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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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Challenges Facing the Profession 2020: Dental hygiene education in the era of COVID-19

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As I sit writing this, I find myself nearly two months into a "stay-at-home" order while our country deals with the COVID-19 pandemic. These times have created pandemonium for most, and we grieve for those who have lost loved ones to this virus. My intention with this editorial is to draw attention to how dental hygiene education has responded, and what it could mean for us and for our profession in the future.

With over 20 years of experience teaching online, I could not be prouder of how our schools and universities have scrambled to adjust to our new normal. While there will eventually be an end to this, or at least a much-reduced threat as we develop vaccines and reach herd immunity, we cannot allow ourselves to become complacent in snapping back to what we were before COVID-19. As Plato once stated, "Necessity is the mother of invention" - this could not ring any truer today! We are discovering new ways to keep our educational programs advancing, robustly using the technology and tools, that if we are honest, have been available for nearly two decades. These strategies have been there in plain sight, and have been either unused or underutilized. This is our chance to really advance our skills in a world of teaching and learning with technology.

I have often written and spoken about how education has allowed corporate America to define our roles in teaching and learning when it comes to technology. For every new gadget or software that reaches the market, we are told *how we must use it*, and that *our students expect us to use it*, along with other similar directives designed to make us feel incompetent as educators. Now is the time to take back our command of what it means to educate our students, using our knowledge and experience as educators to define what is and what is not helpful in our teaching and learning environments. It is time for faculty who are actually in the classrooms, labs and clinics to redefine how technology does, or does not, advance our teaching and learning environments. While we are led to believe the technology is what students demand, that has not been my experience this past 20 years. Similar to faculty, we need to have students defining what technology is, and is not, helpful to *their* learning. We need greater educational research to assist us in making evidence-based decisions about what technologies will be most effective in our learning environments.

In terms of the practice of dental hygiene, these times have the potential for amazing innovation as we become more aware of the need for telehealth! Medicine is showing us the way, now we need to grab on and move our profession forward with the capability of dental hygienists providing oral healthcare services to communities that currently lack access due to our practice model in dentistry that has been in place for over a century. As the scope of practice of dental hygiene is expanded across the country (*Thank you ADHA, governors and state legislators!*), we must rise up and show how we are taking that legislation seriously and are documenting our work of expanding access to oral healthcare. I have been fortunate to have been involved in an education/practice collaboration with the state of Kansas when they authorized legislation creating the Expanded Scope of Practice (ECP) III for dental hygienists. The dental board requires an educational component for dental hygienists to receive the ECP III certification. The University of Missouri-Kansas City School of Dentistry was asked by the dental board to provide that educational component knowing of our experience with

distance and online education. Today we are in our seventh year of delivering the ECP III course. Through the years, we have created a practicum experience for our senior dental hygiene students who over the course of their last semester, are able to interact with dental hygienists across Kansas who are practicing, or considering practicing, within the health care safety net. The synergy between students nearing graduation with practicing dental hygienists is nothing short of inspiring! I am brought to tears each year as these dental hygienists share their stories of working to provide much needed access to oral healthcare. It is more obvious each year why we need dental therapy mid-level providers, so basic restorative services can also be provided for the populations unable to access the traditional dental practice delivery model.

I am extremely honored to have been invited to contribute to the Surgeon General's 2020 report in the section devoted to oral health integration, workforce, and practice. In the guest editorial of the February 2020 issue of the *Journal of Dental Hygiene*, Battrell and Lynch, point out how rare it is that the surgeon general would issue a second report on oral health, the first being, "Oral Health in America: A Report of the Surgeon General" in 2000. It is clear that the surgeon general recognizes that there is still much work to be done 20 years later. Dental hygiene will be highlighted in the report for their contributions in increasing access to oral healthcare, but we cannot stop there. Technology is already available to make telehealth a regular practice for dentists and dental hygienists across the country. Imagine if dentistry and dental hygiene had been able to step forward during this COVID-19 crisis to ask "what can we do – we are qualified health care providers."

Much like our transition to distance and online education that has opened up possibilities for many dental hygienists across the country to advance their education and careers without having to relocate to our physical campuses, telehealth provides that same opportunity for those parts of our population who are unable to access traditional health care. They said it could not be be done back when the University of Missouri School of Dentistry's Division of Dental Hygiene became the first program in the country to transition their degree completion and graduate programs to distance and online delivery. That was twenty years ago! Let's not take that long to show how dental hygiene can be integral to the telehealth movement. Dental hygiene education has risen to the challenge over and over again. Let's make telehealth a regular part of our curriculum so students hit the ground running upon graduation to practice in this new world of telehealth, the safety net environment of community health centers and federally qualified health centers (FQHCs), as well as traditional dental settings. We know the many benefits of interprofessional collaboration in healthcare, improved patient care and outcomes, reduced inefficiencies and healthcare costs, improved job satisfaction, to name a few. Let's show Plato that we heard what he said nearly two and half centuries ago, and we "get" it!

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Research

Impact of an Interprofessional Education Intervention and Collaborative Practice Agreements of Expanded Practice Dental Hygienists in Oregon

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Abstract

Purpose: The state of Oregon developed the expanded practice dental hygienist (EPDH), to address oral health care disparities. The establishment of collaborative practice agreements between dental hygienists (DH) and physician assistants (PA), has created a need for interprofessional education (IPE) for future interprofessional collaboration with EPDHs. The purpose of this study was to assess the impact of an IPE intervention on future interest in collaborative practice agreements.

Methods: Current and former DH and PA students from Pacific University Oregon (n=420) were invited to participate in an electronic survey. The 39-item survey included questions related to an annual IPE activity and questions related to collaborative practice agreements between PAs and EPDHs. Descriptive statistics were used to analyze the data.

Results: A total of 80 DHs and PAs completed the survey for a response rate of 19%. There were high levels of agreement between DHs and PAs in regards to valuing the expertise of other health care providers, teamworking skills and interprofessional collaboration for a better understanding of a patient's condition. Only 18.9% (n=7) of the DH respondents and 25.6% of the PA respondents (n=11) were aware of the collaborative practice agreements for Oregon EPDHs.

Conclusion: Participants from DH and PA disciplines agreed patient care is improved by collaborative practice fostered through interprofessional education activities. Multiple approaches may be needed to increase knowledge on the EPDH collaborative practice agreements with PAs in Oregon.

Keywords: interprofessional education, dental hygiene workforce models, collaborative practice, dental hygienists, physician assistants

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Introduction

It has been almost two decades since the landmark Surgeon General's report cited that oral health is an important component of general health. Dental hygienists (DH) were identified as practitioners that could aid in improving the public's access to oral health care.[1] Oregon was one of the first states to implement the Surgeon General's recommendation of utilizing DHs to increase access to oral health care by granting dental hygienists a "Limited Access" permit (LAP) enabling them to provide care to individuals with either limited or no access to oral health care.[1,2] Through the completion of additional courses and increased clinical practice hours, the LAP allowed a DH to complete oral health assessments to identify unmet needs, create a treatment plan to address the needs, and provide preventive services without the supervision of a dentist.[1,2] In 2007, the name LAP was changed to "Expanded Practice" permit (EPP), and dental hygienists holding this permit were identified as expanded practice dental hygienists (EPDH).[2] The EPDH may provide services in "public and nonprofit community health clinics, extended care facilities, facilities for the mentally ill or disabled, correctional facilities, schools and pre-schools, hospitals, medical clinics, medical offices or offices operated or staffed by nurse practitioners, physician assistants (PA) or midwives, and in job training centers."[3–5]

In order to collaborate with other healthcare providers such as PAs or nurse practitioners, DHs need to learn to function on interprofessional teams.

Interprofessional collaboration has become a significant topic in health care and "advocates that health care providers value, support, and build relationships with each other" in order to work as a team.[6] An EPDH employed by a PA is an example of such a team. Interprofessional collaboration between these providers can be encouraged and established through interprofessional education (IPE) experiences prior to licensure. Presently, a variety of approaches in "teamwork training for interprofessional collaborative practice in education" are being used by health professions.[7] The legal ability to enter a collaborative practice agreement between a licensed PA and EPDH exists in the state of Oregon. However, there was no mechanism in place to educate these two disciplines regarding their unique contributions to patient care. Expanded practice dental hygienist and PA collaborative practice agreements appears to be underutilized, therefore, both disciplines need to be made aware of opportunities for patient care collaboration to make this practice agreement a viable option.[8]

In August 2016, the Commission on Dental Accreditation (CODA) updated the Accreditation Standards for Dental Hygiene Education Programs, Standard 2-15 to explicitly include IPE.[9] Standard 2-15 now states that "dental hygiene graduates must be competent in communicating and collaborating with other members of the health care team to support comprehensive patient care."[9] The goal of IPE is to provide students from different health professions experiences to work together and learn from one another. These experiences allow students to gain a better understanding of the other profession's role in patient care, leading them to "value working within interprofessional teams."[7] Acquiring this knowledge can serve to motivate continued teamwork throughout one's professional career. Furgeson et al. studied IPE within dental hygiene programs in the United States (U.S.) and identified that the majority of IPE activities developed within dental schools and dental hygiene programs consisted of joint volunteer activities, clinical activities, and service-learning projects.[10] These joint service-based activities do not necessarily fit the widely accepted definition of IPE, of students of two or more professions associated with health or social care, engaged in learning with, from and about each other.[11] Developing and implementing IPE activities would be less challenging if students from multiple health professions were located on the same campus or nearby campuses. The American Dental Hygienists' Association (ADHA) has reported a limited number of dental hygiene programs located within dental schools (23) or on health science campuses (37) that teach other health care groups.[7] Only 18% of dental hygiene programs are located within these campuses, which creates challenges for developing and implementing IPE experiences for DH students.[7]

It has been reported that the greatest effect of IPE can be attained when students are exposed to other health care professional students early in their education and presented with frequent IPE experiences while enrolled in school.[10] In order for EPDHs and PAs to pursue existing collaborative practice agreements once they are licensed, it is vital that they learn to work with each other as students. Boyce et al. found that support from various professional organizations has made implementing collaboration in health care more evident to educators and has help to turn the focus towards creating IPE experiences that will ultimately enable successful interprofessional collaboration. Interprofessional teams that are able to collaborate well can lead to improvements in efficiency, quality, and overall patient outcomes.[12] For this reason, the more prepared individuals are to work as part of an interprofessional team to deliver patient care, the greater the likelihood that they will find employment in a health care system.[12]

Recognizing the importance of IPE and interprofessional collaboration, Pacific University Oregon created an interprofessional educational experience designed to promote and prepare DH and PA students for future collaborative practice. Both the DH and PA students have the opportunity to provide general health and oral health care to homeless individuals as part of the Project Homeless Connect (PHC) event, an annual, nation-wide program dedicated to increasing access to an array of services such as dental, medical, vision, clothing, housing, food, pet care, haircuts, and employment for homeless communities.[13] During the PHC event, DH and PA students team up to collect a medical history and provide oral screenings to determine whether urgent or preventive dental care is needed. Urgent care is provided on site such as tooth extractions by Medical Teams International dentists, in addition to providing basic dental care. Patients requiring more in-depth care were shuttled to the Pacific University Oregon DH clinic and received referrals for restorative needs that could not be provided during the event. In 2014, the interprofessional interaction during this event was a limited intervention, involving a simple patient handoff from PA to DH student with a summary of the medical history. However, in 2015 and 2016, changes were made to ensure a more integrated interprofessional collaboration intervention by having the DH and PA students work together throughout the entire patient care appointment. During the appointment a medical history review, oral cancer screening,

periodontal screening and recording, caries examination, plaque and calculus determination were completed. The purpose of this study was to assess the impact of an IPE intervention between DH and PA students and explore the impact of this intervention on knowledge, attitudes and practices towards engaging in a collaborative practice agreement between EPDHs and PAs in the state of Oregon.

Methods

This study was determined to be exempt from Institutional Review Board (IRB) oversight by the University of Michigan Health Sciences and Behavioral Sciences IRB (HUM00129167). The sample consisted of 420 students and alumni from the Pacific University Oregon dental hygiene (n=160) and physician assisting (n=260) programs. For the purpose of this study, DH and PA participants from the classes of 2014-2016 were considered alumni. Students currently enrolled (2017-2018) in the DH and PA programs and who had participated in IPE programs, including the Pacific University Oregon annual PHC event, were classified as students. The 2014 PHC event involved a limited intervention consisting of a simple patient handoff, with a medical history summary, from the PA to DH student. During the 2015-2016 PHC event, the PA and DH students experienced an integrated interprofessional collaboration intervention, by working together throughout the entire patient care appointment. In 2017, PA students were unable to participate in the PHC event due to a scheduling conflict resulting in no interprofessional interaction. The lack of any interprofessional collaboration in this cohort provided the researchers with a control group. Dental hygienists and PA alumni who were licensed and practicing outside of the state of Oregon were excluded from participating in the study.

An electronic survey consisting of 39 questions divided into three sections was developed by the investigators. The survey was pilot tested by two DHs and one PA and revisions were made based on the feedback provided. Section one included demographic items. Section two retrospectively assessed the participant's experience as a DH or PA student with regards to collaborative practice while participating in the PHC event. Section three was an assessment of Oregon PA and EPDH practitioners' knowledge, attitudes, and motivation to engage in collaborative practice. Participants were asked to rate items on a Likert scale from 1 (Strongly Disagree/Not interested) to 5 (Strongly Agree/Very Interested) as well as respond to multiple choice and open-ended items. An invitation to participate email was sent in May 2017 by the respective Pacific University Oregon DH and PA program directors to the students/alumni (DH and PA classes 2015-2018). A reminder email was sent monthly and the Qualtrics administered electronic survey was closed after six months in November 2017.

An a priori power assessment was calculated to determine response rate needed for the study. Data was analyzed with the Statistical Package for the Social Sciences (SPSS) version 24 (IBM; Armonk, NY). Descriptive and inferential statistics were used to analyze the data. A p-value of <0.05 was used to indicate statistical significance. A factor analysis was performed using principal axis factoring extraction with varimax rotation and Kaiser normalization, and scree plot. Cronbach's Alpha was used to measure reliability and internal consistency.

Results

From the sample of 420 students/alumni (160 DH and 260 PA), 99 participants completed the electronic survey. However, 19 respondents were excluded because they did not practice in the state of Oregon bringing the number of participants to 80 for a response rate of 19% (n=80). Respondents with graduation years of 2017 and 2018 were considered current/recent students for this survey, while those graduating in 2014-2016 were identified as alumni. Overall the sample was comprised of 53.8% PA respondents (n=43) and 46.3% DH respondents (n=37). The number of years in practice for PAs ranged from zero to two while the number of years in practice for the DH respondents ranged from zero to more than two years. Respondent demographics are shown in Table I.

Table I. Overview of respondents' demographic characteristics (n=80)

Characteristic	Frequency	%
Gender:		
Male	17	21.3%
Female	63	78.8%
Year of Graduation:		
2014	4	5%
2015	4	5%
2016	5	6.3%
2017	36	45%
2018	31	38.8%
Health Profession:		
PA		
Student	16	20%
Alumni	27	33.8%
Total	43	53.8%
DH		
Student	20	25%
Alumni	17	21.3%
Total	37	46.3%

Physician Assistants

Among the PA participants, 25.6% (n=11) were aware of the possibility of employing an EPDH in the state of Oregon, while 74.4% (n=32) were unaware. Nearly all, 93%, (n=40) of PAs stated that they would consider employing an EPDH to treat patients who have limited access to dental care (if participants owned a practice, made hiring decisions, or practice was financially stable), while 7% (n=3) responded "no." More than one-half 55.9%, (n=24) indicated they were "Interested" or "Very interested" in employing an EPDH (if practicing conditions were met), with a mean response on the 1 to 5 scale (1=Not Interested to, 5=Very Interested) of 3.40 (SD=1.13). However, there was less interest in knowing more about how to pursue employing an EPDH, with 44.2% (n=19) indicating they were "Interested" or "Very interested" and a mean response on the 1 to 5 scale (1=Not Interested to, 5=Very Interested) of 3.09 (SD=1.19).

Dental Hygienists

Only 18.9% (n=7) of the DH respondents were aware of employment opportunities as an EPDH with a PA in the state of Oregon. Nearly all, (97.3%, n=36) would consider employment with a PA as an EPDH to treat patients who have limited access to dental care. Similarly, more than three-fourths (78.3%, n=29) indicated being "Interested" or "Very Interested" in knowing more about how to pursue employment with a PA as an EPDH with a mean response of 4.03 (SD=1.14) on a 1 to 5 scale (1=Not Interested to, 5=Very Interested).

Project Homeless Connect Event Ratings

All respondents (n=80) completed a question regarding their participation in the PHC event and the majority (95%, n=76) indicated "yes." There were 19 items pertaining to the PHC event with Likert scale responses ranging from 1=Strongly disagree to, 5=Strongly agree. Respondents were asked to retrospectively rate each statement as shown in Table II. The statements "I value the expertise of other health care professionals," "Team working skills are essential learning for all health care students," and "It is possible that a person from another health care discipline could have a better understanding of a patient condition or treatment than I do" had the highest level of agreement among the respondents.

A factor analysis was performed for the statements pertaining to the PHC event to identify groups of statements with similar responses by the participants. The analysis identified two factors for attitudes: collaboration and objective outcomes. Twelve statements were grouped together with the one factor related to the event's ability to encourage collaboration (*There was a real desire among team members to work collaboratively*) and seven statements were grouped together with the second factor related to the event's ability to enhance objective outcomes (*Team working skills are essential learning for all health care students*) as shown in Table III. There was excellent reliability for the statements about collaboration (Cronbach's Alpha = 0.958) and good reliability for the statements in regards to objective outcomes (Cronbach's Alpha = 0.814), indicating that the statements have high internal consistency and are compatible when grouped together.

Independent samples t-test were performed to investigate whether there was a significant difference in collaboration and objective outcomes for PAs as compared to DHs, and for alumni as compared to students. Physician's Assistants (M=4.16, SD=0.626) rated collaboration significantly higher than DHs (M=3.75, SD=0.681); t(73)=2.699, p=0.009. There was no significant difference between the PAs (M=4.45, SD=0.045) and DHs (M=4.47, SD=0.041) on objective outcomes, t(73)=-0.250, p=0.803. There was no significant difference between alumni (M=4.03, SD =0.747) and students (M=3.94, SD=0.672) on collaboration, t(73)=-0.413, p=0.681, nor between alumni (M=4.51, SD=0.431) and students (M=4.45, SD=0.432) on objective outcomes, t(73)=-0.421, p=0.675.

Collaboration was rated significantly higher by PA students (M=4.26, SD=0.530) than by PA alumni (M=3.68, SD=0.831); t(36)=2.364, p=0.024. No significant differences were identified between the PA students (M=4.45, SD=0.439) and PA alumni (M=4.45, SD=0.544) on objective outcomes, t(36)=-0.010, p=0.992. Dental hygiene alumni (M=4.43, SD=0.382) rated collaboration significantly higher than DH students (M=3.62, SD=0.649); t(35)=-2.957, p=0.006. No significant differences were found between the DH students (M=4.45, SD=0.432) and DH alumni (M=4.57, SD=0.286) on objective outcomes, t(35)=-0.640, p=0.527.

Intervention Level

Some respondents (n=31) indicated that they had no inter-professional interaction (intervention). These respondents were most likely from the 2017 cohort year when the PA students were unavailable to participate in the PHC. Forty-nine respondents experienced either the limited or integrated intervention that involved the patient handoff from PA to DH student with a summary of the medical history, while the integrated intervention involved the PA and DH students working together throughout the entire patient care appointment.

An independent samples t-test was performed to test significant difference in collaboration and objective outcomes for the limited intervention, compared to the integrated intervention. In the area of collaboration, there was no

Table II. Respondents' attitudes towards collaborative practice based on retrospective experiences as students participating in Project Homeless Connect

*Statement	n	Mean	SD	Minimum	Maximum
Our team mission embodied an interprofessional collaborative approach to patient/client care.	74	3.93	0.849	2	5
All team members were committed to collaborative practice.	74	4.01	0.802	2	5
Patient/client care plans and treatment goals incorporated best practice guidelines from multiple professions.	75	3.95	0.787	2	5
There was a real desire among team members to work collaboratively.	75	3.97	0.870	2	5
It was enjoyable to work with other team members.	75	4.16	0.806	3	5
Team members respected each other's roles and expertise.	75	4.19	0.800	2	5
Team members trusted each other's work and contributions related to patient/client care.	75	4.12	0.788	2	5
I value the expertise of other health care professionals.	***75***	***4.73***	***0.475***	***3***	***5***
Shared learning with physician assistant and dental hygiene students helped me to communicate better with patients and other professionals.	*74*	*3.73*	*0.955*	*2*	*5*
Learning between health care students before graduation improves working relationships after graduation.	75	4.36	0.747	2	5
Team working skills are essential learning for all health care students.	***75***	***4.61***	***0.590***	***3***	***5***
Team members acknowledged the aspects of care where members of my profession had more skills and expertise.	74	3.8	0.891	2	5
It was clear who was responsible for aspects of the patient/client care plan.	*75*	*3.76*	*0.819*	*2*	*5*
Team members had the responsibility to communicate and provide their expertise in an assertive manner.	*75*	*3.79*	*0.827*	*2*	*5*
Optimum patient care requires that the observations of every health professional serving a patient be included in the patient's treatment.	75	4.29	0.653	3	5
I feel confident in my knowledge and am willing to share my ideas with members of a health care team.	74	4.36	0.587	3	5
I trusted the accuracy of information reported among team members.	74	4.07	0.648	3	5
It is possible that a person from another health care discipline could have a better understanding of a patient condition or treatment than I do.	***75***	***4.48***	***0.554***	***3***	***5***
The best care for the patient is best arrived through joint decision making.	74	4.38	0.613	3	5

* Statements with Highest Level of Agreement are ***Italicized in Bold***
Statements with Lowest Level of Agreement are *Italicized*

Table III. Collaboration and objective outcomes: Factor analysis of IPC survey

Item	Statements	*Factor Loadings	
		**Collaboration	***Objective Outcomes
Q20	Our team mission embodied an interprofessional collaborative approach to patient/client care.	0.866	
Q21	All team members were committed to collaborative practice.	0.825	
Q22	Patient/client care plans and treatment goals incorporated best practice guidelines from multiple professions.	0.727	
Q23	There was a real desire among team members to work collaboratively.	0.884	
Q24	It was enjoyable to work with other team members.	0.822	
Q25	Team members respected each other's roles and expertise.	0.845	
Q26	Team members trusted each other's work and contributions related to patient/client care.	0.797	
Q28	Shared learning with physician assistant and dental hygiene students helped me to communicate better with patients and other professionals.	0.68	
Q31	Team members acknowledged the aspects of care where members of my profession had more skills and expertise.	0.746	
Q32	It was clear who was responsible for aspects of the patient/client care plan.	0.723	
Q33	Team members had the responsibility to communicate and provide their expertise in an assertive manner.	0.686	
Q36	I trusted the accuracy of information reported among team members.	0.541	
Q27	I value the expertise of other health care professionals.		0.551
Q29	Learning between health care students before graduation improves working relationships after graduation.		0.694
Q30	Team working skills are essential learning for all health care students.		0.74
Q34	Optimum patient care requires that the observations of every health professional serving a patient be included in the patient's treatment.		0.473
Q35	I feel confident in my knowledge and am willing to share my ideas with members of a health care team.		0.718
Q37	It is possible that a person from another health care discipline could have a better understanding of a patient condition or treatment than I do.		0.455
Q38	The best care for the patient is best arrived through joint decision making.		0.609

* Q28 had a cross loading on the other factor of 0.454, no other cross loadings exceeded 0.400.
**Cronbach's Alpha for Collaboration = 0.958
***Cronbach's Alpha for Objective Outcomes = 0.814

Table IV. Descriptive statistics for collaboration and level of intervention

Intervention	PA or DH	Mean	SD	n
Limited Intervention	PA	3.292	0.629	4
	DH	4.438	0.448	4
Integrated Intervention	PA	4.257	0.550	34
	DH	4.417	0.354	2

Differences of the intervention level and PA or DH respondents on the Collaboration Mean

Source	df	MS	F	p	Effect Size
Intervention	1	0.866	2.911	0.096	0.068
PA or DH	1	1.656	5.563	0.023	0.122
Intervention x PA or DH	1	0.945	3.174	0.082	0.074
Error	40	0.298			

Legend: Two-way ANOVA MS=Mean squares

significant difference between the limited intervention (M=3.86, SD=0.794) and integrated intervention (M=4.27, SD=0.539; t(42)=-1.742, p=0.089. For objective outcomes, no significant differences were identified between the limited intervention (M=4.38, SD=0.489) and integrated intervention (M=4.48, SD=0.424); t(42)=-0.641, p=0.525.

A two-way ANOVA was performed to test the differences of the intervention level and PA or DH respondents on the collaboration mean. It was found that the DHs rated collaboration more highly than the PAs (p=0.023). Table IV provides descriptive statistics for the collaboration mean and displays the differences of the intervention level and the PA or DH respondents on the collaboration mean. There were no other significant findings based on the intervention level. Some of the non-significant differences may indicate that the overall integrated interventions may increase IP collaboration results.

To explore differences between PAs and DHs in knowledge of the PA/EPDH collaborative practice agreement, a chi-square test compared the two groups on their awareness and no significant differences were found between the groups. Overall awareness of the collaborative practice agreement between PAs and EPDHs was low. To examine the differences between PAs and DHs in attitudes about collaborative practice agreement, ratings were analyzed from the statements about believing patient care and one's career are improved by collaborative practice. An independent samples t-test of agreement ratings (1=Strongly Disagree to, 5=Strongly Agree) showed no significant differences on the mean agreement of the two statements. However, there was an overall higher level of agreement among the respondents, and DHs have a slightly better attitude towards the benefits of collaborative practice when compared to PAs.

In the state of Oregon, PAs can hire an EPDH. In order to assess the motivation of PAs and DHs to engage in a collaborative practice agreement, responses to the question about consideration of employment between a PA and an EPDH were examined. A Fisher's exact test showed no significant difference between the groups. While overall awareness of the collaborative practice agreement was quite low, attitudes towards it and motivation to consider employment were quite high. There were no significant differences between PAs and DHs in their knowledge, attitude, or motivations.

During the 2017 PHC event, only DH students participated; therefore, only the DH students were compared across intervention levels. A one-way ANOVA tested the collaboration mean and objective outcome mean by the intervention level (limited, integrated, and none) for DH students. There was a significant main effect based on intervention level, demonstrating a significant difference between groups in regards to collaboration but not on the objective outcomes. Post Hoc test using Tukey HSD for collaboration showed a statistically significant mean difference between the limited and having no intervention, p=0.048. "No interprofessional intervention" was rated the lowest, indicating that some form of interaction between the PA and DH students is needed to encourage collaboration.

Discussion

The U.S. continues to work on improving the nation's oral health and access to dental care through the development of several direct-access workforce models. The EPDH is an example of a well-established direct access model in the state of Oregon. Extended practice dental hygienists

are permitted to practice in alternative settings and can be employed by PAs and other health care providers in order to deliver preventive dental services to patients with limited access. However, this workforce model continues to be underutilized.[8] In an effort to promote this workforce model, the PA and DH programs at Pacific University Oregon offer an IPE experience with a goal of increasing students' awareness of the future possibilities of incorporating EPDHs into primary care practices.

The type of IPE experience in this study was described by Furgeson et al., with joint volunteer activities, clinical activities, and service-learning projects, the most common IPE activities in dental hygiene programs.[10] The 2015 ADHA white paper addressing transforming dental hygiene education in the twenty-first century, along with other studies, reported that providing students the opportunity to work together allows them to become familiar with other health professions, as well as learning the various roles each plays in improving overall health.[7,10] In this study, gaining the knowledge about the dental hygiene profession may lead to PAs viewing an EPDH as an asset to their practice and hire them in the future. However, IPE activities must mimic actual practice dynamics and clearly lay out how each discipline contributes, and who is responsible for each aspect of care. Findings from this study demonstrate the importance of role definition, as this was one of the lowest rated statements revealing that participants were unclear as to who was responsible for the various aspects of the patient care plan.

Participants in this study were asked to rate statements retrospectively regarding their interprofessional collaborative experiences during one of the PHC events that occurred between 2014-2017. In general, there was a higher level of agreement for the collaboration statements (above a 3.7 on the Likert-scale), indicating a positive perspective on interprofessional collaboration particularly for cohorts who experienced the integrated intervention. Overall, PAs considered collaboration significantly more important than the DHs. Although there was no significant difference between the groups on the statements regarding objective outcomes, both groups identified objective outcomes as important. When comparing all the alumni versus all the students, collaboration and objective outcomes were considered slightly more important by DH and PA alumni in general. This could be a result of practitioners recognizing the need for interprofessional collaboration as a result of experiences in clinical practice.

Results from this study showed that the PA students considered collaboration to be significantly more important than the PA alumni, possibly due to fewer PA alumni in the sample. It is also possible that PA students may have anticipated a stronger collaborative relationship with physicians, however once in practice, they discover that they have greater autonomy than they envisioned as students. However, there were no significant difference in objective outcomes, and both groups identified these statements as important. In contrast, the DH alumni practitioners considered collaboration significantly more important their student cohorts. This could be a result of DH practitioners realizing that their scope of practice limits them from applying all of their knowledge and training, and the recognition that as members of collaborative interprofessional team, their knowledge and skills could be better utilized. These findings were of particular interest as it is assumed that both PA and DH practitioners are accustomed to collaborating with their supervising practitioners (primary care physicians or general dentists) and that this would be reflected among the PA and DH alumni.

Currently, 40 states allow direct access to DHs across a wide range of models.[5] Although direct access gives DHs the greatest autonomy, collaboration with a dentist is required and serves to illustrate the dental hygiene profession's ability to collaborate and work together in increasing access to oral health care. Findings from this study suggest that the integrated intervention IPE activity with PA and DH students broadens their outlook and may increase interprofessional collaboration. However, the results of this study are based on an isolated IPE activity, and other studies have indicated the greatest effect of IPE can be attained when students are exposed early in their education and presented with frequent IPE experiences.[10]

While interprofessional collaboration was valued in general, both the PA and DH participants lacked knowledge about the collaborative practice agreement for PAs and EPDHs in the state of Oregon. Interestingly, PAs in this study had more knowledge regarding employing an EPDH than the DH respondents. This could be due to the higher response rate from PAs, as there are currently very few PA providers employing an EPDH in Oregon. As highlighted by Coplen et al. and the ADHA white paper, this lack of knowledge of collaborative opportunities impedes the dental hygiene profession's ability to become part of team-based care and from advancements within the health care system.[7,14] This further emphasizes the importance of early exposure and frequent IPE experiences.[10] Results from this study also support the Coplen et al. findings regarding barriers faced by practicing EPDHs.[14] Without increased knowledge of the collaborative practice agreement,

this workforce model will not succeed in increasing access to oral health care.

Both PA and DH student participants indicated the benefits of developing collaborative practice agreements as licensed professionals. Although both groups agreed that patient care and professional development would benefit from a collaborative practice agreement, DHs had a slightly better attitude towards the benefits of collaborative practice agreement as compared to the PAs. Considering the low number of DH participants holding an EPP and working in settings requiring an EPP in this study, this was a particularly interesting finding. This lack of knowledge may indicate a need for continuing education (CE) courses and marketing of this collaborative working relationship to increase its implementation as an effective workforce model.

Another potential and ongoing barrier to the success of this workforce model is the low number of PAs and DHs currently working in the state of Oregon and the low number of DHs holding EPPs despite the opportunities. Further investigation is needed to determine why EPP practitioners are not being utilized. In 2016 Bell et al. reported there were 186 DHs in Oregon in 2011 holding an EPP, indicating an increase over the 71 DH's holding a LAP in the 2008 Battrell et al. study.[8] With a low number of DH alumni in this study indicating that they held EPP, one might assume that there has not been a significant increase in EPDHs in Oregon since 2011. However, in 2018 the number of EPDHs more than doubled to 729.[15] Since this collaborative agreement is permitted by the state of Oregon, if graduates are not staying within the state, the potential to increase the numbers of PA and EPDH collaborative agreements is lost despite the focused IPE interventions during their education.

Findings from this study suggest that an integrated intervention between the PA and DH students broadens their outlook and may increase future interprofessional collaboration. Although participants agreed that exposure to interprofessional education experiences among PA and DH students may improve working relationships after graduation, findings indicate that interprofessional collaboration has not transferred into clinical practice and there is a lack of knowledge regarding collaborative practice agreements for PAs and EPDHs in Oregon. Other approaches are needed to increase knowledge on the collaborative practice agreement between PA and EPDHs, and the EPDH scope of practice.

This study had limitations. A convenience sample was used representing a small population in Oregon, and there was a low response rate. There was a three-year time gap for respondents who participated in the 2014 PHC event, possibly preventing accurate recall of the specific event details. There was a much smaller sample size in the limited level of intervention group as compared to the integrated intervention group. The sample sizes for the limited and integrated interventions were much smaller than the those who had no intervention and the level of participation may limit the representativeness of the data collected. The survey instrument itself was a limitation because it was self-reporting, and therefore can introduce bias, or over/underreporting.

Conclusion

Overall ratings of the DH and PA respondent groups were positive regarding an IPE experience which occurred during their education. Levels of agreement were high in regards to patient care and the potential for career improvement through collaborative practice thus, indicating a positive perspective on interprofessional collaboration. Future studies should focus on assessment of deeper IPE interventions and assessment of practicing PAs across the state for insight into lack of utilization of this workforce model.

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Research

The Effect of Continuing Education on Dental Hygienists' Knowledge, Attitudes, and Practices Regarding Human Papillomavirus Related Oropharyngeal Cancer

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Abstract

Purpose: The purpose of this study was to investigate the effect a continuing education (CE) course had on dental hygienists' knowledge, attitudes, and practices regarding human papillomavirus (HPV) related oropharyngeal cancer (OPC).

Methods: A two-group, experimental post-test only design was used for this study. Randomly selected, licensed dental hygienists in the state of Florida, were recruited by email and assigned to either an experimental or control group. An investigator designed, questionnaire was developed and tested for validity and reliability. The experimental group received a one-hour web-based CE course on HPV related OPC. Six weeks later, a post-test questionnaire was administered to the experimental and control groups via an online platform, Qualtrics®. Data were analyzed using descriptive statistics and analysis of variance (ANOVA).

Results: Out of 302 dental hygienists who agreed to participate, 133 completed the study for a participation rate of 44.0%. The knowledge score for the experimental group was 72.6% while the control group scored 58.4%. Results demonstrated statistically significant differences between the groups in terms of knowledge ($F=33.81$, $df=1$, $p=0.00$) and attitudes ($F=13.91$, $df=1$, $p=0.00$). No differences were found in oral examination procedures; however, statistically significant differences ($F=7.47$, $df=1$, $p=0.007$) were noted for items related to HPV specific examination practices between the two groups.

Conclusion: Additional research is needed to identify what specific types of educational interventions are effective in increasing the HPV-related OPC knowledge and practice behaviors of dental hygienists.

Keywords: dental hygienists, human papillomavirus, oropharyngeal cancer, knowledge, attitudes, clinical dental hygiene practice

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Introduction

Cancer is a worldwide health problem and the second leading cause of death in the United States (U.S.), surpassed only by heart disease.[1] Surveillance data projected that in 2018, more than 51,000 Americans would develop oral cancer (OC) and oropharyngeal cancer (OPC), and that 10,030 would die from these cancers.[2,3] Although treatment and responses greatly vary, the percentage of patients surviving five years post OC and OPC diagnosis from 2007-2013 was 64.5%.[3] With approximately 70% of these cancer diagnoses occurring in later stages,[1] the need for early detection, consisting of examination, practitioner education, and early diagnosis leading to early treatment and mortality reduction, is further supported.[4,5]

The human papillomavirus (HPV), a common oral infection, has surpassed tobacco and alcohol as the major risk factor for oral cancer,[4] and has been identified in up to 75% of OPCs.[4] Human papillomavirus is comprised of more than 150 strains or types; one type in particular, HPV 16, is associated with most OPCs.[4,6-8] Although the virus currently infects about one in four persons in the U.S.,[1,] it typically clears or resolves on its own by the body's immune system and does not cause health problems.[9,10] When a HPV infection does not resolve however, cancer can result.[10]

The HPV is transferred from person to person (e.g. male/male, male/female, female/female) during vaginal, anal, and

oral sex, as well as open mouth kissing.[6] Research has shown those persons who develop HPV related OPC tend to be white males ages 40 to 70,[2,11,12] although women can also be affected.[2,12] Additional risk factors include number and frequency of oral, anal, and vaginal sex encounters, younger age sexual debut, and smoking. [8,11-16] The anatomy affected by HPV-related OPC includes the tonsils, pharynx, base of the tongue, soft palate, and cervical lymph nodes.[6,13,17,18] Signs and symptoms for HPV-related OPC include a persistent sore throat, chronic trouble or pain when swallowing, ear pain, hoarseness, an ipsilateral neck mass, and a persistent lump in the throat.[6,18,19]

A standardized protocol for visual and tactile evaluation has been described by the World Health Organization, American Dental Association, and the National Institute of Dental and Craniofacial Research to include examination of the extra and intra-oral structures including the face, head, neck, lips, labial and oral mucosa, gingiva, floor of the mouth, tongue, soft and hard palate, including the oropharyngeal tissues.[17,20-23] Although HPV testing is available,[15,18] there is no evidence supporting a screening test for HPV-related OPC similar to the pap smear for cervical cancer.[18] Additionally, a systematic review conducted by Lingen et al.,[4] found that adjunct screening tools are not effective in helping to identify early OCs and OPCs. These studies accentuate the effectiveness of routine comprehensive visual and tactile oral examinations and a definitive diagnosis of OC and OPC made by histopathologic tissue assessment during biopsy.[5,24]

Although clear guidelines for oral cancer and head and neck examinations have been established for the dental professional, research suggests that barriers exist to prevent practitioners from performing these procedures. A lack of literacy regarding HPV,[24,25] HPV-related OPC,[24,25,27] HPV risk factors,[26,27,28] examination practices,[26] anatomy affected,[26] and HPV prevention/vaccination[25,29] are among the most commonly cited barriers. Several studies also determined a deficit in practitioners' communication skills to effectively discuss HPV-related OPC, with the inclusion of risky sexual practices, HPV infection and prevention to be a barrier.[25,26,29-32] Other studies cite the lack of time to complete an examination,[28,31,32] and patient's lack of awareness regarding the exam performance and importance,[28] to be barriers.

Continuing education (CE) programs have been shown to influence knowledge deficits and impact practitioners' attitudes and practices.[27,33-38] With regards to HPV-related OPC topics, CE opportunities have been recommended in several studies to impact these professional attributes.[25,26,30,32] A before and after study conducted by Toftegaard et al.[34] concluded an increase of timely patient oral cancer referrals following CE,[34] whereas a systematic review suggested the CE for medical providers to be useful in improving professional practice and patient healthcare outcomes, especially when coupled with multiple learning methods (i.e. interactive format).[39] Additional studies have evaluated dentists' and dental hygienists' oral cancer understanding and behavior changes post education intervention, finding statistical differences in tested knowledge following CE.[27,37,38] Additionally, self-reported communication skills were found to be statistically significant following CE intervention,[25,33] as were self-reported examination practices.[33,36,38]

Previous studies suggested a need for HPV-related OPC awareness, particularly in regards to the visual and tactile head and neck examination performance[25,26,30,31], however many known barriers have been identified.[25-32] Research has shown that CE attendance impacts the knowledge and practices of medical and dental professionals. [27,33-38] A review of the literature shows a lack of recent research regarding the association of continuing education on dental hygiene practitioner's performance. The purpose of this study was to determine the effect of a web-based CE course on dental hygiene practitioners' knowledge, attitudes, and practices (KAP) regarding HPV-related OPC.

Methods

This two-group experimental post-test only design was granted exempt status by the Idaho State University Institutional Review Board (IRB-FY2018-323). To ensure that the experimental and control groups were equal, random selection and random assignment of participants to each group were used. A post-test design approach was chosen to control for pre-test sensitization which can cause individuals to score higher when they take a test for the second time regardless of the intervention.[40] In this instance, differences between a pre-test and a post-test score may not be a result of the independent variable but rather a result of the testing itself.[40] Therefore, a post-test design was the most appropriate option for this study and served to strengthen the study's internal and external validity. The lack of a pre-test was not thought to impact the results. The study population consisted of licensed Florida dental hygienists. Email addresses were obtained from the Florida Department of Health website. Inclusion criteria were limited to dental hygienists licensed in the state of Florida, and practicing a minimum of two days per week. A power analysis determined the minimum size needed for this study was 128 participants. A computerized, randomization process performed by Excel® (Microsoft; Bellevue, WA) selected the sample for the study. Once the

individuals consented to participate, they were randomly assigned to either the control or experimental group.

The web-based CE course was developed by the principal investigator, who served as the subject matter expert to design the evidence-based content, based on five years of experience educating entry-level dental hygiene students on this topic. The following principles of instructional design were used: creating a task analysis, developing objectives, planning the lesson and instructional strategies including the case studies, and assessing learning.[41] The components of the instructional design process are shown in Table I. The course content was reviewed by a member of the research team who was a participant in the Lingen et al.[4] systematic review, and also had 40 years of teaching experience in oral pathology.

The data collection instrument was a self-generated electronic questionnaire consisting of items assessing the dental hygiene practitioners' knowledge, attitudes, and practices related to HPV-related OPC and demographics. Knowledge was assessed through 15 multiple choice questions; attitudes were assessed through 11 statements, using a Likert Scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree); practices were assessed through 13 statements, using a Likert Scale ranging from 1 (0% of the time) to 5 (100% of the time); and demographic questions in a multiple-choice format.

The questionnaire was validated prior to data collection with a content validity index (CVI) consisting of a four-point rating scale: 1 = not relevant, 2 = unable to assess relevance without question revision, 3=relevant but needing slight revision, and 4 = relevant. [40] Five dental hygiene professionals familiar with HPV-related OPC rated each question. A CVI score was computed for each question by dividing the number of experts rating 3 or 4, divided by five experts. Questions scoring less than .75 were either deleted or rewritten according to rationale and suggestions provided by the panel. Reliability was established by a test-retest completed one week apart by a panel of 12 dental hygiene professionals familiar with clinical practice terms and responsibilities. The reliability coefficient was determined by dividing the number of same question responses by 12. The reliability coefficient was set at .70, and modifications were made to questions scoring less than .70 to improve the final instrument. [40]

An invitation to participate was sent to Florida dental hygienists and included information about the principal investigator, topic of the study, participation expectations, and incentive for study participation. The experimental group participated in a one-hour web-based CE course presented through a videoconferencing platform (Zoom®; San Jose, CA). The course content was case-study based, and included HPV-OPC epidemiology, risk factors, symptoms, examination practices, diagnosis, and prevention. Six weeks following the CE intervention, both groups received an invitation to participate in the post-test. The link to the questionnaire was sent through an online survey tool (Qualtrics®; Provo, UT) Informed consent information was on the first page of the invitation to participate. Data collection took place over a two-week time frame, and the invitation and survey link were resent twice during this time to increase participation. A $50 Visa or Amazon gift card drawing was offered as incentive to complete the questionnaire.

The data collected were downloaded without identifier information into an Excel® file, and confidentiality of responses was maintained through Qualtrics®. Data were analyzed using both descriptive statistics and analysis of variance (ANOVA) to test differences between the experimental and control groups. The level of significance was established at p=0.05.

Results

A total of 302 dental hygienists licensed in the state of Florida met the inclusion criteria and agreed to participate. However, only 133 participants completed the entire study (n=133) yielding a response rate of 44.04%. Participants were randomly assigned to either the experimental (n=76) or the control group (n=78). However, while 76 individuals began in the experimental group, only 71% (n=55) completed the entire survey. Only fully completed surveys were counted in this study. The majority of the participants were between the ages of 36 to 55 years, graduated in the 2000s, and were employed full-time in in clinical practice. Demographic information is highlighted in Table II.

Knowledge of HPV in relation to OPC was examined; Table II summarizes the percentage of correct knowledge item responses for both groups. The mean score of the control group was 8.76, equivalent to a 58.4% test score and the mean score of the experimental group was 10.89, equivalent to a 72.6% test score. The difference between the groups was 14.2%, the equivalent of two test items. ANOVA analysis determined a statistically significant difference between the knowledge of experimental group regarding HPV-related OPC as compared to the control group (p=0.00, Table III). Cohen's d effect size was 1.05, a large effect size, representing a considerable difference between the groups.

Participants were asked to express their attitudes about HPV-related OPC. Responses comparing the control and experimental group are shown in Table V. The majority of respondents from both groups agreed or strongly agreed that

Table I. HPV related OPC CE Course instructional design process

Instructional objective	CE content	Question
Identify the prevalence, virus strain, transmission, development, appearance, and anatomy affected by HPV-related OPC. (Knowledge, Understanding level)	HPV-related OPC overview through case study: • Definition • Prevalence • Strains • Transmission • Anatomy affected • Appearance	What percentage of oropharyngeal cancers are related to HPV? There are 150 virus strains associated with HPV. Which virus strain is associated with Anita's diagnosis? What areas of the oral cavity are affected by HPV? What was the most likely color of Anita's HPV-related oropharyngeal cancer lesion? From the time of Anita's initial HPV infection, approximately how long did oral cancer development take?
Employ the screening, documentation, and referral procedures utilized for HPV-related OPC. (Knowledge, Applying level)	HPV-related OPC Case study continued: • Screening procedures • Documentation procedures • Referral procedures	Documentation of Anita's oral cancer screening assessment includes recording her? During Anita's oral cancer screening, the dental hygienist would have best visualized the oropharyngeal anatomy by? Due to Anita's diagnosis of HPV-related oropharyngeal cancer, which of her lymph nodes were most likely swollen during the oral cancer screening? When Anita's palpable lymph node and oropharyngeal lesion were identified during the oral cancer screening, what would have been most conservative the next step?
Differentiate between positive and negative HPV-related OPC signs, symptoms, and risk factors. (Knowledge, Evaluating level)	HPV-related OPC case study continued: • Signs • Symptoms • Risk factors	Risk factor(s) associated with HPV-related oropharyngeal cancer include? What are signs and symptoms related to HPV oropharyngeal cancer that Anita could be exhibiting? What age, race, and gender are most commonly associated with HPV-related oropharyngeal cancer?
Create a dental hygiene treatment and outcomes plan to establish a definitive diagnosis regarding HPV-related OPC (Knowledge, Creating level)	HPV-related OPC case study continued: • Diagnosis procedures • Treatment • Outcomes	How was Anita's definitive diagnosis of HPV-related oropharyngeal cancer made? The treatment and outcomes of HPV-related oropharyngeal cancer are most influenced by? Which topic(s) should be addressed when discussing HPV-related oropharyngeal cancer with patients?
Value the need to be proactive about HPV-related OPC. (Attitude, Value level)	Dental Hygienist's role in HPV-related OPC; Case study continued: • Assessment procedures • Time involved • Strategies utilized	**It is my responsibility to:** • Collect a thorough health history with the inclusion of a sexual history on all patients. • Identify risk factors on the health history associated with HPV-related oropharyngeal cancer. • Examine all patients for oral cancer. **I need to:** • Visualize the oropharyngeal area during an oral cancer examination. • Palpate the cervical lymph nodes during an oral cancer examination. • Teach my patients about the risky sexual practices associated with HPV-related oropharyngeal cancer. • Follow up with patients who have had a positive oral cancer examination • My patients deserve the highest quality of care I can provide. • It is my employer's responsibility to set the standard for my dental hygiene clinical care. • Continuing education is valuable to maintain current skills and practices.
Display a commitment to their role as prevention specialists in HPV-related OPC. (Attitude, Organizational level)		At each appointment, I review the patient health history with the inclusion of identifying HPV-related OPC risk factors. **During every new patient appointment, I perform an:** • Extra-oral examination. • Intra-oral examination. **During each recare patient appointment, I perform an:** • Extra-oral examination. • Intra-oral examination.
Incorporate HPV-related OPC early diagnosis and prevention into the provision of oral care for every patient. (Practice, Characterization level)		**I perform an:** • Extra-oral examination that includes palpation of the cervical lymph nodes. • Intra-oral examination that includes viewing the base of the tongue. • Intra-oral examination that includes viewing the tonsils and middle part of the throat. **I inform patients when I am performing an oral cancer screening.** **I discuss HPV-related OPC risk factors, including risky sexual practices with:** • Adolescent (ages 12-17) patients. • Adult (ages 18-64) patients. • Geriatric (ages 65 and older) patients. • All of my patients.

Table II. Respondent demographics

	n = 133	%*
Age		
25 or below	2	1.50
26-35	24	18.1
36-45	37	27.8
46-55	35	26.3
>55	35	26.3
Dental Hygiene School Graduation Year		
Before 1970	1	0.80
1970-1979	14	10.5
1980-1989	26	19.5
1990-1999	20	15.0
2000-2009	33	24.8
2010-2018	39	29.3
Years Practicing		
1-5 years	33	24.8
6-10 years	13	9.80
11-20 years	29	21.8
21- 30 years	24	18.0
31-40 years	24	18.0
More than 40 years	10	7.50
Hours Practicing Per Week		
Full-Time (35 or more hours per week)	82	61.7
Part-Time (less than 35 hours per week, but at least two days per week)	49	38.6
Less than 2 days a week	2	1.5
Practice Type		
Public Health	9	6.80
Education	9	6.80
Clinical Practice	99	74.4
Corporate	11	8.30
Missing	5	3.8

***Percentages may not equal 100 due to rounding of numbers**

Table III. Correct responses to HPV-related OPC knowledge questions* (%)

Knowledge Item	Control Group	Experimental Group
1. What percentage of oropharyngeal cancers are related to HPV? A. 35% B. 55% C. 75% D. 95%	46.2%	52.7%
2. There are 150 virus strains associated with HPV. Which strain is most likely associated with Anita's diagnosis? A. 16 B. 18 C. 24 D. 52	57.7%	80.0%
3. Risk factors associated with HPV-related OPC include: A. Tobacco and alcohol use B. Sexual debut at a younger age, and multiple partners C. History of cervical cancer D. Genital warts and other sexually transmitted diseases	60.3%	69.1%
4. What areas of the oral cavity are affected by HPV-related OPC? A. Middle part of the throat, soft palate, uvula, base of the tongue, and tonsils B. Tonsils, sides of the tongue, floor of the mouth, and buccal mucosa C. Buccal mucosa, base of the tongue, hard palate, and labial mucosa D. Ventral surface of the tongue, middle part of the throat, sides of the tongue, and uvula	71.8%	89.1%
5. Documentation of Anita's oral cancer examination includes recording which of the following? A. Palpable lymph node location B. Lesion size and color C. Location of the lesion D. All of the above	92.3%	98.2%
6. Due to Anita's diagnosis of HPV-related OPC, which of her lymph nodes were most likely swollen during the oral cancer examination? A. Pre and post auricular B. Submandibular C. Cervical D. Supraclavicular	20.5%	40.0%

Table III. Correct responses to HPV-related OPC knowledge questions* (%) continued

Knowledge Item	Control Group	Experimental Group
7. During Anita's oral cancer examination, the dental hygienist would have best visualized the oropharyngeal anatomy by: A. Laying the patient back (supine), and using gauze to retract the tongue and view the oropharynx B. Seating the patient upright, and using a mirror and light view the oropharynx C. Using a high definition mirror and asking the patient to swallow D. Positioning of the patient does not matter	16.7%	74.5%
8. What was the most likely color of Anita's HPV-related OPC? A. Red B. White C. Either red or white D. Pink healthy color	47.4%	65.6%
9. From the time of Anita's initial HPV infection, approximately how long did oral cancer development take? A. Days B. Weeks C. Months D. Years	60.3%	58.2%
10. What are signs and symptoms related to HPV OPC that Anita could be exhibiting? A. Sore throat and bleeding gingiva B. Chronic trouble swallowing and ear pain C. Tongue swelling and loss of taste D. Dry mouth and pain with swallowing	59.0%	78.2%
11. What age, race and gender are most commonly associated with HPV-related OPC? A. Middle aged white females B. Younger white males C. Middle aged African-American females D. Older African-American males	35.9%	70.9%
12. When Anita's palpable lymph node and oropharyngeal lesion were identified during the oral cancer examination, what would have been the most conservative next step? A. Show the patient the areas of concern, and tell them to keep an eye on them B. Schedule her to come back in two weeks to re-evaluate the areas C. Performance of an adjunctive screening device such as VELscope®, ViziLite Plus®, or toluidine blue D. Examination by the dentist with referral to the oral surgeon	38.5%	43.6%
13. How was Anita's definitive diagnosis of HPV-related OPC made? A. Adjunctive screening devices such as VELscope®, ViziLite Plus®, or toluidine blue B. Visual inspection of the oropharyngeal anatomy C. Palpation of the cervical lymph nodes D. Histopathic assessment of tissue obtained during biopsy	84.6%	80.0%
14. The treatment and outcomes of HPV-related OPC are MOST influenced by the: A. Age and gender of the patient B. Early detection of a lesion C. Patient's immune system D. Lesion size and color	96.2%	98.2%
15. Which topics should be addressed when discussing HPV-related OPC with patients? A. Risky sexual behaviors B. Being vaccinated C. Cancer signs and symptoms D. All of the above	96.2%	96.3%

Table IV. ANOVA summary

Source of the Variance		SS*	Df*	MS*	F*	Sig.*
Knowledge	Between Groups	140.468	1	140.468	33.841	0.000
Attitudes	Between Groups	242.550	1	242.550	13.914	0.000
Oral Examination Practices	Between Groups	10.171	1	10.171	0.177	0.674
HPV Specific Practices	Between Groups	192.887	1	192.887	7.478	0.007

*SS-Sum of Squares; df-Degrees of Freedom; MS-Mean Squares; F-F Ratio of the MS between to the MS (p<.001); Sig.- Significance

it is their responsibility to identify risk factors on the health history associated with HPV-related OPC (94.6% experimental group, 93.5% control group); to examine all patients for oral cancer (100% experimental group, 98.7% control group); and to visualize the oropharyngeal area during an oral cancer examination (98.1% experimental group, 100% control group). Additionally, participants in both groups valued patients deserving high quality of care (100% both groups) and continuing education to maintain current skills and practices (100% both groups). However, there were differences in attitudes demonstrated by both groups related to the collection of a thorough health history including a sexual history inquiry on all patients; responsibility to teach patients about high risk sexual practices associated with HPV-related OPC; and, employer's responsibility to set the standard for dental hygiene clinical care (responses varied across each of the scales). ANOVA analysis revealed a statistically significant difference between the experimental and control groups' attitudes regarding HPV-OPC (p=0.00) A summary of the ANOVA of the participants knowledge, attitudes, and practices is shown in Table IV. Cohen's d effect was 0.66, a medium effect size, representing a moderate difference between the groups.

Respondents reported on the frequency of their practices related to oral examinations and any HPV specific procedures. More than half of the respondents indicated that they conducted an extra-oral examination on new patients at least 75% of the time or more (experimental group 65.5%, control group 62.8%) and for re-care patients (experimental group 56.4%, control group 59%). In comparison, the vast majority of respondents reported completing an intra-oral examination on new and re-care patients (experimental group 92.7% control group 92%) more frequently than an extra-oral exam (experimental group 93.3%, control group 85.9%). ANOVA analysis showed no statistically significant difference between the groups on oral examination practices (p=0.67). Dental hygienists' practice behaviors related to extra- and intraoral examinations and HPV specific procedures are shown in Table VI.

The ANOVA results comparing the experimental and control groups related to HPV specific practices identified a statistically significant difference (p=0.007) in this area. Cohen's d effect size was 0.48 for these practice items, representing a small effect size, but nearly a medium effect size (.50), indicating a small to moderate difference between the groups. The results also demonstrated that the majority of participants were not holding discussions with their patients about HPV risk factors, regardless of the patient's age and nearly to 50% of the time, participants were not discussing HPV vaccinations (experimental group 83.6%, control group 93.6%).

Discussion

The one-hour web-based CE course on HPV-related OPC in this study was shown to be an effective method for increasing knowledge, attitudes and HPV specific practices, however it was not shown to be effective in changing oral examination practices in the population studied. Knowledge was measured by correct responses to multiple-choice questions as an objective evaluation; whereas, attitudes and practices relied on self-reported measurements. Although the experimental group had higher scores on the knowledge items than the control group, the average score was still low, thus indicating the need for ongoing education on this topic. Participants were not aware of the significant relationships between HPV to OPC and risk factors commonly associated with HPV-related OPC. This finding is consistent with the lack of knowledge about oral cancer among dentists and physicians when measured by an objective evaluation.[27]

The knowledge portion of this study showed that many dental hygienists were not fully informed of the extra-oral anatomy associated with HPV-related OPC, recognition of lymph node involvement, best visualization of oropharyngeal anatomy, signs and symptoms, and re-evaluation procedures based on presenting signs and symptoms. These findings conflict with a previous study's results where the majority of dental hygiene participants self-rated their knowledge and skills regarding examination practices to be very

Table V. Dental hygienists' attitudes regarding HPV related OPC*

Attitude Item (n=133)	Strongly Agree		Agree		Neutral		Disagree		Strongly Disagree	
	C**	E***	C	E	C	E	C	E	C	E
1. It is my responsibility to collect a thorough health history with the inclusion of a sexual history on all patients.	23.1	45.5	24.4	36.4	23.1	10.9	24.4	7.3	5.1	0.0
2. It is my responsibility to identify risk factors on the health history associated with HPV-related OPC.	53.8	67.3	39.7	27.3	5.1	5.5	1.3	0.0	0.0	0.0
3. It is my responsibility to examine all patients for oral cancer.	85.9	90.9	12.8	9.1	1.3	0.0	0.0	0.0	0.0	0.0
4. I need to visualize the oropharyngeal area during an oral cancer examination.	79.5	94.5	20.5	3.6	0.0	1.8	0.0	0.0	0.0	0.0
5. I need to palpate the lymph nodes in the head and neck region during an oral cancer examination.	76.9	81.1	20.5	18.2	2.6	0.0	0.0	0.0	0.0	0.0
6. It is my responsibility to communicate with all patients about HPV prevention, including vaccination.	34.6	52.7	28.2	36.4	26.9	10.9	9.0	0.0	1.3	0.0
7. It is NOT my responsibility to teach my patients about the risky sexual practices associated with HPV-related OPC.	9.0	1.8	17.9	10.9	32.1	16.4	28.2	47.3	12.8	23.6
8. It is NOT my responsibility to follow up with patients who have had a positive oral cancer examination.	3.8	1.8	2.6	0.0	12.8	1.8	32.1	21.8	48.7	74.5
9. My patients deserve the highest quality of care I can provide.	89.7	98.2	10.3	1.8	0.0	0.0	0.0	0.0	0.0	0.0
10. It is my employer's responsibility to set the standard for my dental hygiene clinical care.	9.0	16.4	11.5	5.5	11.5	18.2	38.5	38.2	29.5	21.8
11. Continuing education is valuable to maintain current skills and practices.	93.6	90.9	6.4	9.1	0.0	0.0	0.0	0.0	0.0	0.0

*Results reported in percentages; percentages may not equal 100 due to rounding;
**C: Control Group; ***E: Experimental Group

good and regarded themselves as being highly knowledgeable about oral cancer examination practices.[28] Dental hygienists' knowledge might be more accurately measured through an objective evaluation compared to self-rated assessments.

The vast majority of respondents from this study, (98-100%) shared the attitude that oral cancer examinations should be conducted on all patients. Similar results were reported by Tax et al.[28] where examination procedures were perceived to be an important part of the dental hygienist's scope of practice. Forrest et al.[42] further confirmed this finding where all respondents believed that oral cancer examinations should be performed on adult patients aged 40 years and older. Likewise, Marino et al.[26] found 95.2% of the respondents agreed that these examinations should be routinely performed. This study of Florida dental hygienists concurs with previous findings demonstrating a continued trend in practitioner oral examination attitudes, while mixed practices correlating to this belief, have been documented.

Although overall examination practices were high, fewer respondents indicated that they were palpating the cervical lymph nodes as part of an extraoral examination, and only about two thirds of the respondents examined the tonsils and middle part of the throat as well as the base of the tongue. These anatomical structures are directly related to HPV OPC and regular examination of these structures is essential for early cancer diagnosis. Equally relevant, not all practitioners informed patients they were conducting an oral cancer examination. This particular finding supports other studies in which patients reported they were not told that an oral cancer examination was being performed by their oral health provider,[43] and dentists indicated that they did not always tell their patients that they had completed an oral cancer

Table VI. Dental hygienists' practices related to oral examination and HPV specific practices*

Oral Examination Practices										
Item	0% of the time		At least 25% of the time		At least 50% of the time		At least 75% of the time		100% of the time	
	C**	E***	C	E	C	E	C	E	C	E
1. During every new patient appointment, I perform an extra-oral examination. (n=133)	23.1	18.2	10.3	12.7	3.8	3.6	12.8	16.4	50.0	49.1
2. During every new patient appointment, I perform an intra-oral examination. (N=133)	3.8	5.5	1.3	1.5	2.6	0.0	9.0	3.6	83.3	89.1
3. During each recall patient appointment, I perform an extra-oral examination. (n=133)	19.2	21.8	11.5	10.9	10.3	10.9	12.8	20.0	46.2	36.4
4. During each recall appointment, I perform an intra-oral examination. (n=133)	2.6	1.8	3.8	1.8	7.7	3.6	14.1	14.8	71.8	78.2
5. I perform an extra-oral examination that includes palpation of the cervical lymph nodes. (n=133)	35.9	23.6	6.4	12.7	12.8	9.1	11.8	21.8	33.3	32.7
6. I perform an intra-oral examination that includes viewing the base of the tongue. (n=133)	5.1	1.8	3.8	5.5	10.3	9.1	14.1	14.5	66.7	69.1
7. I perform an intra-oral examination that includes viewing the tonsils and middle part of the throat. (n=133)	5.1	3.6	7.7	1.8	12.8	9.1	14.1	21.8	60.3	63.3
8. I inform patients when I am performing an oral cancer examination. (n=133)	9.0	7.3	5.1	10.9	5.1	10.9	11.5	5.5	69.2	65.5
HPV Specific Practices										
Item	0% of the time		At least 25% of the time		At least 50% of the time		At least 75% of the time		100% of the time	
	C	E	C	E	C	E	C	E	C	E
9. At each appointment, I review the patient health history with the inclusion of identifying HPV-related OPC risk factors. (n=133)	24.4	10.9	20.5	12.7	11.5	20.0	12.8	36.4	30.8	20.0
10. I discuss HPV-related oropharyngeal risk factors, including sexual practices, with adolescent (ages 12-17) patients. (n=132)	65.4	56.4	11.5	7.3	10.3	16.4	5.1	10.9	6.4	9.1
11. I discuss HPV-related oropharyngeal risk factors, including sexual practices, with adult (ages 18-64) patients. (n=132)	57.7	34.5	20.5	12.7	11.5	34.5	3.8	7.3	5.1	10.9
12. I discuss HPV-related oropharyngeal risk factors, including sexual practices, with geriatric (ages 65 and older) patients. (n=132)	69.2	56.4	15.4	14.5	6.4	16.4	3.8	7.3	3.8	5.5
13. I discuss HPV vaccination with all of my patients. (n=133)	70.5	38.2	15.4	21.8	7.7	23.6	2.6	10.9	3.8	5.5

*Results reported in percentages; percentages may not equal 100 due to rounding;
**C: Control Group; ***E: Experimental Group

examination.[33] Dental hygienists play a vital role in increasing patients' awareness of oral examinations, and in turn, may increase patients' expectations and perceptions of the value of this procedure. Standards of practice dictate that oral health professionals should perform a comprehensive visual and tactile oral examination on all patients at every appointment.[4]

Practices specific to HPV were separated out and more closely examined where significant differences were found between the groups. A notable finding of this study was that although many participants agreed/strongly agreed that it was their responsibility to conduct a thorough health history, including a sexual history on all patients, the practice component of the survey showed that many were less inclined to have discussions about HPV-OPC risk factors and sexual practices with patients depending on the patient's age. This same finding held true in regards to attitudes and practices related to discussing HPV vaccinations with all patients. Similar results were reported by Thompson et al.[25] in their study of communication with regards to HPV disease transmission, HPV related cancers and vaccination information among dental hygienists. Kline et al.[44] likewise described the significant role of dental practitioners in HPV-OPC prevention, but also identified barriers specific to HPV discussions, including fear of offending patients, and lack of privacy and time. Similarly, a systematic review conducted by Walker et al.[45] identified practitioners to be less likely to recommend or discuss HPV vaccination if they were uncomfortable discussing sexual practices. Rising rates of HPV-related OPC necessitate developing strategies to overcome oral health practitioners discomfort addressing sexual history and HPV vaccination.

While this study found significant statistical differences between the control and experimental groups regarding knowledge, attitudes, and HPV-related practices, there appears to be a disconnect between respondents' attitudes and actual practices. Investigation into the levels of the affective domain of learning may afford a better understanding of how attitudes are translated to practice. In the affective domain, attitudes are represented by the value one places on something.[46] Practice, a higher level of development known as characterizing, is achieved when attitudes are accepted and acted upon.[47] Further examination of the affective domain levels in relation to dental hygienists' attitudes and practices may be used to enhance future education on the topic of HPV-related OPC.

When considering the American Dental Hygienists' Association (ADHA) Code of Ethics, dental hygiene professionals have a responsibility "to provide oral health care utilizing high levels of professional knowledge, judgement, and skill." [47] Additionally, the dental hygienist is accountable for upholding the ADHA Standards for Clinical Dental Hygiene Practice which includes comprehensive extra- and intraoral examination practices and patient care.[48] The dental hygiene profession must be part of a health care team that is proactive about prevention and early detection of disease. Continuing education is one method of increasing practitioner knowledge; however, alternate methods of ongoing professional development and self-enhancement should be investigated regularly.

Multiple resources are available for patient assessment and examination procedures specifically related to oral pathologies including those provided by the American Dental Association.[21,49] Additionally, the Centers for Disease Control and Prevention have numerous resources on the topics of HPV,[50] HPV risk factors,[51] vaccination[52] and how to take a sexual history.[53] Dental hygienists have also expressed interest in participating in continuing education programs related to these topics.[25] Courses could be more effective in changing behaviors by incorporating more interactive strategies[39] and opportunities requiring audience participation, such as those supported by Phillips et al.[54] for active online CE learning and those by Griscti et al.[55] on the effectiveness of CE programs.

Following the CE webinar for this study, the experimental group participants requested a video on the extra and intraoral examination. Interest was also expressed for guidance on conducting a sexual history, and how to discuss the HPV vaccine. A web-based CE could be enhanced by including an online module with the recorded CE course featuring permanent links to resources associated with course content. This platform aligns with the principles of adult learning which include self-directed, facilitated guidance with the inclusion of videos, resources, and technology.[41]

This study had limitations. The questionnaire used was an original design, however efforts were made to balance this limitation by establishing content validity and reliability. Participants may have provided inaccurate favorable responses to some of the survey items due to self-perceived obligations related to job performance. In addition, the six-week length of time between the CE course and post-test, and the small population size may limit the breadth of data received. There was a loss of participants from the experimental group from the beginning of the study to completion of the survey, although no pattern was identified among the incomplete surveys. Explanations for this loss in numbers might be attributed to the difficulty of the survey, time commitment

of the respondents, or the better retainment of information by those completing the survey. It should be noted, however, that the study design included a randomization procedure to identify the sample, and random assignment was further used to select control and experimental groups.

Additional research in the area of HPV-related OPC and dental hygiene knowledge, attitudes and practice is recommended. Identifying what types of interventions are shown to increase knowledge about HPV-related OPC is important as HPV-related OPC rates continue to rise. Dental hygienists are ideally positioned to be part of the health care team that are effective in prevention, treatment and outcomes of this disease. Determining the drivers for practice change is needed, as knowledge does not necessarily translate to practice. Identifying how dental hygienists can address sensitive topics such as HPV risk factors and sexual practices, how to take a sexual history from individuals spanning all ages, and providing vaccination recommendations, requires further attention from both a qualitative and a quantitative research perspective.

Conclusion:

This study explored the impact a continuing education course on HPV-related OPC epidemiology, risk factors, symptoms, examination procedures, diagnosis, and prevention in regards to dental hygienists' knowledge, attitudes and practices concerning HPV-related OPCs. Results from this study identified statistically significant differences between the the experimental and control groups in the areas of knowledge and attitudes. While no differences were found between the groups in relationship to examination procedures; statistically significant differences were noted for items related to HPV specific practices. Additional research is needed to appreciate what specific types of professional development interventions, such as access to resources, interactive discussion formats, and coordinated hands-on activities, would increase the HPV-related OPC knowledge and practice behaviors of dental hygienists.

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Research

Innovative Collaborative Service-Learning Experience among Dental Hygiene and Nurse Practitioner Students: A pediatric oral health pilot study

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Abstract

Purpose: Preventive oral health behaviors are essential for children during early stages of development. The purpose of this study was to pilot an innovative, collaborative service-learning (ICSL) experience for dental hygiene (DH) and primary care nurse practitioner (NP) students to address pediatric oral health.

Methods: A convenience sample of DH and NP students (n=12) participated in the development, planning and delivery of an ICSL activity focusing on pediatric oral health to 44 pre-school aged children. A learning management system was used for the communicating, planning and evaluating the ICSL activity. The interprofessional socialization of the participants was measured using the Interprofessional Socialization and Valuing Scale (ISVS-9A/9/B) survey prior to and following the ICSL experience. Descriptive statistics were used to analyze the data.

Results: Twelve students agreed to participate in the ICSL experience (DH= 9 and NP=3) and completed the pre and post ISVS-9A/9B surveys. There was a positive change in interprofessional socialization scales (0.42) after the ICSL experience (p=0.066) for all participants. Marginal statistically significant differences were identified among the DH participants (p=0.058) in their pre and post interprofessional socialization scores.

Conclusion: Within the limitations of this pilot study, the ICSL experience had a positive impact on NP and DH students' socialization to interprofessional collaboration. This low resource, service-learning educational project has potential for easy integration within dental hygiene and advanced practice nursing curricula.

Keywords: pediatric oral health, dental hygienists, nurse practitioners, interprofessional education, service learning

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Introduction

Dental caries is a chronic preventable disease that remains a public health problem among children and adolescents. Dental caries results when the enamel becomes compromised by bacteria plaque and the resulting acids produced from the breakdown of dietary carbohydrates.[1] Preventive oral health behaviors are important throughout the lifespan; however, they are even more essential for children during early stages of development. Data from the 2015-2016 National Health and Nutrition Examination Survey (NHANES) revealed 21.4% of children aged 2-5 years in the United States (U.S.) had experienced dental caries and 8.8% of children had untreated dental caries.[2]

The American Academy of Pediatric Dentistry (AAPD), advocates for children to establish a dental home by 12 months of age as a strategy for reducing dental caries risk among children.[3] In 2016, 63.9% of children aged 2-4 years had a dental visit in the past year.[4] A dental home represents a collaborative approach between the patient, caregiver, dental and non-dental professionals focusing on all aspects of oral health.[3] Pediatric primary care providers have a unique opportunity to promote preventive oral health through education, oral screenings, fluoride varnish application and referrals to dental providers. In most cases, these providers have initial and subsequent regular encounters with the

child and caregiver during the first 12 months of life (7 visits between 0-12 months based on the schedule recommended by the American Academy of Pediatrics) often prior to the first dental visit.[5]

In a pilot study conducted by Claiborne and Poston,[6] researchers found that nurse practitioner students' pediatric oral health knowledge and comfort level related to oral health practices improved after receiving online educational content and a 60-minute simulated hands-on fluoride varnish application training. Moreover, the student participants valued the need to incorporate oral health into their well-child assessments.[6] Nurses,' dental hygienists,' and dental hygiene students' pediatric oral health knowledge and practice behaviors have been studied to ascertain gaps in education and practice experiences.[6-12] Researchers have identified continuing education, service learning activities, didactic and clinical experiences as strategies for improving pediatric oral health education and clinical experiences among providers and health professional students.

Providing collaborative interprofessional learning opportunities for health professional students, with a focus on pediatric oral health, has been the goal of previous research studies.[13-15] Isibel et al. designed a faculty facilitated, student-led (dental hygiene, nursing, public health and environmental health) interprofessional service-learning activity to develop maternal and child oral health educational materials for paraprofessionals.[13] However, no studies have been identified in the literature that focus on an interprofessional collaborative approach between dental hygiene and advanced practice nursing students on issues related to pediatric oral health. The purpose of this study was to pilot an innovative collaborative service-learning experience (ICSL) that addressed pediatric oral health issues among dental hygiene (DH) and primary care nurse practitioner (NP) students.

Methods

The Old Dominion University Institutional Review Board and Human Subjects Committee approved this pilot study. A descriptive study design was used to examine DH and NP students' interprofessional socialization using the Interprofessional Socialization Valuing Scale (ISVS) following an innovative collaborative service-learning (ICSL) experience. The target population for this study was a convenience sample of dental hygiene (DH) and nurse practitioner (NP) health professional students enrolled in their respective summer clinical/practicum courses. Students from the DH and NP programs received an invitation to participate in the "Children's Oral Health Day" service-learning activity via their course website. Consent was implied through students' positive email expressing interest to participate in the event and completion of the anonymous pre-post survey instruments delivered through the learning management system.

Innovative Collaborative Service-Learning Activity

The ICSL activity was grounded in the interprofessional education collaborative (IPEC) core competencies, which guide interprofessional curriculum development among health professional programs including dentistry and nursing.[16] The four IPEC core competencies include values/ethics, roles/responsibilities, interprofessional communication, and teams and teamwork.[16] The core competency, roles and responsibilities, were the underpinnings of the ICSL experience for this study. Student learners shared their overall roles and responsibilities, as well as their role in addressing pediatric oral health. The ICSL activity was developed and supported by an interprofessional team of dental hygiene and nursing faculty members in addition to a cohort of pre-school teachers. Prior research focusing on pediatric oral health education for NP students, suggested a next level approach is to provide student-led collaborative service-learning activities allowing for the integration of knowledge and skills of dental hygiene and NP students.[6] This project sought to address this gap by providing students an opportunity to engage in a service-learning activity requiring a collaborative approach.

The service-learning activity focused on pediatric oral health for pre-school age children and consisted of two parts, development and delivery. The content development and the delivery activity was led by DH and NP students with the guidance of faculty members from the schools of dental hygiene and nursing. Due to the distance-learning structure of the advanced practice nursing program, the development of the service-learning activity occurred online through the learning management system (Blackboard Inc.; Washington, DC). The site "My Professional Learning," was created and facilitated by the DH/NP faculty members for the content development and ICSL activity planning. The DH and NP students were able to review all the required content and necessary materials for the pediatric oral health educational service-learning activities through this portal.

The director of the Child Development Center (CDC) and faculty members responsible for classes with children aged 3-5 years were invited to participate in the ICSL project titled, "Children's Oral Health Day." Three classrooms were identified with a total of 52 preschool children ages 3-5 years. Each child's caregiver was given an information packet with an overview of the "Children's Oral Health Day" activity, informed consent for their child to participate and consent for

a fluoride varnish treatment. Caregivers were given four weeks to return packets and the completed packets were collected by the Child Development Center (CDC) faculty/staff. A total of 44 preschool children participated in the "Children's Oral Health Day."

Students who volunteered to participate in the ICSL activity, were invited to the, "My Professional Learning" page in the learning management system. The DH and NP participants completed a series of online interactive activities that were led by dental hygiene and nursing faculty members in preparation for the ICSL activity. Student teams reviewed posted presentations on pediatric oral health care and the value of interprofessional collaboration between DH and FNP/PNPs, dental indices with charting activities, and instructional videos on fluoride varnish application technique. Dental hygiene faculty members also provided a briefing on the oral screening and fluoride varnish application on the day of the event.

The online activities were designed to allow for interprofessional education and collaboration to occur by providing a virtual platform for learning about the importance of pediatric oral health care, from and with each other.[17] Students were asked to describe their background, education, and roles and responsibilities of their respective disciplines using a voice tool in the learning management system. Teams of DH and NP participants learned from and with each other by collaborating on the development of educational materials and interactive activities addressing pediatric oral health for preschool-aged children for use at the ICSL activity.

Dental hygiene and NP student teams delivered hands-on learning and activities at five stations including role playing of pediatric dental visit with dress up/mirror/materials utilized in the dental office, illustrations of healthy eating habits, healthy oral hygiene practices including teeth brushing and flossing, oral screening and fluoride varnish application, and a scavenger hunt/tour of the dental hygiene care facility. Participants completed an "oral health" report card for each child outlining the results of the oral screening. The DH and NP teams applied fluoride varnish at the conclusion of the oral screening to those children who had parental consent. Faculty members from both disciplines supervised all activities. There was a face to face debriefing at the conclusion of the event with faculty members and students present as well as an online discussion forum within the learning management system. Participants were able to provide narrative comments to capture their overall ICSL experience and responded to peers' postings. Participants were also asked to provide overall feedback regarding the experience at the conclusion of the post- survey.

Survey Instrument

The Interprofessional Socialization Values Scale (ISVS9A/ISVS9B) surveys measure beliefs, attitudes and behaviors related to interprofessional collaborative team practice.[18] Participants' demographic information including as age, gender, and specialty program was also collected. The Interprofessional Socialization and Values Scale (ISVS) was initially developed as a 21-item scale to be used for longitudinal data collection. Initial testing of the 21-item scale included in a sample of 124 health professions students and demonstrated reliability with a Cronbach's alpha ranging from 0.79 to 0.89.[18] Further development of the ISVS included shortened equivalent forms to utilize in pre/post testing in an effort to reduce respondent burden and threats to validity.[19] Equivalent subscales (ISVS-9A & ISVS-9B) were tested and demonstrated agreement with ICC-.970, 95% CI .963-976 for health professions students.[19] The ISVS-9A and 9B ask respondents to indicate "the degree to which you hold or display each of the beliefs, behaviors, and attitudes that are described" on a 7 point- Likert scale with a range of 0-7 (0=Not Applicable, 1=Not at all, 7-to a Very Great Extent).[19] Both on the ISVS-9A and ISVS-9B individual item scores are summed and divided by 9 for an average overall score with a minimum score of 0 and maximum score of 7.[19] In this study, the mean score for each individual item and overall mean sum score for the ISVS-9A and ISVS-9B were calculated for the sample.

Data Collection and Analysis

Participants completed the anonymous surveys (ISVS 9A/9B) in the learning management system prior to and following the ICSL activity. Participants entered their own unique ID for the pre/post-test surveys to allow for matched responses and were also given the option to 'opt in' or 'opt out' of having their responses included in future research analysis reported in aggregate. Descriptive statistics were used to analyze the data. Wilcoxon sign-ranked tests were used to examine statistically significant difference between the pre-ISVS 9A and post-ISVS 9B average total scores for all participants. Statistical significance was set at p=0.05; Excel (Microsoft; Bellevue, WA) and SPSS V.25 (IBM; Armonk, NY) were used for data analysis.

Results

Twelve participants (n=9 DH and n=3 NP students) completed the ISVS-9A prior to participating in the ICSL experience (n=12, 100%) and ten participants (n=8 DH and n=2 NP students (n=10, 83%) completed the ISVS-9B following the ICSL experience. In general, the participants'

level of agreement ranged from "to a fairly great extent" – "to a very great extent" for all statements in the ISVS 9A-9B surveys. The mean ISVS 9A scores prior to the ICSL experience ranged 5.50-6.45 for all participants. Prior to the ICSL experience participants scored the lowest level of agreement (5.50) with the statement, "*I have gained an enhanced awareness of roles of other professionals on a team.*" When stratified by discipline, similar findings were observed (DH = 5.67, NP = 5.00). The highest level of agreement (6.45) was observed with the statement, *"I believe that the best decisions are made when members openly share their views and ideas.*" This was also the highest overall level of agreement (6.62) for DH students. After participating in the ICSL experience, the mean ISVS 9B scores for all participants ranged from 5.80-6.80. Learners scored their lowest level of agreement (5.80) with the statement "*I see myself as preferring to work on an interprofessional team.* This was also the lowest overall level of agreement (5.75) for DH students. The second lowest (5.80) level of agreement for all participants was observed with the statement, "*I have gained a better understanding of the client's involvement in decision making around their care.*" This statement was the lowest level of agreement among NP students (4.50). The highest level of agreement for all participants (6.80) and within the disciplines (DH = 6.75 and NP = 7.00) was the statement, "*I believe that it is important to work as a team.*" Levels of agreement for the disciplines are shown in Table I.

Overall, positive changes were observed between the total pre ISVS scores (M=5.97, SD=0.55) and post total post ISVS scores (M=6.33, SD=0.74). However, this difference, (0.42) was not statistically significant (T=-1.83, p=0.066). This positive change was also reflected in the specific discipline (DH 0.28, NP 0.54). Among dental hygiene students, there was a marginal statistically significant difference among DH participants' pre-post ISVS scores (T=-1.89, p=0.058) but not the NP participant scores (T=-1.61, p=0.106).

Discussion

Overall, this pilot ICSL experience demonstrated a positive impact on student values and socialization related to interprofessional collaborative practice with regards to the pediatric oral health care needs for children in the community. Prior to the ICSL experience the participants had their lowest level of agreement with the statement "*I have gained an enhanced awareness of roles of other professionals on a team,*" which suggests that both groups of students had some prior interprofessional collaborative experience before the ICSL activity. While the combined score for all participants was high (5.80) individually, the mean score for NP students was lower (5.00) as compared to DH participants (5.67), which may be indicative of the level of interprofessional education experiences or exposures within the individual disciplines. While the demographic questions did not collect prior interprofessional education experiences, including this information in future studies will provide information on similarities and differences in previous exposures to interprofessional experiences across the health care disciplines.

All participants had the highest level of agreement with the statement *"I believe that the best decisions are made when members openly share their views and ideas"* prior to the ICSL experience. This finding suggests the participants highly valued collaboration, which was reflective in how ideas were exchanged in the development and delivery of the learning activities. Both DH and NP participants had their highest level of agreement with the statement, *"I believe that it is important to work as a team*," implying that both groups of students value the benefits of teamwork. In this study, the participants had to collaborate on both the development and the delivery of oral health learning activities or pre-school age children. Overall, the qualitative student feedback was positive and indicated that this level of engagement within an interprofessional team was appropriate for their professional development and valuable to improving skills and confidence in preventative oral health with pediatric populations.

Previous literature demonstrates that university based interprofessional education for students in the health professions is feasible and effective.[20-21] The literature highlights the necessity of including interprofessional competencies in graduate nursing education to ensure that advanced practice registered nurses are ready to practice effective team-based care.[22] Similarly, in the dental hygiene profession, the Commission on Dental Hygiene (CODA) accreditation standards for dental hygiene education programs require that students be competent in "communicating and collaborating with other members of the healthcare team to support comprehensive patient care."[23] Providing opportunities for collaborative patient care experiences to dental hygiene and nursing students are encouraged and/or required among the two professions. With regards to the dental hygiene profession, several national studies have examined activities, perspectives, and barriers related to interprofessional education in dental hygiene education programs.[24,25,26] In the Furgeson et al. national survey of dental hygiene program directors, it was found that roughly 90% of nursing schools were located within institutions where dental hygiene programs were also a part of the institution and collaborating with a nursing school was the most commonly reported for dental hygiene programs.[24] A similar finding was also identified in the Tolle

Table I. Pre- and post survey scores for dental hygienist and nurse practitioner student participants

ISVS-9A(pre) and ISVS-9B(post) average scores by item							
ISVS-9A (pre)	**All Participants (n=12) Mean (SD)**	**DH (n=9) Mean (SD)**	**NP (n=3) Mean (SD)**	**ISVS-9B (post)**	**All Participants (n=10) Mean (SD)**	**DH (n=8) Mean (SD)**	**NP (n=2) Mean (SD)**
I am able to share and exchange ideas in a team discussion.	5.92 (1.16)	6.00 (1.22)	5.67 (1.16)	**I have gained an enhanced awareness of my own role on a team.**	6.10 (1.10)	6.25 (1.16)	5.5 (0.71)
I have gained an enhanced perception of myself as someone who engages in interprofessional practice.	5.67 (0.78)	5.89 (0.60)	5.00 (1.00)	**I feel comfortable being the leader in a team situation.**	6.30 (1.06)	6.25 (1.16)	6.5 (0.71)
I feel comfortable in speaking out within the team when others are not keeping the best interests of the client in mind.	6.08 (1.00)	6.11 (1.05)	6.00 (1.00)	**I see myself as preferring to work on an interprofessional team.**	5.80 (1.14)	5.75 (1.28)	6.00 (0.00)
I believe that the best decisions are made when members openly share their views and ideas.	6.45 (1.04)	6.62 (0.74)	6.00 (1.73)	**I have a better appreciation for the value in sharing research evidence across different health professional disciplines in a team.**	6.70 (0.48)	6.75 (0.46)	6.50 (0.71)
I feel comfortable in describing my professional role to another team member.	5.83 (1.03)	6.00 (1.12)	5.33 (0.57)	**I believe that it is important to work as a team.**	6.80 (0.42)	6.75 (0.46)	7.00 (0.00)
I have gained an enhanced awareness of roles of other professionals on a team.	5.50 (1.31)	5.67 (1.50)	5.00 (0.00)	**I am able to negotiate more openly with others within the team.**	6.40 (0.84)	6.37 (0.92)	6.50 (0.71)
I have gained an appreciation for the importance of having the client and family as members of a team.	6.17 (1.11)	6.11 (1.17)	6.33 (1.15)	**I feel comfortable in being accountable for the responsibilities I have taken on.**	6.60 (0.70)	6.62 (0.74)	6.50 (0.71)
I am comfortable engaging in shared decision making with clients.	6.08 (0.67)	6.22 (0.67)	5.67 (0.57)	**I have gained a better understanding of the client's involvement in decision-making around their care.**	5.80 (1.55)	6.12 (1.36)	4.50 (2.12)
I feel comfortable in accepting responsibility delegated to me within a team.	6.08 (0.67)	6.22 (0.67)	5.67 (0.57)	**I feel comfortable in clarifying misconceptions with other members of the team about the role of someone in my profession.**	6.50 (0.53)	6.50 (0.53)	6.50 (0.71)
ISVS-9A and ISVS-9B final scores for both groups							
ISVS 9A (pre) Total Score	**All Participants (n=12) Mean (SD)**	**DH (n=9) Mean (SD)**	**NP (n=3) Mean (SD)**	**ISVS-9B (post) Total Score**	**All Participants (n=10) Mean (SD)**	**DH (n=8) Mean (SD)**	**NP (n=2) Mean (SD)**
	5.98 (0.28)	6.09 (0.26)*	5.63 (0.45)		6.33 (0.37)	6.37 (0.32)*	6.17 (0.75)

*Marginal statistically significant difference was observed among dental hygiene students (p=0.058).

et al. study where nursing programs were the most commonly reported program for interprofessional activities.[26] In the Furgeson et al., study, volunteer activities were the most frequently reported interprofessional event between dental hygiene and other disciplines. With regards to service-learning projects, half of the respondents reported service-learning projects as a vehicle for interprofessional education between dental hygiene and other disciplines.[24]

Documented efforts of IPE activities between dental hygiene and nurse practitioner students are scarce, specifically in the area of pediatric oral health. In addition to identifying appropriate programs for collaboration, scheduling coordination has been a highly reported challenge among dental hygiene programs for integrating interprofessional education experiences.[24] This study addresses these gaps by highlighting a cost-effective innovative approach that can be used to overcome challenges shared among health professions in creating interprofessional education opportunities for students. However, future research should include a larger student learner cohort and a longitudinal look at changes in beliefs, values and attitudes related to interprofessional education that are needed to demonstrate meaningful change that can impact professional development and patient care outcomes. Dental hygiene and NP faculty members should continue to utilize the service-learning platform for meaningful interprofessional educational initiatives among DH and NP students focused on integrated pediatric oral health care.

This study has limitations. The small sample size, particularly the NP participants, limits the generalizability of the results. Since the majority of NP students were completing their coursework online and were living at a distance from the university, it was a challenge to obtain an equal number of participants to match the DH students. However, based on the number of pre-school age students and classes within the child development center, the overall number of participant groups was appropriate. Future efforts should include coordinating the ICSL activity with the NP's other required on-campus activities to increase NPs participation. However, while the virtual learning and collaboration component for the ICSL activity was not a challenge; the in-person component of the ICSL activity can be a barrier. Schedule coordination is a reported challenge in the literature for developing interprofessional activities. The use of virtual technology for preparation and delivery of education or care is one strategy to leverage scheduling conflicts while providing students with enriched interprofessional experiences. Considering these limitations, this was the initial pilot of an interprofessional service-learning activity with DH and NP students focused on pediatric oral health that did not require a significant investment of resources (i.e. money) or faculty workload (i.e. time). Although this pilot project was limited to a small number of volunteer participants, positive changes in values and socialization related to interprofessional education and collaborative care were appreciated after participation in this ICSL experience.

Conclusion

This ICSL experience provided important opportunities for DH and NP health profession students to engage in preventive pediatric oral health care collaboratively. Early childhood preventive oral health care represents a key area for interprofessional collaborative practice in primary care settings. Socialization to interprofessional collaboration in early in the health professions education process is an important component in facilitating future success with collaborative patient-centered care. Interprofessional education efforts are occurring within dental hygiene education programs however, more studies are needed to document the specific types of interprofessional activities along with the core competencies used. This low resource, service-learning educational project has potential for easy integration within dental hygiene and advanced practice nursing curricula.

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Research

Sexual Harassment Issues Among Virginia Dental Hygienists

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Abstract

Purpose: The "#MeToo" movement has increased awareness of sexual harassment in the workplace and its detrimental effects on the work environment. The purpose of this study was to determine the prevalence of sexual harassment in a convenience sample of dental hygienists in the state of Virginia (VA).

Methods: A cross-sectional research design was used to determine the experiences of VA dental hygienists with sexual harassment in the workplace occurring over the previous twenty-four months. The revised Sexual Experiences Questionnaire (SEQ-W) measured three constructs: gender harassment, unwanted sexual attention, and sexual coercion and was administered electronically to a convenience sample of 238 dental hygienists attending a continuing education conference. Chi-square was used to determine significant associations between survey scores and demographics.

Results: A total of 161 dental hygienists completed the survey (n=161) for a response rate of 68%. A little more than one-quarter of the respondents (27%) reported at least one experience of sexual harassment in the previous 24 months. Of the three constructs measured, 27.3% of participants reported gender harassment, 18.6% unwanted sexual attention, and 6.8% sexual coercion. The most commonly reported items were being told offensive sexual jokes or stories (21%) and hearing someone make crude and offensive sexual remarks (18%). A definition of sexual harassment was provided and participants were asked, "During your career as a dental hygienist, have you experienced sexual harassment?" to which 24.2% (n=39) responded yes.

Conclusion: Sexual harassment is a contemporary problem in dental hygiene employment settings in the state of Virginia. Effective training and policies in sexual harassment is needed to prevent these behaviors from occurring in the workplace.

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Introduction

The "#MeToo" movement has increased awareness of systemic sexism, sexual harassment and sexual assault in the workplace. Sexual harassment involves the interpretation of a verbal, nonverbal, or physical action against another person that is unwanted, not mutually agreed upon or reciprocated by another individual and causes that person to be threatened or humiliated. Sexual harassment is considered to be a form of sex discrimination that violates Title VII of the Civil Rights Act of 1964, this only applies to employers with 15 or more employees.[1] The United States (U.S.) Equal Employment Opportunity Commission further defines sexual harassment as "unwelcome sexual advances, requests for sexual favors, and other verbal or physical conduct of a sexual nature constitute sexual harassment when this conduct explicitly or implicitly affects an individual's employment, unreasonably interferes with an individual's work performance, or creates an intimidating, hostile, or offensive work environment."[1]

According to the Centers for Disease Control and Prevention (CDC), there are two types of sexual harassment in the workplace.[2] "Quid pro quo" is a form of harassment by a manager/supervisor or person of authority in which an employee's receipt of an employment benefit or the imposition of a tangible job detriment is conditioned on the employee's acceptance or rejection of the harassment.[2] The second type is termed "hostile work environment sexual harassment," which occurs when an employee is subjected to offensive and unwelcome sexual advances, insinuations, or gender-related comments from a co-worker, supervisor, or client that creates an intimidating or offensive place for the employee to work.[2]

Victims of sexual harassment can identify with any gender orientation and the offender can be of the opposite or same gender as the victim. However, sexual harassment is considered a gender phenomenon and as such, women

are most vulnerable and more often experience the hostile environments created by sexual harassment. According to the U.S. Equal Employment Opportunity Commission, as many as 1 in 4 women may have experienced workplace sexual harassment.[3] During 2014, women filed 74% of the sex discrimination charges, which included cases of sexual harassment.[3] The 2016 U.S. Merit Systems Protection Board survey of sexual harassment in the Federal workplace found 18% of women reported experiences of sexual harassment compared to only 6% of men.[4]

Sexual harassment in the workplace is a worldwide problem prevalent in health care settings.[4-15] Research has suggested a variety of health care workers including chiropractors, physical therapists, social workers, nurses and physicians are subjected to sexual harassment during their work.[4-14] For example, one review of the literature combined data from 38 countries and found 28% of nurses reported being sexually harassed,[10] while a survey of U.S. academic medical faculty found that 30% of women reported experiencing sexual harassment.[11] A European study of medical residents revealed 83.8% of females experienced at least one type of sexual harassment,[12] while a study of Japanese medical residents found that over one-half of the female medical residents surveyed (58.3%) reported sexual harassment.[13]

Research has shown a significant positive correlation between sexual harassment and mental health issues such as depression, anxiety, stress, and low self-esteem.[12,16-19] Workplace sexual harassment is costly to victims and studies have found that people who experience frequent workplace sexual harassment have significantly higher depression rates than non-harassed people.[12,18] Vagonis et al. found more severe depression and anxiety and lower quality of life (QOL) scores in sexually harassed medical residents compared to non-harassed residents.[12] Additionally, research by Malik et al. of female physicians and nurses suggests a strong relationship between sexual harassment and post-traumatic stress disorder (PTSD).[20] Similarly, two reviews of the literature and a meta-analysis verified a positive association with sexual harassment and PTSD.[21-23]

In regards to workplace sexual harassment, victims are not limited to the offender and the one being directly attacked, but can also include anyone else who feels indirectly affected by the offense.[1] Research has suggested that people with indirect exposure to sexual harassment, such as hearing about or witnessing it, termed "co-victimization," can suffer from similar negative psychological effects experienced by victims.[21-23] A study by Miner-Rubino and Cortino found that the sense of well-being of all genders was diminished when working in an environment considered to be hostile towards women, even in the absence of personal experiences with harassment.[24] Additionally, sexual harassment has been linked to withdrawal from the organization, which can present as work withdrawal (tardiness, absenteeism, or neglecting work tasks) or job withdrawal (turnover or intentions to quit).[4,14,21,25] Research by Willness et al. suggested a more positive correlation between sexual harassment and work withdrawal versus job withdrawal due to the reluctance or inability of the victim to quit a job.[22] Work withdrawal behaviors may lead to reduced productivity which may explain why there is a negative relationship between sexual harassment and productivity.[22]

Limited research is available on the prevalence of sexual harassment in dentistry and recent studies have focused on dental students. In a study of dental students from four multinational schools, 34% of female students and 7% of male students reported experiences of sexual harassment.[26] Sexual slurs and advances were the most common harassment experiences reported. Another multinational study of female dental students found 11.2% of participants reported experiencing verbal harassment, 3.1% reported physical assault and almost half said that their school was not vigilant about these issues.[27] Additionally, almost half of the participants reported they would not be comfortable reporting a sexual harassment violation, and 62.8% of the participants indicated they would face consequences if a report was filed.[27] It was suggested that cultural traditions of gender bias in patriarchal societies may explain low reports of violations and perceived inability to report violations without consequences.[27]

Minimal research is available on dental hygiene practitioners and the prevalence of workplace sexual harassment. A 1992 study of 472 dental hygienists in Washington State revealed 26% of respondents reported workplace sexual harassment.[28] In this study, results indicated that the perpetrator of the sexual harassment instances was either the dentist/employer (54%) or patients (37%). In a 1998 survey of dental hygienists in the state of Virginia, over half of the dental hygienists surveyed (54%) indicated having experienced sexual harassment.[29] Of the harassed dental hygiene respondents, 50% indicated the harassment happened more than four years prior while 10% reported harassment in the past year. While one-third of the victims considered leaving their employment, only 16% actually left. A 2017 study of dental hygienists in Korea found 48.7% reported experiencing workplace sexual harassment, with the dentist/employer identified as the offender in 67.3% of the cases.[30]

Sexual harassment has been reported as a common problem by women employed in health care as well as the general workforce.[3-14] Given the predominance of women in the dental hygiene profession, assessing its prevalence is needed. In order for dental hygienists to effectively manage this type of illegal behavior, its occurrence must first be recognized. The purpose of this study was to determine the prevalence of sexual harassment in a convenience sample of dental hygienists in the state of Virginia.

Methods

This study received an exempt status by the Old Dominion University Institutional Review Board. A cross-sectional research design was used to determine the experiences of dental hygienists with workplace sexual harassment occurring over the previous twenty-four months in the state of Virginia (VA). A convenience sample of dental hygienists attending a three-day Continuing Education (CE) event in VA was used for the study population. Each attendee received a cover letter explaining the purpose of the study and an invitation to participate in their CE packets during event registration. The inclusion criteria for the study were dental hygienists licensed in the state of VA. Computers were provided for participants to complete the online survey using a web-based software company (Qualtrics; Provo, UT). Participants were informed of the confidentiality of their responses and consent was understood with the completion and submission of the survey. The survey was made available over the three-day period of the CE event.

Survey Instrument

Fitzgerald's revised *Sexual Experiences Questionnaire* (SEQ-W) was used for this study.[31] The SEQ-W survey is comprised of 17 situational specific items related to workplace sexual harassment and measures three constructs: gender harassment, unwanted sexual attention, and sexual coercion. It should be noted that the SEQ-W survey has limitations when used to measure sexual harassment from a legal perspective. Fitzgerald et al. acknowledges that the SEQ-W survey does not address conditions under which the three constructs become harassment under the sanctionable meaning of the term and advocates that complete circumstances must be evaluated in any particular situation before these experiences can be deemed sexual harassment under the law.[31] The construct of gender or sexual harassment is defined as treating someone unfavorably due to one's gender and does not have to be sexual in nature.[1] Unwanted sexual attention is defined as unwelcomed, non-reciprocated sexual attention such as asking for dates, touching, staring, or making gestures of a sexual nature.[32] Sexual coercion is "quid pro quo" sexual harassment where a job-related benefit or consequence is conditioned on the employee's acceptance or rejection of the harassment. A five-point Likert-type scale ranging from one (never) to five (most of the time) was used to indicate how often participants experienced the listed behaviors over the previous 24 months. In addition to the SEQ-W, five demographic questions (age, gender, highest education, ethnicity, and primary employment setting) were included along with additional questions on whether the participant believed they had ever been a victim of sexual harassment during their dental hygiene career, how long ago, if it was reported, and whether or not their current employment setting had a written anti-sexual harassment policy. The additional questions were reviewed by a panel of experts for face validity and revisions were made to improve clarity based on comments made by the panel.

Data Analysis

Data analyses were conducted to understand the frequency and pervasiveness of sexual harassment among participants using descriptive statistics. Additionally, Pearson's Chi-square test of association was used to determine if statistically significant relationships existed between demographic characteristics and each of the three subscales. Statistical significance was set at α=0.05. Frequency of responses for all 17 situational specific items of the SEQ-W were calculated. Additionally, the percentage of sexual harassment across various demographics was calculated.

Responses were grouped by subscale category and analyzed using Fitzgerald's recommendation to calculate simple percentages at the scale level. Any participant who endorsed at least one item in a subscale with any answer except "never" was counted as having experienced sexual harassment assessed by that subscale, in order to avoid double counting participants who reported multiple behaviors within the same subscale.[33]

Results

Of the 238 dental hygienists invited to participate, 161 completed the survey (n=161) for a response rate of 68%. Most of the respondents were employed in a solo private practice (44.1%), followed by group practices (33.5%). The majority of participants were white (77%) and female (99%). Nearly one-half (46.0%) of the participants reported a bachelor's degree as their highest education and 40.4% reported an associate's degree. Over one-half (60%) of respondents were 40 years of age or older. Complete demographic data is found in Table I. The rates of sexual harassment across various demographics were also calculated and shown in Table II.

Table I. Respondent demographics

Characteristics	Number of Respondents n (%)
Gender	
Male	2 (1.2%)
Female	159 (98.7%)
Ethnicity	
White	124 (77.0%)
Black or African American	14 (8.6%)
Hispanic	6 (3.7%)
Native Hawaiian or other Pacific Islander	2 (1.2%)
Asian	9 (5.5%)
Other	6 (3.7%)
Age Range	
20-29	20 (12.4%)
30-39	43 (26.7%)
40-49	35 (21.7%)
50-59	37 (22.9%)
Over 60	26 (16.1%)
Employment setting	
Solo Private Practice	71 (44.0%)
Group Private Practice	54 (33.5%)
Education	17 (10.5%)
Public Health	3 (1.8%)
Corporate Setting	7 (4.3%)
Other	9 (5.5%)
Highest education	
Associate degree	65 (40.3%)
Bachelor's degree	74 (45.9%)
Master's degree	19 (11.8%)
Doctoral degree	3 (1.8%)

Table II. Comparison of sexual harassment experiences among respondents*

	Sample %	Gender harassment %	Unwanted sexual attention %	Sexual coercion %
Age				
20-39	39.1	28.6	23.8	6.3
40+	60.9	26.5	15.3	7.1
Race/Ethnicity				
White	77.0	27.4	18.5	5.6
Non-White	23.0	27.0	18.9	10.8
Education Level				
Associate's degree	40.4	35.4	26.2	10.8
Bachelor's degree	46.0	20.3	10.8	4.1
Graduate degree (MS/ PhD)	13.7	27.3	22.7	4.5
Employment Setting				
Solo practice	44.1	29.6	16.9	9.9
Education	10.6	29.4	29.4	5.9
Public health	1.9	66.7	33.3	33.3
Other	5.6	11.1	0.0	0.0
Group practice	33.5	20.4	20.4	3.7
Corporatesetting	4.3	57.1	14.3	0.0
Written Policy				
Yes	44.0	28.6	17.1	4.3
No	25.2	27.5	25.0	10.0
Not Sure	30.8	22.4	14.3	6.1

*Percentage of respondents who shared a specific trait (i.e. holding an associates degree) who reported having experienced a specific category of sexual harassment (i.e. sexual coercion).

The prevalence of sexual harassment experienced by participants in each of the three subscales (gender harassment, unwanted sexual attention, and sexual coercion) is shown in Table III. Over one-fourth of the respondents reported gender harassment (27.3%), followed by unwanted sexual attention (18.6%), and sexual coercion 6.8%). Combined, gender harassment

Table III. Sexual harassment prevalence for three subscales

	Yes n	Yes (%)	No n	No (%)	Total n	Total (%)
Gender Harassment	44	(27.3)	117	(72.7)	161	(100)
Unwanted Sexual Attention	30	(18.6)	131	(81.4)	161	(100)
Sexual Coercion	11	(6.8)	150	(93.2)	161	(100)

and unwanted sexual attention were reported by 49.5% of the respondents as compared to 6.8% who reported sexual coercion. The most commonly reported sexual harassment items were: "told sexual stories or jokes that were offensive to you" (21.7%), "made crude or offensive sexual remarks" (18.0%), and "made offensive remarks about your appearance, body, or sexual activities" (13.0%). Every item on the scale was reported by at least one respondent. Frequencies of the SEQ-W sexual harassment items are shown in Table IV.

Pearson's chi-square tests were used to check the relationships between the variables. No statistically significant differences were identified between demographic characteristics of age, ethnicity, education, employment setting, or written policy on sexual harassment with any of the gender harassment, unwanted sexual attention and sexual coercion. The results of the Pearson chi-square tests of potential factors correlating with sexual harassment are shown in Table V.

Following the 17 situational specific SEQ-W items and demographic questions, a definition of sexual harassment was provided. Participants were asked the question, "During your career as a dental hygienist, have you experienced sexual harassment? Nearly one-fourth of the respondents (n=39, 24.2%) replied "yes." Respondents indicating "yes" were asked how long ago the sexual harassment occurred with 42% reporting over 10 years ago, and 18.4% reporting an occurrence within the past year (Figure 1). These respondents were also asked about reporting of the sexual harassment incident. A little over one-third (34.2%) responded "no reporting" while nearly one-third (31.5%) responded "employing dentist", and 31.5% responded "friend" or "other" while 2.6% indicated the "office manager" (Table VI). Respondents were also asked whether they had ever left their place of employment due to sexual harassment with the majority indicating "no" (76.9%). In regards to a written policy on sexual harassment, under one-half (44.0%) of all respondents indicated having an office policy, while one-fourth had no policy and nearly one-third (30.8%) were unsure if a policy existed.

Discussion

Workplace sexual harassment is a serious stressor, negatively affecting physical and emotional health, contributing to absenteeism and high employment turnover rates. Sexual harassment fosters an ineffective work environment due to continued destruction of the victim's confidence and skills, and may cultivate negative attitudes toward a chosen profession including dental hygiene.[15-17,25,34] While the legal definition of sexual harassment focuses on patterns of repeated offenses, a single incident can be interpreted by the victim as being so severe that it fosters a negative work culture causing psychological harm to the victim.[31] Moreover, due to "co- victimization", the damaging psychological effects of sexual harassment may impact anyone in the workplace witnessing or hearing about the harassment;[21-23] making sexual harassment prevention a priority to promote a healthy and productive work environment for all.

Results from this study suggest at least one out of four participants experienced workplace sexual harassment in the past 24 months as measured by the SEQ-W. These findings are similar to national employment data reporting 21% of Americans have experienced workplace sexual harassment.[35] In the 1998 study conducted by Pennington et al., over one-half of VA dental hygienists (54%) indicated having experienced sexual harassment.[29] In comparison to the previous study, prevalence of sexual harassment among VA dental hygienists appears to have decreased; however, sexual harassment still remains a serious and prevalent problem among VA dental hygienists. The assessment tools used in the two studies may explain the variation in the results. This study used the SEQ-W survey in contrast to the self-designed survey instrument used by Pennington et al.

When compared to recent data from other healthcare professions, results from this study are similar to those of Spector who found 28% of nurses reported sexual harassment[10] and Jagsi et al. who found 30% of medical faculty experienced sexual harassment.[11] Data from this study and others suggest workplace sexual harassment continues to be a problem for many women in the current healthcare workforce. Increased, high-quality education is needed to facilitate workplaces that feel safe to all. No amount of sexual harassment is acceptable or should be tolerated, and all healthcare settings should strive to promote an atmosphere of prevention especially considering the negative consequences associated with sexual harassment.

When comparing results of this study to sexual harassment experienced by dental students, findings are similar to those of Quick et al. who found 34% of female dental students reported experiencing sexual harassment.[26] According to Kabatt-Farr et al., unaddressed sexual harassment in healthcare education settings may actually increase acceptance of the ideology that harassment is an innate part of the job.[36] Dental hygiene students could benefit from sexual harassment education to help recognize the behavior and learn about resources to help victims.[6]

Sexual harassment is often associated with power in settings where males dominate over female employees. Research has shown that sexual harassment is more about maintaining

Table IV. Frequency of sexual harassment

Sexual Harassment	Never n	Never (%)	Once or Twice n	Once or Twice (%)	Sometimes n	Sometimes (%)	Often n	Often (%)	Most of the time n	Most of the time (%)
Gender Harassment										
Told sexual stories or jokes that were offensive to you	126	(78.3)	24	(14.9)	8	(5.0)	0	(0.0)	3	(1.9)
Made crude or offensive sexual remarks	132	(82.0)	18	(11.2)	7	(4.3)	3	(1.9)	1	(0.6)
Made offensive remarks about your appearance, body, or sexual activities	140	(87.0)	13	(8.1)	7	(4.3)	1	(0.6)	0	(0.0)
Displayed, used, or distributed sexist or suggestive materials (for example, pictures, stories, or pornography which you found offensive)	150	(93.2)	4	(2.5)	6	(3.7)	0	(0.0)	1	(0.6)
Made offensive sexist remarks (for example, suggesting that people of your sex are not suited for the kind of work you do)	149	(92.5)	9	(5.6)	3	(1.9)	0	(0.0)	0	(0.0)
Unwanted Sexual Attention										
Made unwelcome attempts to draw you into a discussion of sexual matters (for example, attempted to discuss or comment on your sex life)	144	(89.4)	9	(5.6)	5	(3.1)	2	(1.2)	1	(0.6)
Made gestures or used body language of a sexual nature which embarrassed or offended you	147	(91.3)	9	(5.6)	4	(2.5)	0	(0.0)	1	(0.6)
Stared, leered, or ogled you in a way that made you feel uncomfortable	142	(88.2)	15	(9.3)	2	(1.2)	0	(0.0)	2	(1.2)
Made unwanted attempts to establish a romantic sexual relationship with you despite your efforts to discourage it	149	(92.5)	7	(4.3)	4	(2.5)	0	(0.0)	1	(0.6)
Continued to ask you for dates, drinks, dinner, etc., even though you said "No"	149	(92.5)	8	(5.0)	3	(1.9)	0	(0.0)	1	(0.6)
Touched you in a way that made you feel uncomfortable	146	(90.7)	12	(7.5)	1	(0.6)	1	(0.6)	1	(0.6)
Made unwanted attempts to stroke, fondle, or kiss you	151	(93.8)	6	(3.7)	2	(1.2)	1	(0.6)	1	(0.6)
Sexual Coercion										
Made you feel you were being bribed with some sort of reward or special treatment to engage in sexual behavior	152	(94.4)	4	(2.5)	3	(1.9)	1	(0.6)	1	(0.6)
Made you feel threatened with some sort of retaliation for not being sexually cooperative	152	(94.4)	4	(2.5)	3	(1.9)	1	(0.6)	1	(0.6)
Implied faster promotions or better treatment if you were sexually active	154	(95.7)	2	(1.2)	4	(2.5)	0	(0.0)	1	(0.6)
Made you feel afraid you would be treated poorly if you didn't cooperate sexually	155	(96.3)	2	(1.2)	3	(1.9)	0	(0.0)	1	(0.6)
Treated you badly for refusing to have sex	155	(96.3)	0	(0.0)	4	(2.5)	0	(0.0)	2	(1.2)

Table V. Pearson's Chi-square results of potential sexual harassment correlations

Potential correlations with sexual harassment	X^2	df	P value
Age (n=161)			
Gender harassment	0.08	1	.777
Unwanted sexual attention	1.83	1	.176
Sexual coercion	0.04	1	.846
Ethnicity (n=161)			
Gender harassment	.002	1	.963
Unwanted sexual attention	.003	1	.959
Sexual coercion	1.195	1	.274
Education (n=161)			
Gender harassment	3.980	1	.137
Unwanted sexual attention	5.655	1	.059
Sexual coercion	2.661	1	.264
Employment Setting (n=161)			
Gender harassment	8.197	1	.146
Unwanted sexual attention	4.126	1	.531
Sexual coercion	6.360	1	.273
Existence of written policy (n=159)			
Gender harassment	1.588	1	.745
Unwanted sexual attention	1.796	1	.407
Sexual coercion	1.414	1	.493

Statistical significance was set at α=0.05.

power and excluding others from full participation in the work environment as opposed to actual sexual attraction.[36] The predominately female dental hygiene profession with male dentist employers could be conducive to this type of dynamic due to the traditional male hierarchical structure. Additionally, dental hygienists frequently work in isolated rooms and in close proximity with male employers, factors which could contribute to sexual harassment. However, dental hygienists should not feel obligated to tolerate these behaviors as "normal," but instead feel empowered to object this mistreatment. Dental hygienists need to be aware of sexual harassment and know how to handle it if it occurs to help prevent it from being a work stressor that negatively affects their job and health.

Of the three constructs, gender harassment was reported most frequently, followed by unwanted sexual attention. Previous studies measuring these constructs also found highest incidences of gender harassment, followed by

Table VI. Sexual harassment reporting (n=38).

Individual receiving the sexual harassment report	% (n)
Office manager	2.6% (1)
Hygiene manager	0
Employing dentist	31.5% (12)
Corporate administrator	0
No reporting	34.2% (13)
Friend	15.8% (6)
Other	15.8% (6)

unwanted sexual attention, then sexual coercion.[6,12] The most commonly reported items from this study were: "told sexual stories or jokes that were offensive to you", "made crude or offensive sexual remarks," and "made offensive remarks about your appearance, body, or sexual activities." This finding is similar to other studies who also found sexual jokes and crude and offensive sexual remarks to be among the most commonly reported items of the SEQ.[6,37] Counteractions to these behaviors should focus on awareness, tips for identifying such offenses, and ways to handle these offenses. Sexual harassment training in dental hygiene employment settings as well as continuing education seminars could promote a better understanding of how to identify sexual harassment and support the development of proactive action plans to prevent or counteract these behaviors.

No statistically significant differences were found between demographic characteristics in any of the three subscales in this study. This differs from research by Moylan and Wood who found a statistically significant difference among ethnicity and sexual harassment with Latina/Hispanic respondents reporting the highest prevalence of sexual harassment.[6] The predominately white sample of the current study (77%) may explain the lack of significant differences in ethnicity and harassment. A sample with more non-white participants may provide more accurate information on this relationship. No significant relationships were found between education level and sexual harassment, which is similar to a previous study of sexual harassment prevalence between bachelor's degree and master's degree students[6] and a second study where no significant differences in reported sexual harassment were found between medical residency training years.[12] This differs another study where sexual harassment prevalence was higher among nurses with bachelor's degrees when compared to nurses who graduated from vocational programs.[14] Conflicting data has also been found regarding age and sexual harassment prevalence. While results of this study and those of Vagonis et al. found no significant

correlation between age and sexual harassment experiences,[12] Moylan and Wood found younger respondents reported higher a prevalence.[6] More research is needed to determine the relationship between age and sexual harassment.

In this study, over one-third of the respondents identifying with sexual harassment (34.2%) did not report the incident. In a study of sexually harassed nurses, over one-half of the victims did nothing regarding the sexual harassment (59.3%).[14] Similarly, in a 2017 study of sexually harassed dental hygienists, 36.4% reported "I did not say anything special or take any special action" and about half reported coping in this manner because "It was no use to counter the offense."[30] Similarly, another study found that only 7% of sexually harassed respondents acknowledged reporting the incident.[37] These findings support suggestions from Kabat-Farr et al. that current reporting mechanisms are flawed and in need of change.[36] Updated safeguards are needed for victims who are brave enough to come forward should include a means of leveling out power disparities.[30,36] It has also been suggested to include an outside investigator to assist with documentation and mitigation of complaints.[36] A lack of reporting resources, unawareness of how to report sexual harassment, or being afraid of the consequences, can be hindrances to reporting. Research by Ivanoff et al. supports this finding with nearly one-half of the participants who experienced sexual harassment stating that they would not be comfortable reporting a violation, and over one-half stating that they would face consequences if they filed a report.[27] Another possibility for lack of reporting, is the doubt that a formal grievance will be effective in remediating the behavior, along with fear of additional harassment and stress.[36] It is important for victims to report sexual harassment to their employer because an employer who has not been informed of the sexual harassment issue may not be held accountable.[38] Employers have a responsibility to prevent and stop sexual harassment in the workplace.[38]

One-fourth of the respondents reported no written policy on sexual harassment, and nearly one-third were unsure whether a policy existed indicating a need for many dental employment settings to implement and disseminate a anti-sexual harassment policy and provide the appropriate staff training. Policies should include a description of prohibited behavior, a reporting system, a promise of immediate action including an impartial investigation, assurance of confidentiality, and protection against retaliation for the reporter and witnesses.[39,40] Furthermore, established policies should be made known to existing employees and new hires, and employers should review the policy annually.[40] The policy should be located in place that allows for direct, easy, and confidential access for anyone at any time.[39] While sexual harassment is a form of sex discrimination in violation of Title VII of the Civil Rights Act of 1964, it only applies to employers with 15 or more employees. A sexual harassment policy could be a resource dental personnel could rely on in any employment setting.

Unfortunately, the existence of a written policy may not be adequate to prevent sexual harassment in the workplace. Results from this study show that of the participants who were aware of a written policy, only one-half reported having experienced gender harassment, unwanted sexual attention, or sexual coercion. Additional measures to prevent workplace sexual harassment include training all employees and modeling appropriate behavior.[40] Training should be required annually for all dental personnel including management as they have a responsibility to represent the practice and handle complaints. In addition to attending training, those in hierarchical positions of leadership such as dentists (both male and female) need to model appropriate behavior and set an example for all in the workplace[40] particularly since harassers often hold positions of power.[12,14,30]

Sexual harassment is a global concern in health care, and there likely is no single solution for this problem. Findings from this study suggest that sexual harassment is occurring within the dental hygiene profession and needs to be effectively addressed. The current #MeToo movement has served to highlight the issue and brought the necessary attention to sexual harassment in the workplace. Increased awareness, training and a workplace culture where such behavior is negatively viewed, may have a stronger impact than a stand-alone written policy.

This study has several limitations. The SEQ-W survey has a low Cronbach alpha (.42) in the area of sexual coercion, meaning that this portion of the survey tool may not be reliable as compared to the gender harassment (.82) and unwanted sexual attention (.85) portions of the survey which have acceptable Cronbach alpha levels.[31,41] Additionally, the definition of sexual harassment used[1] were plural such as "advances" and "requests" indicating that some incidents needed to occur more than once to be considered sexual harassment. However, Fitzgerald at al. argued that the experiences described in the survey pertained to work conditions that facilitate or hinder harassment versus the legal definition of sexual harassment.[31] The survey questions were stated in the plural tense and participants were given the option to choose the Likert response "once or twice" which may have resulted in an over estimation of true sexual harassment experiences.

Incidences of sexual harassment were measured through self-report, which might have impacted findings causing one to assume a corresponding bias in the key variables. The convenience sample of VA dental hygienists from the same geographic location, may not represent the occurrence of sexual harassment nationally. The overwhelming majority of participants were Caucasian females and therefore the results cannot be generalized to male dental hygienists or those of other ethnic races. Response bias may have been an issue as those who experienced sexual harassment may have been more likely to complete the survey. Study replication with a national sample of dental hygienists is suggested to enhance generality of findings. Future studies should also evaluate best practices to reduce sexual harassment in dental hygiene employment settings, causes for the occurrence of sexual harassment and the impact of culture on prevalence.

Conclusion

Sexual harassment is a contemporary problem in dental hygiene employment settings in the state of Virginia. Approximately 27% of the study participants reported experiencing sexual harassment behaviors in the past 24 months. The most commonly reported behaviors were being told offensive sexual stories or jokes, crude or offensive sexual remarks, and offensive remarks about physical appearances, body, or sexual activities. Findings from this study support the need for additional research on the prevalence and impact of sexual harassment at the national level, as well as the need to develop effective sexual harassment policies to prevent these behaviors from occurring in the workplace.

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Research

Dental Care Needs of Male versus Female Children Visiting a School-based Mobile Dental Facility in West Virginia

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Abstract

Purpose: Many school-aged children have not received dental care in West Virginia, despite mandated statewide requirements of a dental evaluation and dental treatment before entering school, and the provision of Medicaid/CHIP insurance coverage for children from families below the federal poverty level. An innovative mobile oral health program to educate children, provide preventive care, and bring technology to public schools was developed for West Virginia children in a need shortage area. It was unknown if the unmet dental needs challenge was greater for male or female children residing in that area. The purpose of this study was to determine whether there was a difference by sex in the number of attendees and the incidence of dental caries for children who visited a school-based mobile dental facility.

Methods: School-aged children who had not had a dental examination within the previous year were offered school-based examinations/assessments, preventive care, and oral health education via a mobile oral health program following parental/guardian consent. Data were collected concerning the number of current carious teeth in need of restoration. Descriptive statistics and chi square analyses were conducted to analyze the data.

Results: There were 429 students evaluated at the school-based mobile dental facility. Half (50.3%) were male. Referrals for additional necessary oral/medical care were made for 214 (50.1%) children; 45.9% of males and 53.3% of females (p= 0.287) had dental caries.

Conclusion: Results from this study indicate that sex was not a statistically significant factor in school-based mobile dental facility attendance nor in current dental caries incidence among school-aged children in an underserved area of West Virginia.

Keywords: dental care, dental caries, mobile dentistry, West Virginia, oral health disparities, dental public health, community interventions

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Introduction

Dental caries is a formidable. In the United States (US), an estimated 14% of children ages 2-8 years have untreated dental caries.[1] In children ages 6-11 years and in children 12-15 years, an estimated 19% have untreated dental caries.[1] The national trend, except for a small increase in young children from 1999-2004, has shown little change in pediatric dental caries incidence over the past 30 years.[1] Dental care trends over the past 30 years have focused upon innovative prevention techniques not available to previous generations. Toothpastes with bioavailable calcium, pit and fissure sealants, and alcohol-free fluoridated mouth rinses, in addition to community water fluoridation, and fluoridated toothpaste have resulted in many advances in limiting caries experiences.[2,3] Researchers are continuing to develop innovative products and techniques to manage the caries process and its risk factors. However, many children continue to have dental caries throughout the U.S.and West Virginia (WV) in particular.

Caries development is complex. A familiar dental caries theoretical model is the Keyes Triad.[4] It is a time-dependent biological model of dental caries in which the intersection of microflora, vulnerable host and teeth, and substrate/diet results in dental caries. Researchers Fisher-Owens, et al.

developed another dental caries model that included other factors encapsulating the triad. In that caries model, there were also child-level influences (such as health behavior practices, development, biologic and genetic endowments, sex, etc.), family-level influences (family function, culture, socioeconomic status, health behaviors of the family, etc.), and community-level influences (dental care system characteristics, physical environment, social capital, community oral health environment, governmental policies, etc.) considered in dental caries development.[5]

Genetic, dietary, and hormonal factors; lower salivary flow, earlier eruption patterns, and oral microbiome factors have been associated with a higher caries risk in females as compared with males in several studies.[6-9] Additionally, eco-socio-behavioral factors potentially affect caries experience by sex. Researchers have indicated that a gender gap of biologic and cultural influence, have placed women at a disadvantage in oral health.[10] In the U.S., there remains a cultural emphasis to sexualize young girls in their clothing, hair, makeup, and teeth.[11] Girls may need more dental care than boys, or may have parents/guardians who perceive that they need more dental care than boys, and therefore receive more dental care than boys; however, such research results have not been well established. Among the many eco-social-behavioral factors of family influences on caries (distance to care,[12] transportation, parent/guardian time away from work, dental fear, cost, convenience, lower income and other aspects of accessing care[12-15]), seeking dental care for one's children may be influenced by parental/guardian perceptions of the importance of need of dental care. The oral health status of daughters may be perceived as different from sons. Little research exists to support or document the relationship of perception of oral health status and caries.[16]

The issue of sex and dental caries is also controversial.[17] Some researchers have indicated girls have a higher caries risk in some studies.[15,18] Researchers, reporting National Health and Nutrition Examination Surveys (NHANES) 2011-2014 data, have indicated that U.S. caries experience for boys, ages 2-5 years, was at a level similar to girls, while in previous years it had been higher than girls.[1] From the same data, there were 17.6% of males and 15.5% of females, ages 5-19 years, with untreated dental caries.[19] Results were mixed in a WV and Pennsylvania (PA) 2002-2009 study where there were no differences in caries by sex in children, ages 1-5 years and 12-17 years, while females, ages 6-11 years, had fewer caries experiences.[20] Adult females in this study had similar affected teeth as males, but had more dental restorations; while males had more untreated caries ($p<.0001$).[20] Researchers have identified sex disparities in dental caries in many populations. Females more commonly have affected teeth in national and international studies, possibly due to earlier tooth eruption patterns, dietary differences, nature/composition of dentition or saliva, and dental utilization practices.[20]

It is important to know if such a disparity exists in an Appalachian sub-population. Given the limited resources for dental care in WV, such information would help plan where efforts should be concentrated for the best use of these resources. If there were greater dental caries incidence for either group, public health community initiatives could be developed for events known to be attended well by the parents/guardians of the children most in need. Dental public health personnel would be more likely to reach more boys and their families in Appalachia at children's football/baseball games, scouting events, etc.; and more likely to reach more girls and their families at softball games, tennis matches, ballet/other dance classes/recitals, girl scout events, etc., thereby maximizing limited resources.

Meeting oral healthcare need with innovative dental care systems

Guided by an idea that if children cannot be taken for dental care, perhaps dental care should be taken to them, healthcare professionals at Monongalia County Health Department in WV began a mobile dental program in 2018. Itinerant dentistry has been common in the history of the U.S. Traveling dentists were often necessary to meet dental needs of people in underserved areas due to a lack of providers in those areas.[21] Since the mid-1970's state dental boards, the American Dental Association, and other professional organizations have defined appropriate standards for mobile dental care and the strategy has proven effective to provide greater physical access to under-served individuals.[22] The Monongalia mobile dental program was established to visit public schools, and to provide oral evaluations/assessments and preventive dental care to children who had not had a dental examination within the previous year. Services included examination, oral health instruction, prophylaxis, topical fluoride application, pit and fissure sealants, radiographs and the encouragement to establish a dental home with local dental professionals.

Based upon the previous research cited regarding caries incidence and sex,[20] a greater effort has been made to access dental care for girls in Appalachia through targeted outreach programs. However, it is not known whether more boys would participate in a convenient, school-based mobile dental facility. The purpose of this study was to determine whether there was a difference in current dental caries incidence in school-aged girls and boys visiting a convenient, school-based mobile dental facility.

Methods

This was a cross-sectional secondary data analysis of existing dental chart data available from evaluations/assessments performed on school-aged children who visited Monongalia County Health Department's mobile dental facility from September 2018 to May 2019. The Monongalia County Health Department provided the data which were collected and managed using secure REDCap electronic data capture tools hosted at West Virginia University.[23,24] This study was approved by the West Virginia University Institutional Review Board (I1901439187A003).

The dental examinations/assessments were conducted by two dental care providers. Data were extracted from the clinical records. As these data were from clinical notes written by the two different providers, and the collection of the data was for clinical rather than research purposes, the two providers were not formally calibrated for conducting research. The records included information from written forms completed by parents/guardians. Child health information, age, sex, and insurance information was collected from the forms. Clinical notes included self-reports by the children (number of times per day they brushed, flossed, and any exposure to tobacco smoke in the home), and clinical evaluations/assessments (existing restorations, current dental caries, pit and fissure sealants present, pit and fissure sealants needed and placed at the mobile facility visit, and referrals.

Students, ages 5-18 years, throughout a five-county area of North-central WV public schools were invited to have dental evaluations/assessments, oral hygiene instructions, radiographs (as needed), prophylaxis, topical fluoride applications, and dental pit and fissure sealants placed (as needed) during normal school hours, if they had not had a dental examination within the previous year. Parents/guardians of all children in 66 schools were provided information about the service. The number of children who had received dental care within the previous year is not known; however, the state of West Virginia requires all pre-kindergarten, kindergarten, second-grade, seventh-grade, and twelfth-grade students to have a dental examination/assessment prior to the school year. The parents/guardians provided the information whether their child/children had a dental examination within the previous twelve months. Parents/guardians provided written consent for the treatment. If specific dental/medical needs were determined, letters indicating such needs were provided to parents/guardians. The parents/guardians were encouraged to seek a dental home for their child(ren) for follow-up care. Data were analyzed with SPSS software, version 26 (IBM: Armonk, NY). Analyses included descriptive statistics and Fisher exact Chi-square testing by sex.

Results

A total of 429 students (50.3% male, n=216) were seen by healthcare providers in the mobile dental facility. All the participants received oral hygiene instruction, oral evaluations/assessments, prophylaxis, and topical fluoride application. More than one-half (n=232, 54.1%) of the children did not have current dental caries teeth at the time of evaluation/assessment and 60.8% (n= 261) did not have any restorations. More than one-quarter (27.8%) had at least one existing dental pit and fissure sealant. One-half of the children (n=214, 50.1%) had a need for additional oral/medical health care and approximately one-third (n=147, 35.7%) were lacking any type of dental insurance coverage. Overall screening results are shown in Table I.

In the data analyses comparing male and female students regarding their current dental caries status, no significant differences were identified between the groups. There were 53.3% of the males (n=105) and 46.7% of the females (n=92) who had current dental caries (p=.287). Female students were more likely to need and have pit and fissure sealants placed during their mobile dental facility visit (n=111, 53.6%) than male students (n=74, 36.5%) (p=.045). Although not a focus of this study, older age was significant in analyses for current caries, a history of existing restorations, the existence of dental pit and fissure sealants, and the placement of dental pit and fissure sealants (Table II). In the analysis of insurance status and current caries, families with Medicaid/CHIP had children with more current dental caries (n=116, 52.3%) than families with other insurance or no insurance and with no insurance (n=17, 39.5%) (p=.019).

Discussion

West Virginia school-aged children who had not had a dental visit within the previous year and attended a mobile dental facility at their school were the focus of this study. No significant statistical difference was found in the two main aims of the study: the number of males/females presenting to the mobile dental facility; or, current dental caries incidence. Similarly, there were no statistical differences identified in having a history of restorations, existing dental pit and fissure sealants, needed referrals, self-care by brushing and flossing, between male and female students. However, there was a greater need and placement of dental pit and fissure sealants for female students (n= 111, 53.6%) compared to male students (n=74, 36.5%) (p=.045). A high level of caries was also present in the participants of this study, with 45.9% of children attending the mobile dental facility having current dental caries.

Table I. Sample characteristics and comparison by sex of children, ages 5-18 years

	Overall Sample	Males	Females	*p*-value[1]
Current dental caries				**.287**
Yes	197, 45.9%	105, 53.3%	92, 46.7%	
No	232, 54.1%	111, 47.8%	121, 52.2%	
Any restoration present				**.424**
Yes	165, 38.5%	89, 53.9%	76, 46.1%	
No	261, 60.8%	125, 47.9%	136, 52.1%	
Any dental sealant present				**.827**
Yes	115, 27.8%	57, 49.6%	58, 50.4%	
No	298, 72.2%	152, 51.0%	146, 49.0%	
Dental sealants provided				**.045**
Yes	241, 58.6%	74, 36.5%	111, 53.6%	
No	170, 41.4%	96, 46.4%	129, 63.5%	
Need for referral[2]				1.000
Yes	214, 50.1%	107, 50.0%	107, 50.0%	
No	213, 49.9%	107, 50.2%	106, 49.8%	
Tobacco use in the home				.589
Yes	96, 22.5%	49, 51.0%	47, 49.0%	
No	35, 8.2%	20, 57.1%	15, 42.9%	
Missing	296, 69.3%	146, 49.3%	150, 50.7%	
Daily use of floss				.451
Yes	20, 4.7%	10, 50.0%	10, 50.0%	
No	133, 31.4%	73, 54.9%	69, 45.1%	
Missing data	271, 63.9%	130, 48.0%	141, 52.0%	
Brushing twice daily				.197
Yes	69, 16.3%	33, 47.8%	36, 52.2%	
No	113, 26.7%	65, 67.5%	48, 42.5%	
Missing data	242, 57.1%	115, 47.5%	127, 52.5%	
Dental Insurance				.453
Medicaid/CHIP	222, 53.9%	107, 48.2%	115, 51.8%	
Other	43, 10.4%	25, 58.1%	18, 41.9%	
None	147, 35.7%	76, 51.7%	71, 48.3%	
Age categories (in years)				.638
≤5	38, 8.9%	18, 47.4%	20, 52.6%	
>5 to ≤11	220, 51.3%	107, 48.6%	113, 51.4%	
>11 to ≤19	171, 39.9%	91, 53.2%	80, 46.8%	

Note: All children attending the mobile dental facility received oral hygiene instructions, a prophylaxis, topical fluoride application, and any needed dental sealants as part of the services provided.

[1]Fisher exact Chi-square p-values between male/female and the presented variables.

[2] "Need for referral" included having a need for restorative care, orthodontic care, oral surgical care, or medical care.

A family preference to seek dental care more for girls than boys, was not evident in this study. Researchers showed Appalachian health beliefs/practices influence health seeking behavior and are deeply rooted in the culture. However, gender inequity in dental care in childhood was not evident as one of them in this study. There remains a need to identify and target the traditional beliefs that do influence oral health.[25] For example, in a qualitative study of young Appalachian adults receiving recommendations for oral health behavior, recommendations were viewed as "excessive."[26] It is important to understand the belief factors that are in play in families and cultures to improve oral health.

Although not a focus of the study, there were interesting results concerning insurance, for example, 53.9% of participant families had Medicaid/CHIP and 35.7% of participant families had no insurance. The presence of a financial safety net such as Medicaid/CHIP is considered a protective family factor against childhood caries. However, this was not evident in this population as families with Medicaid/CHIP had children with more current dental caries than families with other insurance or no insurance. In instituting the mobile dental facility, the Health Department made an effective public health effort in the provision of preventive dental care to students who previously did not have such access.

Similar studies

In a study of children ages 2 through 17 years, using the 2016 National Survey of Children's Health data, there were no significant differences in the number of carious teeth within the previous year, between males and females.[27] Similarly, in another study of U.S. children, ages 6 to 9 years, there was also no significant

Table II. Characteristics by children's age (5-18 years)

	≤ 5 years n, %	>5 to≤11 years n, %	>11 to ≤19 years n, %	*p*-value[1]
Current Dental Caries				**.041**
Yes	16, 8.1%	114, 57.9%	67, 34.0%	
No	22, 9.5%	106, 45.7%	104, 44.8%	
Any Restoration present				**.028**
Yes	cell size suppressed	cell size suppressed	cell size suppressed	
No	30, 11.5%	127, 48.7%	104, 39.8%	
Any Dental Sealant present				**.017**
Yes	34, 11.4%	150, 50.3%	114, 38.3%	
No	cell size suppressed	cell size suppressed	cell size suppressed	
Dental Sealants Provided				**<.005**
Yes	11, 4.6%	139, 57.9%	90, 37.5%	
No	26, 15.3%	70, 41.2%	74, 43.5%	
Need for referral[2]				**0.086**
Yes	16, 7.5%	121, 56.5%	77, 36.0%	
No	22, 10.3%	98, 46.0%	93, 43.7%	
Tobacco use in the home				**.776**
Yes	cell size suppressed	cell size suppressed	cell size suppressed	
No	cell size suppressed	cell size suppressed	cell size suppressed	
Missing	27, 9.2%	152, 51.5%	116, 39.3%	
Daily use of floss				**.003**
Yes	cell size suppressed	cell size suppressed	cell size suppressed	
No	cell size suppressed	cell size suppressed	cell size suppressed	
Missing data	28, 10.3%	144, 53.1%	99, 36.5%	
Brushing twice daily				**.008**
Yes	cell size suppressed	cell size suppressed	cell size suppressed	
No	cell size suppressed	cell size suppressed	cell size suppressed	
Missing data	27, 11.2%	124, 51.2%	91, 37.6%	
Dental Insurance				**.064**
Medicaid/CHIP	24, 10.8%	122, 55.0%	76, 34.2%	
Other	cell size suppressed	cell size suppressed	cell size suppressed	
None	12, 8,2%	66, 44.9%	69, 46.9%	

Note: All children attending the mobile dental facility received oral hygiene instructions, a prophylaxis, topical fluoride application, and any needed dental sealants as part of the services provided. Rows in which one cell was below 10 children were suppressed to protect identification.

[1] Fisher exact Chi-square p-values among ages and the presented variables.

[2] "Need for referral" included having a need for restorative care, orthodontic care, oral surgical care, or medical care.

difference between the sexes in the prevalence of untreated caries.[28] The researchers indicated that 21.80% of male children and 17.84% of female children had untreated caries.[28] Though no difference between sexes were noted the current study and the 2018 Lin, et al. study, there was a large difference in overall untreated caries between them.[28] A possible rationale is that the children attending the mobile dental facility were more likely to have a lower socio-economic status and resultant dental access issues than the participants in the Lin, et al. study.[28] Caries has been shown to be disproportionate in children with health inequities related to structural determinants, intermediary determinants and the nature of the health system.[29]

In a study of children, ages 5-15 years in the United Kingdom, no significant differences in untreated dental caries were found between males and females; however, deprivation was significantly associated with higher occurrences of caries experience.[30] The same pattern was noted in a comparative study using NHANES data in which children whose families had incomes below the poverty level were more likely to have dental caries.[30] This pattern has remained consistent over the 20 years of the study despite the expansion of Medicaid and other health insurance programs.[30]

Dental caries, on a public health level, is manageable with preventive professional dental care. Although the American Dental Association policy-makers reported that the majority of Medicaid-insured children live in close proximity to a Medicaid-participating dentist,[31] other researchers have indicated that such a result was an overestimate and access to dental care *remains* a public health issue.[32]

Strengths of this study were the large sample size, and availability of current information concerning caries and restorations present in children attending the mobile dental facility. As a secondary data analysis of existing dental charts, data were limited to the captured information available in the charts and from the self-reports of the parents/guardians concerning the child's health, and length of time since the last dental visit. This limitation is noted as there is a potential for parents/guardians without insurance coverage to seek free care, even if the child had a dental visit within the previous year. Neither examiner had any formal calibration, resulting in the possibility for the data to be skewed. Also, the number of students who were eligible, but did not keep their appointments, were not available from the secondary data source.

Future needs

Researchers continue to try to understand caries disparities to determine where and how limited resources should be applied. This study has generated relevant questions that need to be addressed. West Virginia children, from poor or near-poor households, have access to Medicaid and CHIP coverage, which includes free dental care. Remuneration to West Virginia dentists for Medicaid and CHIP is high and most West Virginia dentists participate and would welcome these children. West Virginia is adequately covered by dental office locations throughout the state. Most West Virginia homes are within a 20-30 minute drive to a dental office. The mobile dental facility was also conveniently located on the school campus, and care was free. And yet, attendance to the mobile dental clinic varied from generally good to poor attendance. Concerns about access to care due to location of providers and cost of service do not appear to be the reason for children not receiving needed care in West Virginia.

A Minnesota mobile dental service program was successful in increasing utilization and providing dental care for low-income school children over the fifteen-year period (2000-2015) of its existence.[33] Such programs need time to be developed, and to become sustainable. The concept is innovative and deserves long-term commitments to thrive. The school-based mobile dental clinic program described in the current study also needs time to develop and obtain long-term commitment to become self-funding and fiscally independent. A mechanism to encourage parents to follow through with the referrals made during the preventive school visits is needed. Public health outreach and parental incentives may be helpful in obtaining the needed care.

The public health vision of the future, is one where dental caries is largely controlled. A family's attribute of a protective sense of coherence (ability to manage tension; cope by finding solutions, identify and use resources from within and externally; and be health-promoting) and other psychosocial correlates are relevant factors in oral health-related behaviors, including greater tooth brushing frequency, and higher frequency of dental visits.[34] There is a need for a caries free community to be a common cause. Parents/guardians need to want good oral health for their children, for themselves, and their community. Future research is needed to address these important aspects to reach caries-free goals.

Conclusion

Results from this study indicate that sex was not a statistically significant factor in attending a school-based mobile dental facility nor in the current dental caries incidence among school-aged children in an underserved area of West Virginia.

Disclosures

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Data

Study data were collected and managed using REDCap electronic data capture tools hosted at West Virginia University. De-identified data for this study are available upon request to Tiffany Summerlain: Tiffany.D.Summerlin@wv.gov

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