Subjects Committee and received approval (IRB-FY2017-252).

Results: Data analysis of participant interviews revealed four themes. The first theme validated the DHDx as a necessary component in the dental hygiene process of care that facilitates patient-centered care. Second, foundational learning of the DHDx begins in dental hygiene education; confidence and full value in the use of the DHDx was gained through clinical experiences. Third, dental hygienists create the dental hygiene care plan and include a holistic approach to care as they advocate for inter- and intra-professional referrals. The fourth theme confirmed that providing a DHDx helped improve patient outcomes through disease identification, dental hygiene interventions, and increased communication.

Conclusion: Dental hygienists use a systematic, patient-centered, holistic approach to dental hygiene care which authenticates the DHDx as a necessary and valuable component in the dental hygiene process of care. DHDx is an important factor for improving patient outcomes.

Incivil Classroom Behaviors in Dental Hygiene Education

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Problem: Dental hygiene faculty strive to maintain a classroom that maximizes teaching and learning. Fostering healthy student faculty relationships through awareness of uncivil behaviors is critical to an optimal teaching and learning environment. Minimal data has been collected on the perspective of the dental hygiene student and incivil behaviors in the classroom.

Purpose: The purpose of this study was to determine dental hygiene student perspectives on classroom behaviors that are disruptive to the teaching/learning process.

Methods: Following IRB approval, an online survey was sent to a convenience sample of 75 dental hygiene students (36 junior) and (39 senior) with a 100% response rate. Two demographic items, one open ended question and two quantitative questions comprised the survey. Participants used a four point Likert scale to determine the degree to which twelve behaviors were considered disruptive in the classroom and their frequency of occurrence over the past 12 months. Primary descriptive statistics were used for calculating and reporting results along with the Mann Whitney U test with a .05 level of significance to determine significant differences between junior and senior students.

Results: Seventy nine percent of respondents agreed that making sarcastic remarks in the classroom was disruptive. Similar results were found with cheating and talking in class with 76% of respondents agreeing these were disruptive behaviors. Seventy three percent of participants agreed that challenging authority was disruptive and almost three quarters (72%) found classroom sleeping disruptive. Less agreement was found with leaving class early as only 51% agreed this behavior was disruptive. Most students (79%) disagreed that eating in class was disruptive. Sixty-two percent of students agreed that using personal technology to engage with social media during class was in, which was also reported as the most frequent observed disruptive behavior with over 50% of students reporting this occurring at least 7 times over the past 12 months. Thirty three percent of students reported observing cheating at least one time over the past 12 months with 9% observing cheating over 7 times. When comparing overall scores of both student groups a Mann Whitney U Test revealed no significant differences ($p>.05$) between junior and senior students' opinions of disruptive behaviors in the classroom setting.

Conclusion: Effectively managing disruptive classroom behavior is a challenge even for the most seasoned educator. Results from this study provide educators with insight into what behaviors students find disruptive in dental hygiene education.

Dental Hygienists' Attitudes on and Confidence in Providing Nutrition and Exercise Counseling for Weight Management: A National Study

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Problem: The obesity epidemic in the US is of grave health and economic concern. Evidence suggests that consistent messaging should be taken by all health professionals to help patients improve their dietary and exercise habits. Dental hygienists (DH) historically have taken on the preventive role in the dental team. Therefore, they are well placed to take part in the interprofessional promotion of healthy nutrition and exercise habits for their patients.

Purpose: The aim of this study was to examine the attitudes and confidence of US dental hygienists in providing nutrition and exercise counseling, and to determine what factors are associated with confidence in providing such counseling. A secondary aim was to compare the results from a national sample of DH with those from a previously published study conducted in North Carolina.

Methods: A cross-sectional design was used. The 54-question survey, previously used in the NC study and obtained with permission, was emailed by the ADHA to its 13,846 members and data was collected via Survey Monkey software. Descriptive statistics were calculated for attitudes and barriers, and compared to the NC results. A regression model was used to determine factors associated with confidence. IRB approval was obtained from Columbia University on October 7, 2016.

Results: The response rate was 11% (n=1575). Almost all respondents felt that DHs have a role in helping patients improve overall nutrition (92%) and health (91%). Positive responses in the Confidence section on providing weight management advice ranged between 17% and 64%. Age ($p < 0.0001$), self-reported obesity ($p < 0.0271$), and dental hygiene school clinic facility ($p < 0.0012$) were predictor variables of confidence. Tests of reliability were conducted. The Cronbach α of Attitudes section questions = 0.80* and of Confidence section questions = 0.89. Findings between the US and NC studies were comparable, with the exception of weight stigma, which has decreased.

Conclusion: While most US dental hygienists are interested in helping patients with their overall health, they report low to moderate confidence in providing nutrition and exercise counseling for weight management.

Utilizing Photography and Self-Assessment of Ergonomics Among Dental Students

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Problem: Dental professionals are at high risk for musculoskeletal disorders (MSDs) due to static working positions for extended periods of time. Proper ergonomics are taught didactically in dental schools across the nation and yet musculoskeletal pain has been identified as early as during their entry level dental education.

Purpose: The purpose of this study was to determine whether feedback involving photography and self-assessment would improve ergonomic scores and the accuracy of ergonomic self-assessments among dental students.

Methods: The study involved a randomized control design of 135 dental students. There were 33-35 dental students per dental class who consented to participation. The participants in each class were randomly assigned to either the control or training group. At weeks one and four, all participants had two photographs (frontal and profile view) taken and at weeks one through four, all participants completed ergonomic self-assessments, using a Modified-Dental Operator Posture Assessment Instrument (M-DOPAI). During weeks two and three, participants in the training group were also photographed and used those photographs to aide in completing the ergonomic self-assessments. All participants' pre-training and post-training photographs were evaluated for ergonomic scores by two faculty raters.

Results: A mixed-design ANOVA of ergonomic scores as determined by the faculty raters revealed that ergonomic scores improved for all students who received the ergonomics training by using their photographs to aide in completing the ergonomic self-assessments ($F(1,254)=17.41$, $p<0.001$). In addition, a mixed-design ANOVA of Kappa coefficient values between participant self-assessment scores and rater scores revealed that the accuracy of self-assessment scores improved for all participants who received the ergonomics training ($F(1,127)=6.33$, $p<0.05$).

Conclusion: Ergonomic training incorporating self-assessment and photography resulted in improved ergonomic scores from pre-test to post-test and increased accuracy of ergonomic self-assessment among dental students. The use of photographs and self-assessment provides dental and dental hygiene educators with a pragmatic method to improve students' self-assessment skills, increase students' awareness of any postural deviations from ideal, which may improve musculoskeletal health long-term.