



American  
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Hygienists'  
Association

# JOURNAL OF DENTAL HYGIENE

THE AMERICAN DENTAL HYGIENISTS' ASSOCIATION

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- Impact of Operator Positioning on Musculoskeletal Disorders and Work Habits Among Dental Hygienists in Mississippi
- Assessing the Use of Loupes and Lights in Dental Hygiene Educational Programs
- Oral Manifestations of Menopause: An Interprofessional Intervention for Dental Hygiene and Physician Assistant Students
- Hookah Smoking: Assessing College Students' Behaviors, Attitudes, and Knowledge
- Patients' Willingness to Participate in Rapid HIV Testing: A pilot study in three New York City dental hygiene clinics
- The Value of Interprofessional Education: Assessing the Attitudes of Dental Hygiene Administrators and Faculty
- Compensation and Position Characteristics of Dental Hygiene Program Directors
- 2017 ADHA Annual Conference Research Abstracts

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## STATEMENT OF PURPOSE

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

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## Growth, Change...and Gratitude!

Rebecca S. Wilder, RDH, BS, MS

We are grateful this year! Here at the American Dental Hygienists' Association, we are extremely appreciative for everyone who plays a role in supporting the *Journal of Dental Hygiene* through their submissions of timely papers, and to the many peer reviewers who freely give their time and expertise with thorough reviews of the research manuscripts. In addition, we have many individuals who are not formally on our Editorial Review Board who contribute their time when needed. This editorial is dedicated to all of who provide ongoing support of the *Journal*.

Our editorial review board consists of a diverse group of dedicated professionals including dental hygienists, dentists, physical therapists, nurses and other health care professionals who bring a wide range of experience to the *Journal* and are contributing to the growth of interprofessional practice. Over the past year, we have seen an increase in submissions pertaining to interprofessional education and collaboration as well as the contributions of dental hygienists in increasing access to care. As the profession of dental hygiene continues to grow and expand, it will be even more important to collaborate with other professionals as we strive to provide the most comprehensive care possible to our patients and the public.

Last year I reported that changes were occurring with the *Journal*. The *Journal* has a new home...in the Professional Development and Membership Engagement Division of ADHA. Sue Bessner is at the helm and is doing a fantastic job! In addition, many of you can attest to the dedication of our managing editor, Cathy Draper! She has been a wonderful addition to the JDH team. I also wish to gratefully acknowledge the support and valuable contributions of the American Dental Hygienists' Association for their longstanding commitment to the *Journal of Dental Hygiene* and for their ongoing recognition of the value of scholarship and research to the growth of the profession.

We would like to give a special acknowledgement to the Sigma Phi Alpha Journalism Award winning manuscripts published in this issue. Cori Pacanins, RDH, BSDH and Katelyn Thomson, RDH, BSDH from Pacific University were the recipients of the undergraduate award for their submission, "Compensation and Position Characteristics of Dental Hygiene Program Directors." Windy Rothmund, RDH, MS, from Eastern Washington University received the graduate award for "Oral Manifestations of Menopause: An Interprofessional Intervention for Dental Hygiene and Physician Assistant Students." Congratulations to the authors and their mentors ... thank you for your contribution to our body of knowledge and *keep on writing!!!*

The 2017 *Journal of Dental Hygiene* Editorial Review Board is listed on the following page along with those who have specific expertise for whom we call on as guest reviewers. Thank you again for your time, knowledge and commitment to the growth and advancement of the dental hygiene profession. All of us at the *Journal of Dental Hygiene* look forward to working with each of you to continually improve **OUR** Journal!

Sincerely,

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



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## Impact of Operator Positioning on Musculoskeletal Disorders and Work Habits Among Mississippi Dental Hygienists

Rebecca M. Barry, RDH, PhD; Ann E. Spolarich, RDH, PhD; Mark Weber, PT, PhD, SCS, ATC; Denise Krause, PhD; William D. Woodall, PT, EdD, ATC; Jessica H. Bailey PhD, RHIA, CCS

### Abstract

**Purpose:** The purpose of this study was to assess impact of operator positioning on the development of musculoskeletal disorders (MSDs) and workforce issues among practicing dental hygienists in the state of Mississippi.

**Methods:** The sample consisted of all dental hygienists (n=1,553) licensed in the state of Mississippi. A modified 47 item, online version of the Standardized Nordic Questionnaire was used to document the following: types of MSDs, practice history, operator positioning, ergonomic work habits and the impact of MSDs on workforce issues. Descriptive statistics were used to analyze practice history and work habits. Chi-square analysis examined the relationship between operator positioning and MSDs as well as the relationship between the onset of MSDs and their impact on patient workload, work hours, time off from work, and ability to practice clinical dental hygiene. Survival analyses were used to test the onset of MSDs in relationship to operator positioning.

**Results:** The survey yielded a 22% (n=338) response rate. There was no significant difference in the prevalence of MSDs between those sitting in front of the patient as compared to those sitting behind the patient (PL) ( $\chi^2 (1) = 1.67, p=0.196$ ), although respondents sitting behind the patient reported developing their MSDs earlier ( $\chi^2 (1) = 3.92, p=0.048$ ). Of the participants who had practiced 15 or more years, 85% reported developing MSDs. However, only 13% reported ever having to modify their patient load. Sixteen percent reported reducing work hours and 21% reported taking time off from work due to MSDs.

**Conclusions:** Regardless of the operator position used, the majority of practicing dental hygienists surveyed developed MSDs earlier than has been previously reported in the literature. Workforce related issues were not shown to have a negative impact on this study population.

**Keywords:** musculoskeletal disorders, ergonomics, operator positioning, clinical education, dental hygiene workforce

This manuscript supports the NDHRA priority area **Professional Development: Occupational health** (methods to reduce occupational stressors).

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### Introduction

Published studies document that musculoskeletal disorders (MSDs) have been a potential occupational health hazard to practicing dental hygienists since the late 1980s.<sup>1-9</sup> There is also evidence that some individuals may develop MSDs early in their exposure to the profession, even as students prior to entering clinical practice.<sup>4,9-11</sup>

MSDs contribute to lost work time, increase need for health services and costs for medical care, and negatively impact overall quality of life.<sup>8,12-14</sup> Additionally, having a MSD may require a reduction in the number of hours worked each week or ultimately lead to the inability to work in clinical practice; both contributing to potentially devastating financial and/or psychological consequences for the

individual.<sup>8,13</sup> Ultimately, the increased risk for these occupational injuries may jeopardize recruitment efforts into the profession and retention of the dental hygiene workforce. Specifically, in Mississippi, where the potential loss of dental hygiene practitioners due to MSDs would negatively impact the delivery of preventive care services to the residents of this state. The significance of this potential manpower challenge is further magnified by the fact that the current number of practitioners is inadequate to meet the existing oral health care needs identified throughout the state of Mississippi.<sup>15</sup>

Numerous studies have addressed the prevalence, type, location and severity of MSDs among practicing dental professionals.<sup>1-9,16,17</sup> Additional publications in the non-refereed literature also discuss specific

dental practice-related ergonomic challenges, advancements in ergonomic technologies, and suggestions for interventions to both prevent and treat MSDs.

Collectively, the results reveal that the predominant areas of MSDs and related pain identified and reported by dental hygienists were in the neck, back, shoulder, and hand/wrist. The body of literature supports that MSDs are a major cause of concern for dental hygienists in clinical practice.<sup>1,3,5-7,16,17</sup>

Dental hygienists perform procedures while seated next to patients from various positions, which in education settings, are typically referenced as clock positions. Clock guidelines for practicing dentistry have been based on whether the dentist/hygienist is working with a dental assistant.<sup>18</sup> The clock position/zones referenced in basic instrumentation textbooks for both right-handed (RH)/left-handed (LH) operators places the patient's head at 12:00 o'clock, with instrumentation approaches from the 7:00/8:00-12:00 o'clock position for right-handed and 5:00/4:00-12:00 o'clock position for left-handed operators.<sup>19-23</sup> These working positions/zones are taught in the majority of dental hygiene programs in Mississippi, and are referenced as the traditional, or 'front', approach to operator positioning.

The Performance Logic (PL) model, developed in the 1960s as a component of "sit-down" dentistry, proposed an alternative approach to operator positioning, differing from the traditional front approach. The PL positioning model provides a systematic approach to operator and patient positioning by allowing the operator to self-determine and maintain a natural position for procedures performed.<sup>24-26</sup> Theoretically, this self-derived position can repeatedly be determined by the operator, and varies among individuals. PL encompasses more than the where and how of how the dental hygienist sits and moves around the patient. Proper placement of the patient's chair and head position (specifically the maxillary occlusal plane) and the accessibility and placement of the operator's equipment are critical components of PL.<sup>26</sup> Patient head position is particularly critical as the operator's spine typically parallels the patient's occlusal plane; failure to monitor the occlusal plane results in poor operator postures.<sup>27</sup> With PL, the operator does not perform procedures from the seated front position, but instead uses clock positions ranging from 10:00 o'clock to 12:30 for right-handed operators, referenced as the "back" position.

Schoen and Dean's periodontal instrumentation text was the first dental hygiene instrumentation manual to discuss PL and the proprioceptive self-derivation approach to instrumentation.<sup>28</sup> The text offers pictures and directions for alternative positioning when eliminating the 8:00 operator position. While there is generally some consensus among existing dental hygiene textbooks used in

academic programs as to the value of PL and use of the back position, some minor variations occur in the descriptions of optimal sitting positions according to the clock. Therefore, practitioners may approach positioning while performing dental hygiene care from slightly modified locations. Operators may choose to work from either beside or behind the patient depending upon which textbook method was used to teach instrumentation skills.

Little is known about the long-range impact of use of PL and other ergonomic training models for preventing MSDs among practicing dental hygienists. Two studies have investigated the benefits of PL among dentists while one qualitative study analyzed the benefits of PL among dental hygienists.<sup>29-31</sup> Sunell and Maschak found that only 12% (n=25) of dental hygienists reported 'new' neck/back/shoulder pain after practicing PL. Comments as to benefits of practicing PL included greater comfort, less fatigue, decreased muscle soreness, and less strain to the neck/back/shoulders. Dental hygiene faculty believed that the problem-solving frame of the PL model also produced students who were more self-directed in analyzing instrumentation principles.<sup>31</sup>

Several research studies have examined development of MSDs with assessment of clock positions as part of the study design. Using a modified version of the Standardized Nordic Questionnaire (SNQ), Liss, et al. compared prevalence, symptoms, and diagnoses of carpal tunnel syndrome (CTS) with work-related factors consisting of number of years in practice, dominant hand used while scaling, and characteristics of patients treated by dental hygienists.<sup>6,32</sup> While only 10% of dental hygienists developed CTS, factors that most strongly predicted prevalence of CTS included treating 3 to 4 patients with heavy calculus each day (high degree of difficulty), working for 5 to 14 years in practice, and sitting in the 10:00 and 12:00 o'clock operator positions ("back" positions). Anton, et al. examined prevalence of CTS and MSDs among dental hygienists also using a modified version of the SNQ, in addition to nerve conduction assessments.<sup>7</sup> The modified SNQ asked participants to provide the number of hours worked per week, number and type of patients seen per day, and the clock position predominantly used when providing care. Approximately 93% of respondents reported experiencing at least one MSD, with the 10:00, 11:00 and 12:00 o'clock positions identified as the preferred working sites for 69% of the respondents. However, there were no associations between the clock positions used and specific sites of reported MSDs. Horton et al. conducted an observational study by videotaping 8 final-year, New Zealand oral health students performing routine clinical dental hygiene procedures on patients.<sup>9</sup> Approximately 31% of the "time in the mouth" was spent sitting in the 8:00-10:00 o'clock position, while 60% was spent

sitting in the 11:00-1:00 o'clock position. However, the majority of students demonstrated poor neck and shoulder postures. Collectively, these studies infer that working from a seated position behind the patient may contribute to MSD development.

Dental hygiene educators, to date, are unaware whether or not the current academic approaches to operator ergonomics actually prevents or contributes to the development of MSDs over the course of a dental hygienist's career. While it is not possible to control for all of the non-modifiable risk factors for MSDs, dental hygiene educators should select training methods that have been documented to reduce occupational risks for injury. It is critical to identify which aspects of ergonomic training result in the most effective risk reduction. The purpose of this study was to investigate the extent of occupational MSD development based on the training approach used to teach operator positioning and assess the impact of MSDs on workforce issues among dental hygienists in the state of Mississippi.

## Methods

A convenience sample of registered dental hygienists in the state of Mississippi was used for this study. Email addresses (n=1,553) were obtained from the Mississippi State Board Dental Examiners' dental hygiene licentiate renewal list for 2012. An invitation to participate in the study was sent to all Mississippi dental hygienists with an active license. IRB approval for the study was granted by the University of Mississippi Medical Center.

A 47 item, modified version of the validated Standardized Nordic Questionnaire (SNQ) was used as the survey instrument.<sup>32</sup> The Standardized Nordic Questionnaire (SNQ) has been used worldwide to assess MSDs in a number of occupations, including dentistry.<sup>7,12-13,17,29,33</sup> The SNQ is a standardized questionnaire developed for occupational health care service evaluation and to serve as an instrument for the screening of MSDs in an ergonomic context.<sup>32</sup> The questionnaire includes a dorsal view diagram of the body with nine typical symptomatic areas of MSD development that are clearly shaded so that subjects can plainly view areas of interest. Specific modifications made to the instrument for the purposes of this study were the inclusion of survey items to assess demographics, practice history, educational training on operator positioning, and the impact of MSDs on workforce issues. Participants were provided the Center for Disease Control (CDC) definition of a musculoskeletal disorder on the questionnaire as a point of reference.<sup>34</sup> Operator positioning was defined for study participants as 8:00-12:00/9:00-12:30 for right-handed operators or 4:00-12:00/3:00-11:30 for left-handed operators.

Twelve practicing dental hygienists representative of the target sample assessed the face validity of

the modified instrument and 19 dental hygienists living outside of Mississippi conducted a pilot-test to verify functionality of the online survey mechanism. Data for this study were collected using Research Electronic Data Capture (REDCap).<sup>35</sup> Consent for participation was indicated by clicking on the link to the survey embedded in the email invitation. Two reminders were sent, giving each licentiate a maximum of three opportunities to participate.

Descriptive statistics were used to analyze demographics, work history, and work habits. Chi-square analysis was used to determine the relationship between operator positioning and development of MSDs. Chi-square analysis was also used to determine the relationship between onset of MSDs and four identified workforce retention factors: modification of patient workload, reduction of work hours, taking time off from work, and the ability to continue to practice with a MSD.

Survival analyses were used to test onset of MSDs in relation to operator positioning. Survival analysis consists of statistical steps in which *time until an event occurs* served as the outcome variable of interest and is typically referred to as survival time.<sup>36</sup> Onset ranges were identified as: immediately, 1-3 years, 4-6 years, 7-10 years, 11-15 and 16+ years and referenced as: immediate, 2 years, 5 years, 8.5 years, 13 years and 15+ years respectively. Censoring, in survival analysis, refers to those participants whose exact survival time is unknown. Participants who did not experience an event by the end of the study were considered censored (e.g. not included in the analysis). For example, in this study, a participant who did not develop a MSD by 15+ years was considered censored.

Kaplan-Meier log rank (LR) (Mantel-Cox) and Breslow (generalized Wilcoxon) survival test statistics were used to determine if there was an association between onset of MSD development and the operator position used to practice. Log-rank (Mantel-Cox) analysis compares two groups, weighs all time points the same, but places more emphasis toward the end of the study. Therefore Log-rank is more powerful for detecting differences in the survival probabilities later in the study.<sup>37</sup> Breslow (generalized Wilcoxon) analysis is a variation of the Log-rank test. Breslow analysis places more emphasis at the beginning of the survival curve because more people exist at the beginning of the study, thus early occurrences receive more weight than the later occurrences.

The total number of years in practice before a MSD developed was the *time event or onset*. Statistical Package for the Social Sciences (SPSS) syntax was used to capture the time of event based on years of practice along with the participant's response to when a MSD developed.

All analyses were conducted using SPSS 21 (2012) statistical software.

## Results

Three hundred and thirty-eight responses (n=338) were obtained for a 22% response rate. The respondents' demographic data were compared to data obtained from the American Dental Hygienists' Association (ADHA) annual practitioner survey conducted in 2016 to determine whether the study sample was representative of practitioners in Mississippi. According to personal communication with the ADHA Director of Research, the ADHA survey included 8,107 respondents nationally, with 64 reporting from the state of Mississippi. There were no significant differences in age, sex, employment status or hours worked (part-time or full-time). However, Pearson Chi Square analysis revealed a significant difference between the samples for work setting only, ( $p=0.005$ ) with 70.5% of Mississippi hygienists in the ADHA sample reporting employment in a private practice setting versus 88.4% of the Mississippi hygienists in the study sample. As this study sought only hygienists who were currently in clinical practice, the analysis suggests that despite the low response rate, the sample was representative. In general, the majority of study respondents were female, 50% graduated prior to 2000 and 50% were between the ages of 20-39 years. Participant demographic data are reported in Table I.

The majority of respondents (72.5%) reported receiving didactic lectures on ergonomics in general while in school, but less than half (43.6%) reported having had lectures specific to MSDs. Over three-quarters (77%) were taught to use the 8:00–12:00 o'clock (front) operator position while 23% were taught to use the 9:00–12:30 o'clock (back) operator position. When responding to which position was primarily in clinical practice, nearly three-quarters (72%) of the actively practicing clinicians indicated the 8:00–12:00 o'clock position, while 28% used the 9:00–12:30 o'clock position. Reasons cited for changing positions were primarily due to workstation design (9.2%, n=31) and personal preference (9.5%, n=32). Only 4% (n=13) cited a health issue as a reason for changing position.

Pearson chi-square analyses revealed no significant difference ( $\chi^2(1) = 1.67, p=0.196$ ) between those clinicians who developed and those who did not develop MSDs based on the clock position used in practice. (Table II) However, further analysis of specific MSD sites revealed a significant difference between the position used and MSDs reported on after graduation for the upper back and wrists/hands. Dental hygienists who sat from 8:00–12:00 o'clock (n=84) were more likely to develop MSDs in the upper back ( $X^2 = 8.09(1), p<0.05$ ) and in the wrist/hands ( $X^2 = 8.29(1), p<0.05$ ) (n=104), when compared to those who sat from 9:00–12:30 o'clock (upper back: n=38; wrists/hands: n=52).

Using Breslow analysis, results also revealed a significant difference in *early* onset of MSDs and type of positioning used in clinical practice ( $\chi^2(1) = 3.92, p<0.05$ ). Respondents reported developing a MSD at different times. Median time interval for a MSD to develop was 8.5 years for those seated at the 8:00–12:00 o'clock position versus 5 years for those seated at the 9:00–12:30 o'clock position.

**Table I.** Demographics of Dental Hygiene Participants

Gender	(n=337)
Female	336 (99.7%)
Male	1 (0.3%)
<b>Age Groups</b>	<b>(n=335)</b>
20-29	88 (26.0%)
30-39	82 (24.3%)
40-49	74 (22.0%)
50+	91 (27.0%)
Mean	40
Median	39
<b>Dominant Hand</b>	<b>(n=338)</b>
Right	316 (93.5%)
Left	22 (6.5%)
<b>Graduation Year</b>	<b>(n=337)</b>
1999 or Before	70 (50.1%)
2000-2012	167 (49.9%)
<b>Currently Practicing</b>	<b>(n=336)</b>
Yes	286 (85%)
No	50 (15%)
<b>Employment Setting</b>	<b>(n=338)</b>
Private Practice	297 (88%)
Education	18 (5%)
Public Health	17 (5%)
Other	4 (2%)
Navy	
Oral Surgery	
<b>Type Practice Setting</b>	<b>(n=336)</b>
General Dentistry	288 (85.0%)
Pedodontic	18 (5.0%)
Periodontics	18 (5.0%)
Prosthodontics	1 < 1%
Orthodontic	1 < 1%
Oral Surgery	1 < 1%
US Navy	1 < 1%
<b>Hours Practiced/Week</b>	<b>(n=336)</b>
< 20 Hours	28 (8.3%)
20-29 Hours	60 (17.8%)
30-39 Hours	203 (60.1%)
40+ Hours	45 (13.3%)
Mean	30.7
Median	32
Mode	32

**Table II.** Position Used in Clinical Practice and Reported MSDs

			Ever Had or Currently Suffer From MSDs		Total
			No	Yes	
Position Used in Practice	8:00 - 12:00 Clock Position	Responses	52	192	244
		% within Position Used in Practice	21.3%	78.7%	100.0%
	9:00 - 12:30 Clock Position	Responses	14	79	93
		% within Position Used in Practice	15.1%	84.9%	100.0%
Total		Responses	66	271	337
		% within Position Used in Practice	19.6%	80.4%	100.0%

**Table III.** Comparisons of MSDs Reported in Current and Previous Studies<sup>1,3,5,6,7,16,17</sup>

	Present Study Responding Yes to Ever Having MSD or Currently Having MSD by Site	Minimum From Previous Studies	Maximum From Other Studies
Neck	74% (n=202/272)	28% <sup>1</sup>	74% <sup>17</sup>
Shoulders	61% (n=165/271)	27% <sup>16</sup>	81% <sup>3</sup>
Lower Back	54% (n=148/272)	39% <sup>3</sup>	65% <sup>6</sup>
Hands/Wrists	57% (n=156/272)	42% <sup>3</sup>	69% <sup>7</sup>
Upper Back	45% (n=122/272)	22% <sup>5</sup>	67% <sup>7</sup>

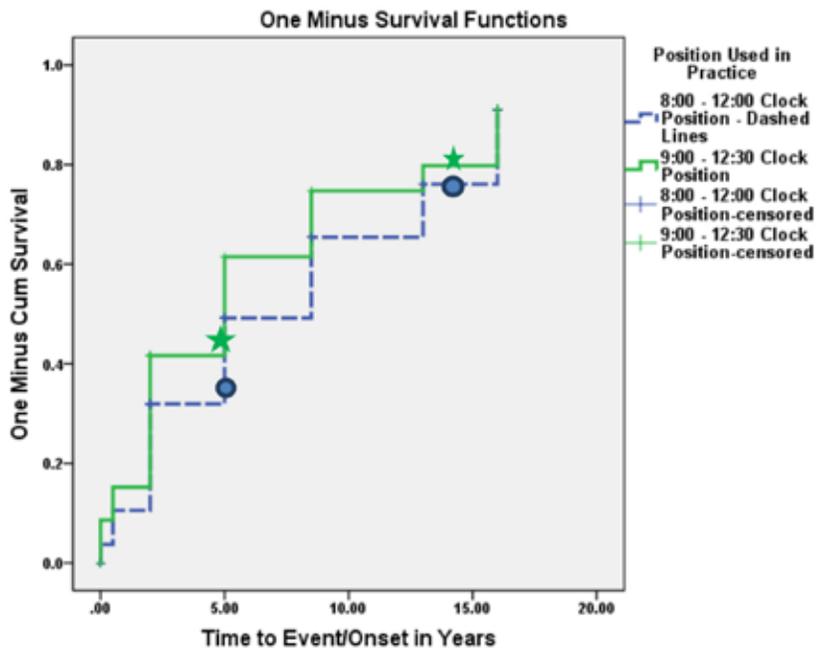
However, after 15+ years of practice, the difference in time of MSD onset was not significant for practitioners using the 9:00-12:30 o'clock position (79%) when compared to those using the 8:00-12:00 o'clock position (85%) (LR analysis ( $\chi^2$  (1) = 2.13,  $p=0.144$ ). Of the 244 participants using the 8:00 - 12:00 o'clock position, 79% developed a MSD from the beginning of practice to 15+ or more years of practice. Of the 93 participants using the 9:00-12:30 o'clock position, 85% developed a MSD within the same time period. Time of MSD onset by operator clock position is illustrated in Figure 1. Significant differences are identified at the 5-year mark; however, no significant difference is shown at the 15+ year time period.

Workforce issues included items related to modifying patient workload, reducing hours of work, taking time off from work and ability to practice clinically. The majority of practitioners (85%, n=231/272) responded that they are still able to practice despite having a MSD. Only 44 practitioners

(13.1%, n=338) reported ever having to modify their patient load; 56 (16.6%, n=338) reported reducing work hours, and 72 (21.4%, n=337) reported taking time off from work due to MSDs. Pearson chi-square analyses revealed no significant difference between time of onset of a MSD and the need to modify the patient work load ( $X^2 = 3.5$  (1),  $p=0.06$ ), reduce work hours ( $X^2 = 2.97$  (1),  $p=0.08$ ), take time off from work ( $X^2 = 1.96$  (1),  $p=0.16$ ) or the ability to continue to work ( $X^2 = .00$  (1),  $p=0.97$ ) due to MSDs.

## Discussion

The most remarkable findings in this study were that regardless of operator position used, the majority of respondents reported experiencing a MSD. Almost half of respondents had an onset of a MSD within the first 6 years of practice, and the majority reported that they were able to continue clinical practice despite having a MSD. Overall, the percentage of dental hygienists effected with and type of MSDs reported in this study are highly consistent with findings reported by others. (Table III)<sup>1, 3, 5-7, 16, 17</sup>



**Figure 1.** Survival Distributions for Positions Used in Practice and Development of MSDs

Legend: Horizontal lines represent time intervals. Vertical lines represent increases in MSD development.

(Dot ●) placed at 5 years illustrates over 30% using 8:00-12:00 position developed MSD and at 15 years slightly less than 80% had MSD; Star (★) placed at 5 years illustrates over 40% using the 9:00-12:30 position and at 15 years = 80% developed MSD

### Operator Positioning

Results from survival analyses revealed that study participants developed a MSD sooner after entering practice than what has been previously reported in the literature. In this study, almost half of the dental hygienists developed a MSD within the first 6 years of practice, as compared to findings from a qualitative study by Crawford, et al. who reported that physical aches and pain appeared more frequently after 10 years of practice.<sup>8</sup>

Breslow analysis demonstrated that the median estimated time to develop MSDs was 5 years for those who practiced from “behind” the patient as compared to the median time of 8.5 years for those who practiced “in front” of the patient. This analysis may be more reflective of the true timing of the onset of MSDs as it examined the MSDs as variables of time; for example, a clinician’s increasing age and number of years in practice may further compound signs and symptoms of MSDs. These same variables also may explain why the Log rank analysis showed no difference in onset of MSDs and positions used at later time points. Early onset MSDs may be related to the adjustment period following graduation with factors including the need to maneuver in a new and different work environment, space limitations within the operatory, and adjusting to new equipment and/or equipment placement.

Furthermore, recent graduates must learn to transition from the low patient loads of the academic setting to the significantly higher patient loads and increased physical demands of the work setting. Anecdotally, students tend to accommodate patient comfort before personal comfort. If this habit continues when transitioning to the work environment, new graduates may not realize how poor postures can jeopardize their future health.

Later onset may also be caused by the nature of cumulative trauma. When poor postures become the “normal” position, tissues change and adapt to the new position.<sup>38</sup> These new postures/positions can become the “default” postures; however, the resultant complications from practicing with these postures may take years to develop into MSDs. This phenomenon is supported by findings from the Log rank analysis, which demonstrated that while study participants sitting in the back position developed MSDs at an earlier time point, after 15+ years, hygienists sitting from either position were highly likely to have developed MSDs. Data suggests that regardless of operator position used, given an adequate amount of time, a large percentage of dental hygienists are going to develop MSDs.

### Work Habits

Surprisingly, only small numbers of hygienists who developed early or late onset MSDs reported modifying their workloads despite having a MSD. A previous study reported that 25% of study participants with MSDs modified their workloads; however, the time of onset was not identified.<sup>6</sup> The need to reduce work hours in the present study was reported by 18% of those with early onset MSDs and 27% of those with late onset. Two other published studies documented similar percentages of respondents, 27% and 31% respectively, who needed to reduce work hours due to late onset MSDs.<sup>8,17</sup>

One quarter of the dental hygienists in this study reported taking time off from work due to early onset MSDs as compared to 33% with late onset. Previous studies reported that dental hygienists with neck and forearm pain were more likely to take off from work than those without pain.<sup>7,13,39</sup> In this study, 24% missed work due to chronic musculoskeletal pain and only a very small percentage of dental hygienists were absent due to MSDs.

The majority of Mississippi dental hygienists who participated in this study with both early and late onset development of MSDs continue to practice clinically despite having MSDs. A qualitative study by Crawford et al. assessed reasons why dental hygienists continue to work with severe discomfort and pain.<sup>8</sup> Reasons cited included financial obligations which prevented being absent, no sick leave, and fear of job loss if absent. It can be assumed that these identified reasons are similar to those of this study population. Although previous studies report that a number of dental hygienists with MSDs leave the profession due to physical stress, being adversely affected by discomfort, and neck and carpal tunnel pain,<sup>8,12,14</sup> the data from this study suggests that the dental hygiene workforce productivity in Mississippi has not been negatively impacted by the presence of MSDs.

Results from this study suggest that existing approaches to operator positioning are insufficient to protect against future injury. In many dental hygiene programs, the greatest ergonomic training emphasis is placed on operator positioning; however, findings from this study do not support that one position is considered to be better than the other, as MSDs affected the majority of participants regardless of the chosen sitting position. Knowledge and mindfulness of proper body mechanics, such as sitting with more neutral postures in conjunction with regular movement and exercise, may be a more effective approach to training dental hygiene students.

Limitations in this study included that the working identified clock positions did not reflect the full variation in operator positioning. Although the 9:00 – 12:30 o'clock position eliminates the 8:00 o'clock position and slightly extends the 12:00 o'clock position, there may not have been enough of a distinct difference between the two working zones for participants to distinguish the difference or make a difference in the MSD rates due to the overlapping of these two zones. The use of a survey instrument dependent upon the participant's ability to accurately recall and report the events under investigation, has intrinsic limitations. Self-reported positions used while practicing could not be verified, and all responses are subject to recall bias. While it is assumed that respondents reported their typical operator position as requested, in reality practitioners often shift positions frequently while working, and this most likely occurred with these study participants as well. It was also assumed that participants provided their responses to questions about MSDs based upon their occupational risk and work habits. Injuries due to other causes, such as motor vehicle accidents, or pain and physical limitations due to illnesses or chronic conditions such as arthritis, could not be controlled for in this study.

It is important to note that many other factors can influence the development of MSDs, including the use of devices meant to assist with operator positioning, such as: custom stools, devices to assist with visibility and head posture (magnification loupes with/without headlamps), and instruments to reduce hand fatigue and physical demands on the operator (instruments with wide handles, power instruments, swivel cords). Exercise, including history of regular exercise and type of exercise regimen, may also be an important consideration for both the prevention and time to onset of MSDs among practitioners. To date, there is little evidence documenting the effects of these factors on either the development, prevention and/or reduction of MSDs in dental hygienists in clinical practice. Existing literature discusses the theoretical benefits of these interventions but there is a need for more definitive research assessing their impact on the long-term health outcomes and career longevity among practitioners.

To date, most ergonomics-related research has been conducted with dental hygiene students. It is imperative for researchers to conduct longitudinal studies on *practicing* dental hygienists working within the true clinical environment, using typical patient workloads and mimicking actual working conditions, so that identified behaviors leading to the development of MSDs can be adequately assessed and measured. While studies conducted on dental hygiene students have merit, these populations are often comprised of healthy young adults who are practicing under optimal conditions within the academic environment and treating a limited number of patients per day. Differences are most likely to occur between student populations and practicing clinicians.

Additional research also is needed to determine the significance of operator positioning on the development of MSDs. Specifically, studies are needed to examine whether working from a variety of clock positions (moving between 8:00 to 4:00 o'clock) would allow for operators to use different muscle groups and thus reduce musculoskeletal strain, and/or whether alternating between sitting and standing positions throughout the day can sufficiently break up the static postures associated with "sit down" dentistry. Prospective studies are also needed to explore how alternating positions in combination with exercise habits, stretching and/or use of ergonomic devices influences the development of MSDs in practicing dental hygienists.

## Conclusion

Dental professionals are at high risk for developing MSDs due to positioning and repetitive motions that can lead to permanent tissue injury and chronic pain and dysfunction. Participants in this single state study developed MSDs earlier after entering clinical

practice than what has been previously reported in the literature. Data from this study suggests that regardless of operator position used, over time, a large percentage of dental hygienists will develop MSDs. However, data from this study also suggests that while the presence of MSDs may impact quality of life, they do not appear to negatively impact the dental hygiene workforce productivity in the state of Mississippi.

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## Assessing the Use of Loupes and Lights in Dental Hygiene Educational Programs

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### Abstract

**Purpose:** The purpose of this study was to explore the use of loupes and lights in dental hygiene programs, to assess why they are being used, and to evaluate at what point in time they are introduced to students within the curriculum.

**Methods:** A 20 question survey was developed and pilot tested. The survey was disseminated electronically to 335 dental hygiene program directors in the United States. Frequency distributions were analyzed to provide an overview of the data and Fisher's Exact Test was used to investigate differences between technical/community college programs and university-based programs.

**Results:** Out of the 335 electronic surveys, 143 were completed for a response rate of 47%. Prevention of musculoskeletal disorders, ergonomics, and enhanced vision for instrumentation remain the top three advantages of using loupes. Ninety-six percent of respondents indicated students use loupes and over 50% of faculty use loupes. Fifty-seven percent of dental hygiene programs encourage students to purchase loupes with a light. Fifty percent of students pay \$601-\$900 for loupes and 47% pay \$300-\$600 for a light.

**Conclusion:** Student and faculty use of loupes and lights are increasing in educational programs. Future research should focus on the longitudinal impact of using loupes/lights, the prevention of musculoskeletal disorders, and an investigation of the continued use of loupes in a professional setting post-graduation.

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### Introduction

Dental hygienists endure routine physical stress by sitting in static positions and performing clinical care in restricted fields of vision.<sup>1,2</sup> These prolonged positions also require hand and eye coordination with finely tuned movements.<sup>1-3</sup> Repetitive instrumentation creates stress on both the dominant and non-dominant hand and can result in musculoskeletal disorders (MSDs).<sup>1,4</sup> MSDs are caused by cumulative trauma of force and repetition.<sup>4-6</sup> This excessive trauma affects bones, muscles, causes neuro-circulatory diseases, in addition to increasing the risk of developing carpal tunnel syndrome.<sup>2,5,7</sup>

MSDs are a well-documented occupational hazard and the main cause of pain and injury within the dental hygiene profession.<sup>2-5,8,9</sup> Female clinicians suffer from MSDs involving the spine, shoulders, and neck more often than males.<sup>10</sup> The number of MSDs reported are directly correlated with the number of clinical practice hours worked weekly.<sup>2</sup> This can also have a negative impact on a dental hygienist's productivity and result in missed days of work.<sup>2,7</sup> Furthermore, this occupational hazard can decrease the long-term potential of a dental hygienist's

career.<sup>2,7,9</sup> The use of magnification loupes and lights can improve the dental hygienist's ergonomics by correcting postural positioning.<sup>11-13</sup>

It is suggested that injuries caused by MSDs can be reduced or prevented by applying proper ergonomics in combination with the use of appropriate equipment such as loupes and lights.<sup>7,10,14</sup> This combination can also reduce cognitive and physical stress by creating a safe, healthy, and comfortable workspace for dental hygienists.<sup>9,10</sup> Many studies support the use of loupes to improve ergonomics and help prevent the risk of work related MSDs.<sup>1-3,9,11,12,15-17</sup> In addition, loupes can also compensate for visual deficiencies.<sup>13,18</sup> According to Perrin et al., the potential decline in a clinician's vision over time could be compensated for with early the incorporation of loupes.<sup>18</sup>

Although loupes are being used in clinical practice to improve ergonomics, reduce MSD symptoms, and to enhance the clinician's field of vision, historically they have not been routinely implemented in dental hygiene educational programs.<sup>1,9,15</sup> Congdon et al. revealed that only 23% of dental hygiene programs in the United States required students to purchase

loupes.<sup>9</sup> In addition, 90% of schools indicating that students were not required to purchase loupes also indicated they would not be requiring students to purchase loupes in the future.<sup>9</sup> It was also reported that dental hygiene students who do use loupes tend to buy them in the middle of their educational program after they have already learned and adjusted to their new clinical skills.<sup>9</sup> However, the greatest percentage of respondents in the Congdon et al. study, indicated the optimal time to introduce and begin using magnification loupes is during pre-clinic instruction.<sup>9</sup>

In a case study by Branson et al., dental hygiene students self-reported positive changes in their posture and quality of work when using loupes.<sup>1</sup> In a second study by Branson et al., clinical posture was examined with and without loupes.<sup>15</sup> The majority of those wearing loupes reported improvement in their clinical performance.<sup>15</sup> Furthermore, 100% of the study participants reported an improvement in posture and clinical skills prior to graduation.<sup>12</sup>

The use of LED headlamps for illumination has also grown in recent years. A study by Ari et al. found the use of a light, in combination with low-powered magnification (2.5x), augmented caries detection in primary teeth.<sup>19</sup> The use of headlamps, also known as coaxial headlights or lights, can also enhance clinician ergonomics.<sup>20</sup> Inadequate lighting may result in poor postural positioning contributing to MSDs.<sup>1-5,20,21</sup> The use of proper lighting can reduce these risks by helping the operator maintain a neutral body position.<sup>20,21</sup> The combination of loupes and lights has been shown to reduce the occupational hazard of MSDs in the dental hygiene profession.<sup>2-6,9,20,21</sup> There have also been some concerns raised about the safety of LED headlamps.<sup>22</sup> According to Stamatacos et al., the use of LED illumination can possibly be detrimental to the retina at certain intensities.<sup>22</sup> However, the white or colorless LED beams are considered to be the safest and many dental manufacturers produce this type of headlamps.<sup>22</sup>

Research indicates that introducing loupes to dental hygiene students may reduce the development of poor ergonomic habits.<sup>9,12</sup> However, the use of loupes has not been systematically incorporated in dental hygiene curricula as a best practice,<sup>9</sup> and there are no accreditation standards requiring loupes.<sup>9</sup> There are, however, growing numbers of practicing dental hygienists using loupes and lights to enhance visibility and improve ergonomics, often as a result of having used them in their educational programs.<sup>9,13</sup> The inclusion of the use of these optical aids in a dental hygiene program can potentially lower the risk of cumulative trauma (MSDs) and reduce eyestrain, which may in turn prolong dental hygiene careers.<sup>9</sup> The purpose of this study was to explore the use of loupes and lights in dental hygiene programs, to assess why they are being incorporated, and to evaluate at what point in time they are introduced to students within the curriculum.

## Methods

University of Michigan (U-M) Health Sciences & Behavioral Sciences Institutional Review Board (IRB) determined this study was exempt from IRB oversight. (HUM00102763) E-mail addresses of the 335 dental hygiene program directors was obtained from the American Dental Hygienists' Association (ADHA) Entry-Level Dental Hygiene Program Directory for this cross-sectional study. The survey questions were adapted with permission from Congdon et al. and modifications were completed in consultation with the U-M Center for Research on Learning and Teaching (CRLT).<sup>9</sup> Content validity was determined through pilot testing with four U-M faculty members. Modifications to the survey were made based on feedback.

The electronic survey consisted of 20 questions including multiple choice, open-ended, Likert-scale, and yes/no options. The first four questions focused on the institutional category, degree conferred, the percentage of faculty using loupes, and a yes/no response question to students' use of loupes. Respondents who answered, "yes, their students used loupes," were then asked if the students were required, encouraged, or neither. They were also questioned on the use of lights, at what point in time loupes were introduced in the curriculum, advantages of using loupes and lights, and the overall cost of the equipment. Respondents who answered "no, their students were not using loupes," were then asked if the inclusion of loupes and lights would be considered at some time in the future. In addition, questions were asked regarding the number of hours dedicated to this topic in the curriculum, reasons why loupes are not being utilized in their program, and at what point in the curriculum did they feel that loupes should be introduced.

The survey was disseminated using Qualtrics software. Dental hygiene program directors received an email introduction/invitation describing the purpose of the project, informed consent, and a link to the survey. The survey was open to participants for one month with three reminder notifications emailed. Data analyses were performed using the IBM Statistical Package for the Social Sciences (SPSS) version 24. Frequency distributions were analyzed to provide an overview of the data. Fisher's Exact Test was used to investigate differences between technical/community college programs and university-based programs. Significance was set at  $p < 0.05$ .

## Results

Out of the 335 electronic surveys, 143 were completed for a response rate of 47%. Table I provides a summary of respondents including the type of educational setting and the degrees conferred. Of the total respondents, 70% were from dental hygiene

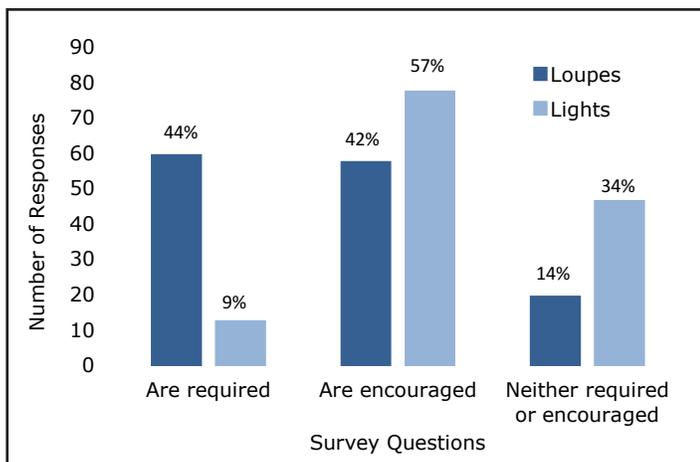
**Table I.** Dental Hygiene Program Demographics

Institutional Category	n (%)
Community college	79 (55%)
Technical/vocational school	18 (13%)
University not associated with dental school	31 (22%)
University associated with a dental school	15 (10%)
Degree Conferred	n (%)
Associate	112 (70%)
Bachelor	44 (28%)
Certificate	3 (2%)
Use of Loupes	n (%)
Students use loupes	138 (96%)
Students do not use loupes	5 (4%)

programs conferring an associate's degree, with 55% from community college programs and 13% from a technical/vocational school. Twenty-two percent of respondents were from universities not associated with a dental school and 10% were from programs associated with a dental school. Ninety-six percent of the respondents indicated students used loupes in their educational programs while only 4% indicated that the students were not using loupes.

Figure 1 illustrates whether or not programs require or encourage the use of loupes and lights. Of the 96% of the respondents indicating that their students used loupes, 44% required their use. In dental hygiene programs not requiring loupes, 42% of the respondents encouraged the use of loupes within the curriculum, while 14% stated they neither require nor encourage students to use loupes. With respect to the use of lights, 57% of the respondents stated that students are encouraged to use lights,

**Figure 1.** Dental Hygiene Programs Use of Loupes and Lights



9% require lights, and 34% neither require nor encourage their students to use lights.

When respondents were asked to report on the percentage of faculty use of loupes, 52% reported that between 76-100% used loupes. (Figure 2) This was followed by 17% reporting between 1-25% using loupes in clinic and 17% indicating between 51-75%. Twelve percent indicated between 26-50% and 2% stated that none of their faculty use loupes in clinic.

**Figure 2.** Percentage of Faculty who Use Loupes

Answer	Response	%
76-100%	74	52%
1-25%	24	17%
51-75%	24	17%
26-50%	17	12%
None	3	2%
Total	142	100%

When asked the number of hours in the program dedicated to education about the use of magnification and ergonomics, 76% reported spending 1-3 hours, while 4% spent more than 6 hours, and 1% do not include magnification at all in the curriculum. (Table II) A reported 39% of the respondents estimated that students begin using loupes during the first semester pre-clinic course, 36% begin using loupes when they start treating patients, and 4% do not use loupes in the dental hygiene program. No statistical significance was found when the Fisher's Exact Test was applied to explore the differences between technical/community college programs and university-based programs for each of the survey questions.

**Table II.** Hours in Curriculum Dedicated to Loupes & Point in Curriculum When Used

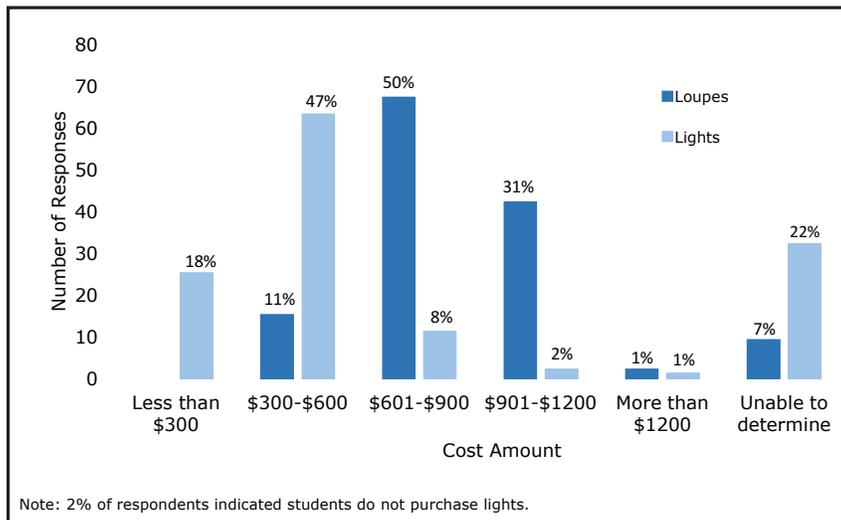
Hours in curriculum dedicated to loupes	n (%)
1-3 hours	102 (76%)
4-6 hours	21 (16%)
> 6 hours	6 (4%)
Unable to determine	4 (3%)
0 hours	2 (1%)
Point in curriculum when students begin using loupes	n (%)
1 <sup>st</sup> semester/pre-clinic	53 (39%)
1 <sup>st</sup> semester students see patients	49 (36%)
2 <sup>nd</sup> year of program	25 (19%)
Other	8 (6%)

Respondents were asked to identify the two most important advantages to using loupes. (Figure 3) Improvement in ergonomics and posture was reported by 77% of the respondents as being the most advantageous, followed by enhanced vision for instrumentation (57%), decreased musculoskeletal pain (19%), improved reading of the periodontal probe (18%), obtaining good habits for clinical care (12%), calculus detection (4%), soft tissue assessment (1%). One percent of the respondents reported no advantages to using loupes.

**Figure 3.** Advantages to Using Loupes (Select two most important advantages)

Answer	Response	%
Ergonomics/posture	115	77%
Enhanced vision for instrumentation	86	57%
Decreased musculoskeletal pain	29	19%
Improved reading of periodontal probe	27	18%
Provides good habits for clinical care	18	12%
Calculus detection	6	4%
Assessment of soft tissues	2	1%
No advantages to using loupes	1	1%

**Figure 4.** Average Price Students Pay for Loupes and Lights



Student expenses for loupes and lights are shown in Figure 4. Fifty percent of the respondents reported paying between \$600 and \$900 for loupes, while 31% paid between \$900 and \$1200. In addition, 11% indicated students spending between \$300- \$600. With respect to lights, 47% spent \$300-\$600 and 22% were unable to determine the costs.

## Discussion

This study examined the inclusion of magnification loupes and lights in dental hygiene programs. Nearly all dental hygiene programs participating in this study indicated loupes were being utilized by their students. In 2012, Congdon et al. reported 23.8% of dental hygiene programs required the use of loupes while this study found 44% of programs required loupes.<sup>9</sup> The increase is notable and may be related to a better understanding about the improvement of clinical posture and clinical performance while using loupes.<sup>12,14,15</sup> Additionally, more companies are now manufacturing loupes, making pricing more competitive.

Ergonomics and improved vision for instrument-ation were the highest ranked advantages noted for using loupes. According to this study, as well as Congdon et al., these factors, and the prevention of MSDs have consistently remained the top advantages for using loupes.<sup>9</sup> Contrary to how important proper ergonomics is to minimize MSDs, studies show that dental professionals have limited knowledge on correct ergonomic posture.<sup>10,23,24</sup> Perhaps this is why only a very small percentage of programs dedicate more than six hours to magnification and ergonomics in the curriculum. Interestingly, nearly all dental hygiene programs have some percentage of their faculty utilizing loupes in clinic. This may also be a factor related to the increased loupes utilization by students. Faculty can serve as role models for students, illustrating the advantages of loupes, even though magnification may not be required or necessarily taught throughout the curriculum.<sup>9</sup>

As noted in Congdon et al., this study also found a majority of respondents believe loupes should be introduced in the first year of a dental hygiene program, with one-third indicating pre-clinic.<sup>9</sup> The adjustment period is a noted disadvantage to wearing loupes.<sup>17</sup> If introduced early in the curriculum, students have the ability to learn instrumentation while wearing loupes, lessening the effects of having to readapt to instrumentation, and reduce potential symptoms such as headaches and vertigo when using loupes in the future.<sup>17</sup> Introducing loupes in pre-clinic could also enable students to more efficiently learn psychomotor skills as well as enrich proficiency and self-confidence

during instrumentation.<sup>11</sup> Others indicated the second year of the program would be the appropriate time to incorporate loupes into the curriculum. Perhaps those respondents felt students are overwhelmed with the new concepts of instrumentation in pre-clinic, and think it is best they feel comfortable in clinic before introducing loupes.

Interestingly, over half of the study respondents encouraged the use lights in conjunction with loupes for their students. Adequate lighting allows a clinician to more easily assess patient issues and provide quality care. The use of lights improve ergonomics by encouraging a neutral position, enhance visibility, and reduce eye strain.<sup>20,21</sup> In addition, the inclusion of a headlamp can improve the ability to detect caries.<sup>19</sup> These reasons may support why faculty encourage the use of lights. Students need to be attentive to the type of light they are purchasing. Guidelines have been established to minimize the potential hazards from the use of LED headlights.<sup>22</sup> In addition to following safety guidelines, faculty need to educate their students about the potential risks to the eyes when using LED illumination.

Another factor students consider when purchasing loupes and lights, is their cost. Adding the purchase of this additional equipment to the rising costs of tuition, books, instruments, and housing, could be perceived as an additional financial burden for students. Perhaps institutions could utilize discounts offered to students and could also consider ways to bundled this purchase into a financial aid package. Expanding education about the benefits of loupes and lights could potentially assist students in understanding the value of such a costly purchase.

Despite the notable 47% response rate of program directors to this survey, there are limitations to this study. The results may not be an accurate representation of all dental hygiene programs since respondents were solely the program directors reporting on student and faculty loupe and light use. Further studies elucidating responses from students as well as faculty could give clearer depiction of why and when loupes are utilized within the dental hygiene curriculum.

## Conclusion

Utilization of loupes and lights are increasing for both students and faculty in dental hygiene programs. The use of loupes may prevent occupational hazards of MSD injuries, enhance ergonomics, improve vision for instrumentation, and decrease visual deficiencies. Cost remains the greatest barrier to incorporation of loupes and lights and cost-effective means for their inclusion in dental hygiene educational programs should be considered. Future research should focus on the impact and safety of lights. Longitudinal studies on loupes and lights and their role in preventing MSDs should also be pursued as well as

investigating how many students continue to use loupes in a professional setting post-graduation.

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## Oral Manifestations of Menopause: An Interprofessional Intervention for Dental Hygiene and Physician Assistant Students

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### Abstract

**Purpose:** Interprofessional education (IPE) is a means of fostering integration and collaboration between health care professions. The purpose of this study was to evaluate the effect of an IPE educational module on dental hygiene (DH) and physician assistants (PA) students' knowledge of the oral manifestations of menopause and overall confidence in treating these conditions.

**Methods:** A convenience sample of DH and PA students was used for this mixed-method study. Quantitative data was collected with pre- and post-tests using a modified Readiness for Interprofessional Learning Survey (RIPLS) and a principle investigator (PI)-designed knowledge of menopause test, to determine the students' attitudes and learning levels. Students participated in a one-time workshop that included an educational presentation on the oral manifestations of menopause and a case study exercise using a pseudo-standardized patient. Students from both disciplines, worked in preselected groups to create a patient care plan addressing the oral manifestations of menopause. Qualitative data was collected from student comments.

**Results:** Study results indicate an increase in participants' knowledge of the oral manifestations of menopause ( $p < 0.05$ ). Results also suggest improved attitudes toward interprofessional teamwork and collaboration ( $p < 0.05$ ), positive professional identity ( $p < 0.05$ ), roles and responsibilities ( $p < 0.05$ ) for IPEC core competencies RR1, RR2, RR3, RR4, interprofessional communication ( $p < 0.05$ ) for IPEC core competencies CC3, CC4, CC 6. Qualitative data from interprofessional care plan formulation and debriefing demonstrated facilitation of gained confidence in applying new skills related to the oral manifestations of menopause.

**Conclusion:** Patients experiencing menopause are susceptible to oral manifestations. Implementation of an IPE intervention demonstrated correlation between an IPE experience and participants' knowledge, attitudes and confidence. Preparing students to meet the needs of menopausal women may ultimately decrease oral discomfort and improve overall quality of life.

**Keywords:** interdisciplinary Collaboration, interprofessional education, oral health promotion, menopause, women's health

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### Introduction

Research supports interprofessional education (IPE) as a means of fostering integration and collaboration between medical and dental health care providers.<sup>1-4</sup> The 2010 definition of IPE by the World Health Organization (WHO) states, "Interprofessional education occurs when two or more professions learn about, from and with each other to enable effective collaboration and improve health outcomes."<sup>5</sup> Although interest in IPE has varied over the years, there is an increasing body of evidence supporting the inclusion of dental hygienists (DH) in IPE.<sup>6-8</sup> A

recent call to action by Vanderbilt, et al., describes the need for DH to be included in IPE, specifically in regards to dental hygiene and physician assisting education programs.<sup>9-11</sup>

Since DHs and PAs are frequently the first providers of diagnostic and therapeutic services, IPE between these health care providers is particularly important especially as women from the "baby boomer" generation transition through menopause.<sup>12-14</sup> Approximately 65 million women in the U.S.

experience oral conditions related to menopause, with 43% of these women reporting oral pain and discomfort as compared to 6% of premenopausal women.<sup>14,15</sup> Oral manifestations associated with menopause vary from those that are painful, such as burning mouth syndrome (BMS), to those that are not, such as periodontal disease.<sup>16</sup> The range of oral manifestations reported include xerostomia, viscous saliva, increased caries, altered or unpleasant taste, ulcerations, BMS, trigeminal nerve pain, periodontal disease, osteoporotic jaw, and loss of alveolar bone height.<sup>17-19</sup> Although recommendations have been made for treating the more specific symptoms such as xerostomia, BMS, and periodontitis, there are no oral care guidelines for menopausal women.<sup>16,20</sup> The few recommendations found in the literature generally advise regular dental examinations, professional oral prophylaxis, basic oral care instruction, fluoride use, and the maintenance of a balanced diet including adequate intake of vitamin D and calcium.<sup>17,21-23</sup> With the average American woman experiencing menopause at age 51 and a life expectancy of 80 years, addressing the oral health conditions related to menopause plays a critical role in the overall quality of life for this life stage.<sup>24</sup>

Teaching methodologies in health care training programs incorporating the use of actors trained to portray patients in a simulated clinical setting, (standardized patients or SP), and case studies allowing for new learning to be applied to real-life scenarios following completion of a related lecture or lab, (case-based learning or CBL), have been shown to improve students' confidence within a non-threatening environment.<sup>25,26</sup> The use of SP and CBL has been shown to improve students' communication, interviewing, and clinical skills.<sup>25,27,28</sup> Research indicates that CBL is commonly used in both DH and PA curricula.<sup>29-31</sup> Calhoun, et al., reported that the majority of accredited PA programs use SP as a teaching methodology.<sup>32</sup> However, little evidence is found regarding use of SPs in DH education and when reported its use has been limited to tobacco dependence counseling training.<sup>26,33</sup> There is a lack of research available regarding use of SPs and CBL in menopause/oral health education across the health care disciplines. The purpose of this study was to evaluate the effect of an IPE educational module on dental hygiene (DH) and physician assistants (PA) students' knowledge of the oral manifestations of menopause, interprofessional collaboration and overall confidence in treating these oral conditions.

## Methods

A mixed-method pre- and post-test design evaluated the comparative relationship between DH and PA students related to an educational intervention. Subsequent to Eastern Washington University IRB approval, a convenience sample of DH students from Eastern Washington University ( $N=63$ )

and PA students from the University of Washington MEDEX Northwest PA program ( $N=29$ ), were invited to participate in the study. Inclusion criteria were current enrollment in the DH or PA program and matriculation in the respective program to the point of having had clinical exposure to patients.

DH and PA students were invited to attend separate informational meetings regarding the study. Students who completed a consent form ( $N=54$ ), were emailed a link to enroll in the study workshop session. The principle investigator (PI) reserved a classroom at the study site equipped with a dental chair and audio-visual equipment for the workshop. All printed forms, tests and supplies were provided to the participants by the PI.

A pseudo-SP was employed to promote student practice in IPE, risk assessment, patient assessment and counseling, and care planning with increased comfort.<sup>33</sup> For the purposes of this study, the pseudo-SP did not undergo the minimum of 10 hours of training required to be a true SP,<sup>34</sup> but instead completed a one-hour training session. Following the completion of a one-hour training session, the pseudo-SP used a written script specifying signs and symptoms, how to respond to various lines of questioning by providing responses with dialogue, believable patient history of the presenting problem, and other personal information that allowed the pseudo-SP to answer questions participants asked.<sup>33</sup>

The three-hour workshop began with a demographic survey, menopause knowledge pretest, and a modified Readiness for Interprofessional Learning Survey (RIPLS)<sup>35,36</sup> pretest. Upon completion of the baseline assessments, participants listened to a presentation regarding IPE followed by information on the oral manifestations of menopause. Participants were then randomly assigned to one of six heterogeneous interprofessional (IP) teams to create a patient care plan based on a given case study and pseudo-SP presentation. Participants were provided guidelines for management of the oral manifestations of menopause (Figure 1) and the IPE Assessment, Diagnosis, Planning, Implementation, Evaluation, and Documentation (A.D.P.I.E.D.) Process of Care Algorithm (Figure 2), both designed by the PI. All participants received the same educational slide presentation and case study. The same pseudo-SP was used throughout the workshop. Upon completion of the workshop, participants were given a menopause knowledge post-test, modified RIPLS posttest, and participated in a videotaped debriefing interview.

## Case Study

The workshop utilized a single case study addressing xerostomia, periodontitis, and oral osteoporosis. The case study format and use of pseudo-SP encouraged participants to assess a multitude of factors, provide patient education and counseling, and develop a collaborative care plan as a team. Each IP team

**Figure 1.** Guidelines for Management of the Oral Manifestations of Menopause <sup>16,17, 63-72</sup>

Condition	Intervention
General	Brush 2-3x daily; Floss 1-2x daily Regular Dental Visits Chlorhexidine Rinse prn Nutrition: Limit Sodium, Caffeine, and Alcohol Habits: Tobacco Cessation, Stress Reduction
Periodontium	Hormone Therapy Corticosteroids for Desquamative Gingivitis
Oral Osteoporosis	Radiographic Evaluation and Monitoring: Bitewing, Periapical, Panoramic 1500-2000 mg Calcium Daily 800-1000I IU Vitamin D Daily Osteoporosis Screening *Note medications and therapies coincide with systemic treatment
Xerostomia and Caries	Sialometry Sipping Water Frequently Saliva Substitutes Sialogogues Sugar-Free/Xylitol Mints and/or Gum Xylitol Mints, Gums, Oral Patches Prescription 1.1% Sodium Fluoride Toothpaste Fluoride Varnish Application Hormone Therapy
Burning Mouth Syndrome	Multivitamin Zinc Hormone Therapy Clonazepam Systemic or Topical Antidepressants Capsaicin Alpha-Lipoic Acid Psychotherapy Behavioral Feedback
Trigeminal Neuralgia	Stress and Anxiety Reduction Short Appointments

recorded findings, diagnosis, and treatment on a patient care plan worksheet used to collect qualitative data. The case study content was based on information from the literature review and represented a complex menopausal patient scenario requiring expertise from both DH and PA professionals for assessment, appropriate intervention and best outcomes.

## Instruments

Instruments used in the current study included a demographic survey, modified RIPLS survey menopause knowledge pre- and post-test, patient care plan worksheet, and videotaped debriefing session. The demographic survey provided descriptive statistics of the sample regarding age, gender, race, professional discipline, years of clinical experience, and prior experiences. A multiple-choice pre- and post-test evaluated for changes in knowledge regarding oral manifestations of menopause and the oral systemic health connection. The knowledge test subsections included women's health and IPE, menopause systemic manifestations, oral manifestations, and oral health management in menopause.

The modified RIPLS was employed as a pre- and post-test. The modified RIPLS, a valid and reliable tool for evaluating IPE, is a 19-item survey with four subscales, using a 5-point Likert scale ranging from strongly disagree (1) to strongly agree (5).<sup>35,36,37</sup> This tool evaluated the influence of the educational intervention on participant's attitudes and perceptions of IPE. (Figure 3) The modified RIPLS collected data regarding two IPEC competencies, RR and CC, the foci of this study. The RR domain focuses on using the knowledge of one's own roles and those of other professions to appropriately assess and address the health care needs of the patients and populations served and the CC domain focuses on communicating with patients, families, communities, and other health professionals in a responsive and responsible manner that supports a team approach to the maintenance of health and the treatment of disease.<sup>2</sup>

A patient care plan worksheet was completed by each IP team using a IPE A.D.P.I.E.D. Process of Care Algorithm, synthesized by the PI from the Interprofessional Team Reasoning Framework (IPTRF) algorithm and A.D.P.I.E.D. process of care.<sup>38,39</sup> The patient care plan worksheet assisted teams in their responsibilities of identifying oral problems through IP interaction, streamlined data entry, and provided qualitative data.<sup>40</sup>

Data was also collected via video recording of the participant's debriefing. The PI transcribed the videos to analyze for themes, measure participants' confidence in IP patient care regarding oral

**Figure 2.** Interprofessional A.D.P.I.E.D. Process of Care Algorithm<sup>38,39</sup>

<b>1 What is the health care setting?</b> <ul style="list-style-type: none"> <li>• Hospital • Medical Office</li> <li>• Dental Office • Other</li> </ul>		<b>Interprofessional A.D.P.I.E.D. Process of Care</b> <ul style="list-style-type: none"> <li>*Progress through each step 1-7, including team discussion and documentation</li> <li>*Collect data &amp; identify specific oral-systemic associations derived from assessment data that impact the diagnosis</li> <li>*Determine how to perform interprofessional treatment planning, implementation, and evaluation of patient outcomes</li> <li>*Use the given algorithm as a guide</li> </ul>			
<b>2 Who will lead the team?</b> <ul style="list-style-type: none"> <li>• Dental Provider • Medical</li> </ul>					
<b>3 Assess</b>		<b>4 Diagnose</b>	<b>5 Plan</b>	<b>6 Implement</b>	<b>7 Evaluate</b>
<b>Collect Objective &amp; Subjective Data</b> <ol style="list-style-type: none"> <li>1. Medical &amp; dental history</li> <li>2. Nutrition</li> <li>3. Risk assessment</li> <li>4. Exams</li> </ol>		<b>Identify the Problem</b> <ol style="list-style-type: none"> <li>1. Statement of risk for a problem</li> <li>2. Statement for actual problem                             <ul style="list-style-type: none"> <li>*Etiology: Determine factors associated with patient's problem</li> </ul> </li> </ol> <p>*Symptoms: Determine manifestations of identified problem</p>	<b>Select Interventions</b> <ol style="list-style-type: none"> <li>1. Identify factors &amp; impact on intervention                             <ul style="list-style-type: none"> <li>*<b>Personal Factors:</b> gender, age, social background, profession</li> <li>*<b>Environmental Factors:</b> social norms, culture, politics</li> </ul> </li> <li>2. Identify impact of oral health condition on daily activities &amp; participation in society</li> <li>3. Identify barriers to facilitate patient outcomes</li> </ol> <p><b>Identify goals using statements such as, "The goal is to..." or "Patient will..."</b></p>	<b>Activate the Plan</b> <ol style="list-style-type: none"> <li>1. Collaborative interventions:                             <ul style="list-style-type: none"> <li>Activities carried out in collaboration with other health care providers</li> </ul> </li> </ol>	<b>Evaluate Patient Outcomes</b> <ol style="list-style-type: none"> <li>1. Evaluate patient response or results to intervention</li> <li>2. Write a patient outcome statement including how the patient:                             <ul style="list-style-type: none"> <li>*Looks</li> <li>*Feels</li> <li>*Behaves</li> </ul> </li> </ol> <p>If needed, modify patient care plan to improve outcomes</p>
<b>Team Discussion:</b> <ul style="list-style-type: none"> <li>*What oral manifestations is the patient presenting with?</li> <li>*What symptoms are only apparent to the patient</li> </ul>		<b>Team Discussion:</b> <ul style="list-style-type: none"> <li>*What is the patient's priority/chief concern?</li> </ul>	<b>Team Discussion:</b> <ul style="list-style-type: none"> <li>*Identify team priorities</li> <li>*Which team members can address the patient's concerns &amp; priorities</li> <li>*Determine interventions to be provided by each team member</li> </ul>	<b>Team Discussion:</b> <ul style="list-style-type: none"> <li>*Which team members will communicate patient outcomes?</li> <li>*Finalize documents &amp; management of patient care</li> </ul>	<b>Team Discussion:</b> <ul style="list-style-type: none"> <li>*Evaluate patient outcomes</li> <li>*Determine next steps in treatment if needed</li> </ul>
<b>DOCUMENT</b>					

manifestations of menopause, likeliness to use knowledge gained from the current study in the future, and feelings about the use of pseudo-SP and CBL. Data was analyzed using SPSS® statistical software (version 23).

**Results**

The response data represents 69% (n=25) DH students and 31% (n=11) PA students. Sixty-nine percent of the study participants were from the DH program versus 31% of the participants from the PA, providing representative samples from

the two programs. The majority of participants were female, Caucasian, DH students with an average age of 21 to 24 years. The PA students ranged in age from 25 to 54 years. One hundred percent of the respondents reported having had some experience with IPE. (Table I)

Descriptive statistics and a paired t-test compared change in knowledge of menopause and its oral manifestations from pre- to post-test in the DH and PA participants. Both groups demonstrated increased knowledge (p<0.05). Table II

**Figure 3.** Modified Readiness for Interprofessional Learning Scale (RIPLS) Questionnaire<sup>36,37</sup>

The purpose of this questionnaire is to examine the attitude of health care students toward interprofessional learning.

Circle one response for each statement		Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
1	Learning with other students will make me a more effective member of a health care team	5	4	3	2	1
2	Patients would ultimately benefit if health care students worked together	5	4	3	2	1
3	Shared learning with other health care students will increase my ability to understand clinical problems	5	4	3	2	1
4	Communication skills should be learned with other health care students	5	4	3	2	1
5	Team-working skills are vital for all health care students to learn	5	4	3	2	1
6	Shared learning will help me to understand my own professional limitations	5	4	3	2	1
7	Learning between healthcare students before licensure would improve working relationships after licensure	5	4	3	2	1
8	Shared learning will help me to think positively about other health care professionals	5	4	3	2	1
9	For small-group learning to work, students need to respect and trust each other	5	4	3	2	1
10	I don't want to waste my time learning with other health care students before licensure	5	4	3	2	1
11	It is no necessary for undergraduate/postgraduate health care students to learn together	5	4	3	2	1
12	Clinical problem solving can only be learned effectively with students from my own program	5	4	3	2	1
13	Shared learning with other health care professionals will help me to communicate better with patients and other professionals	5	4	3	2	1
14	I would welcome the opportunity to work on small group projects with other health care students	5	4	3	2	1
15	I would welcome the opportunity to share some generic lectures, tutorials, or workshops with other health care students	5	4	3	2	1
16	Shared learning and practice will help me clarify the nature of patient's problems	5	4	3	2	1
17	Shared learning before and after licensure will not help me become a better team member	5	4	3	2	1
18	I am not sure what my professional role will be/is	5	4	3	2	1
19	I have to acquire much more knowledge and skill than other students	5	4	3	2	1

The Wilcoxon signed-rank test analyzed pre- and posttest modified RIPLS scores to test the second hypothesis, "Can an IPE module on oral manifestations of menopause improve DH and PA student's attitudes and perceptions about IPE? Table III shows significant changes in perceptions of IPE were indicated in two of

the four RIPLS subscales, teamwork and collaboration ( $p < 0.05$ ) and positive professional identity ( $p < 0.05$ ). The participants demonstrated improved perceptions regarding IPEC domains, RR ( $p < 0.05$  RR1, RR2, RR3, RR4) and CC ( $p < 0.05$  CC3, CC4, CC6) as shown in Table IV.

**Table I.** Demographic Characteristics

Characteristic	DH (n=25)	PA (n=11)
Gender		
Female	100% (n=25)	45% (n=5)
Male		55% (n=6)
Age		
21-24	84% (n=21)	27% (n=3)
25-28	12% (n=3)	27% (n=3)
29-33	4% (n=1)	45% (n=5)
35-54		
Race		
Caucasian	80% (n=20)	100% (n=11)
Hispanic	16% (n=4)	
Asian American/ Pacific Islander	4% (n=1)	
Prior Clinical Experience		
Yes	20% (n=5)	91% (n=10)
No	80% (n=20)	9% (n=1)
Prior Menopause Experience		
Yes	16% (n=4)	9% (n=1)
No	84% (n=21)	91% (n=10)
Prior IPE Experience		
Yes	100% (n=25)	100% (n=11)
No		
Experience Treating Oral Conditions		
Yes	84% (n=21)	27% (n=3)
No	16% (n=4)	73% (n=8)

**Table II.** Descriptive Statistics for PI-Designed Menopause Knowledge pre/post-test

	n	M	SD	SEM	LL	UL	t	df	Sig. (2tailed)
DH**	25	-1.440	3.06	.611	-2.702	-0.178	-2.356	24	.027*
PA**	11	-3.182	2.04	.615	-4.553	-4.553	-5.172	10	.000*

Confidence interval 95%; LL=lower limit; UL=upper limit  
\* $p < .05$ .

\*\*Dental hygienist, physicians' assistant

Data from the IP care plan exercise and debriefing answered the question, "Can an IPE workshop utilizing a pseudo-SP and CBL facilitate gained confidence of participants in applying new skills related to the oral manifestations of menopause? To explore this hypothesis, participants worked in one of six teams to construct an IP care plan based on PI-designed guidelines for managing oral manifestations of menopause, a given case study, pseudo-SP interaction, and PI-designed IP A.D.P.I.E.D. Process of Care Algorithm. Correct responses included:

- *Oral Diagnoses:* xerostomia, oral osteoporosis, and periodontitis.
- *Risk Factors for oral manifestations:* menopause, nutrition, alcohol, smoking, caffeine, salt, stress, lack of sleep, infrequent dental/medical visits, and poor homecare.
- *Barriers to care:* low medical/dental IQ, finances, and environmental factors.

Table V indicates all teams were able to successfully create an IP care plan using the case study information, PI-designed guidelines for management of the oral manifestations of menopause, and PI-designed IP A.D.P.I.E.D. Process of Care Algorithm. Table VI shows coded debriefing data indicating gained confidence in treatment of the oral manifestations of menopause.

## Discussion

**Table III.** Wilcoxon Signed-rank Test Modified RIPLS Subscales Pretest/Posttest Comparison

Subscale	Items	Possible Score	M	SD	M	SD	Z**	p
Teamwork and Collaboration	1-9	45	41.28	3.318	42.25	3.281	-2.428 <sup>b</sup>	.015*
Negative Professional Identity	10-12	15	13.00	1.724	13.14	1.823	-.721 <sup>b</sup>	.471
Positive Professional Identity	13-16	20	16.72	2.250	17.61	2.284	-2.802 <sup>b</sup>	.005*
Roles and Responsibilities	17-19	15	12.22	1.551	12.47	1.464	-.849 <sup>b</sup>	.396

\*\*Z (<sup>b</sup> Based on negative ranks)

Asymptotic Significance (2-tailed) *p* value

\**p* < .05

This study explored the effects of an intervention consisting of a presentation and pseudo-SP case study on the oral manifestations of menopause. Results of the study suggest that the implementation of an IPE workshop for DH and PA students on oral manifestations of menopause imparts new knowledge, gives participants the opportunity to communicate in small groups and improve attitudes and perceptions toward IPE, and facilitates gained confidence of participants in applying new skills related to the oral manifestations of menopause.

This IPE university-based study provided an opportunity to bring attention to the oral manifestations associated with menopause and their relationship to overall health. The results demonstrate an increase in participants' knowledge of oral health for the menopausal patient after completing this one-time workshop. These findings are consistent with those of Christenson demonstrating the positive effects of a single learning intervention.<sup>41</sup> Results of the current study are also supported by research demonstrating that both PA and dental students benefit from interactions in IPE.<sup>42-44</sup>

Prior to participating in this study, the majority of participants demonstrated lack of awareness in the oral health manifestations and oral health management during menopause, as measured by the menopause knowledge pre-test. These findings were surprising given 84% of DH (*n*=21) and 38% of PA (*n*=3) in the current study reported experience in treating oral conditions in general.

Previous research suggests lack of specific training in oral health inhibits PAs from providing oral care services.<sup>6,7,45-47</sup> Research conducted by Murray and Fried indicates that DHs also need more training regarding the oral manifestations of menopause.<sup>48</sup> Therefore, it may be inferred that if PA are not trained to provide oral care services and DH are not trained to

recognize and manage the oral manifestations of menopause, they may omit discussions about the oral manifestations of menopause when providing patient care. Results from this study support previous research indicating that oral health providers, including DHs, possess greater potential for the detection, monitoring, and prevention of chronic conditions<sup>49</sup> which in turn supports the importance of integrating women's health content into the DH curriculum.

Communicating in small IP groups facilitated improved attitudes and perceptions toward IPE through learning about each other's roles and responsibilities. Utilizing the PI-designed IP A.D.P.I.E.D. Process of Care Algorithm and guidelines for management of oral manifestations of menopause, DH and PA students collaborated in teams to create a patient care plan and provide patient-centered care with a focus on assessing and treating oral manifestations of menopause.<sup>36,38</sup> The modified RIPLS evaluated students' attitudes and perceptions regarding IPE.<sup>50-52</sup> Measured aspects of students' attitudes and perceptions toward IPE showed significant improvement in IP teamwork and collaboration and positive professional identity. Overall, there were no significant changes in negative professional identity or RR domains. However, item number 17 in the RR domain was shown to be statistically significant.

Wakely et al. had similar findings to this study, reporting significant changes in all subscales except RR.<sup>53</sup> The lack of significant change in negative professional identity and RR domains may be because initial scores were already high, or because this was a one-time study limited to a three-hour time allotment. Also, the study evaluated two IPEC competency domains, RR and CC. Pre- and post-test scores align with those of Christenson and demonstrate significant growth in CC and RR.<sup>41</sup> This suggests implementation of IPE has the potential to

**Table IV.** Wilcoxon Signed-rank Test Modified RIPLS Questions Determining Changes in IPEC Core Competency Domains Roles and Responsibilities (RR) and Interprofessional Communication (CC)\*

IPEC Domain	n	RIPLS Items	Possible Score	M	SD	M	SD	Z**	p
RR1	36	1,3,9, 13,18	25	22.36	2.016	23.03	1.890	-2.474 <sup>b</sup>	.013*
RR2	36	1,2,3, 6,9,10, 11,13, 15,19	50	44.06	3.601	45.31	3.454	-2.438 <sup>b</sup>	.015*
RR3	36	1,2,3, 8,10,11, 13, 14, 15	45	39.47	3.895	41.41	3.549	-3.572 <sup>b</sup>	.000*
RR4	36	1,2,3, 15,16	25	22.31	2.227	23.08	2.143	-2.602 <sup>b</sup>	.009*
CC3	36	2,3,5, 7,13,14	30	27.08	2.260	27.78	2.380	-2.336 <sup>b</sup>	.019*
CC4	36	7,9,10, 13,14	25	22.14	2.100	22.81	2.095	-2.737 <sup>b</sup>	.006*
CC6	36	7,14, 15,16	20	16.89	2.148	17.61	2.296	-2.427 <sup>b</sup>	.015*
CC7	36	1,4,5,6, 8,9, 12,18,19	45	39.36	3.053	40.06	3.338	-1.291 <sup>b</sup>	.197
CC8	36	1,2,13, 15	20	18.08	1.592	18.56	1.557	-1.928 <sup>b</sup>	.054

\*\* Z (<sup>b</sup> Based on negative ranks)

Asymptotic Significance (2-tailed) *p* value

\**p* < .05

<b>*LEGEND:</b> RIPLS items used to assess IPEC Core Competencies for IPE: Roles and Responsibilities (RR) and IP Communication (CC)	
IPEC Domain 2 Roles and Responsibilities	RR: Use the knowledge of one's own role and those of other professions to appropriately assess and address the healthcare needs of the patient and populations served.
RR1	Communicate one's role and responsibilities clearly to patients, families, and other professionals.
RR2	Recognize one's limitations in skills, knowledge, and abilities.
RR3	Forge interdependent relationships with other professions to improve care and advance learning.
RR4	Use unique and complementary abilities of all members of the team to optimize patient care.
IPEC Domain 3 Interprofessional Communication	CC: Communicate with patients, families, communities, and other health professionals in a responsive and responsive manner that supports team approach to the maintenance of health and the treatment of disease.
CC 3	Express one's knowledge and opinions to team members involved in patient care with confidence, clarity, and respect, working to ensure common understanding of information and treatment and care decisions.
CC 4	Listen actively and encourage ideas and opinions of the team members.
CC 6	Use respectful language appropriate for a given difficult situation, crucial conversation or interprofessional conflict.
CC 7	Recognize how one's own uniqueness, including experience level, expertise, culture, power and hierarchy within the healthcare team contributes to effective communication.
CC 8	Communicate consistently the importance of team work in patient-centered and community-focused care.

**Table V:** Team Care Plan Descriptive Statistics

Care Plan Category	N	Possible score	Min	Max	M	SD
Oral Diagnoses	36	3	0	3	1.67	1.211
Risk Factors	36	10	3	7	4.67	1.633
Barriers	36	3	0	2	.83	.753

help students improve their communication skills with other disciplines. This is particularly important for DH educators, because the Commission on Dental Accreditation (CODA) standards for dental hygiene programs require competence in comprehensive collection of patient care data (Standard 2-13), interprofessional communication and collaboration (Standard 2-15), and problem solving strategies related to comprehensive patient care and management (Standard 2-23).<sup>54</sup>

Use of a pseudo-SP and CBL promoted shared responsibility and the study participants gained confidence in the care of the menopausal patient thus further supporting Gibson-Howell's findings demonstrating that the application of students' knowledge increases learners' acquisition and retention of knowledge.<sup>55</sup> The current study also supports results similar to Feely's et al. research demonstrating the value of utilizing a pseudo-SP for communication training and health education promotion.<sup>56</sup> This study's results are further strengthened by research demonstrating that when students work collaboratively to solve a case study, they are required to develop skills needed in the real-world including critical thinking, problem-solving, prioritization, working with others, and appreciation of roles.<sup>56,58</sup> Working on a case study can facilitate students' gained confidence in their knowledge of content, success in group work, and the ability to look at a problem from various viewpoints, process it, and use critical thinking to reach a solution.<sup>56,57</sup> Collaboration with other disciplines encourages greater communication, improved access and overall quality of care.<sup>59</sup>

A primary goal of the pseudo-SP CBL exercise was for DH and PA students to participate actively in developing a care plan. The IP groups were also encouraged to use a presentation outline containing the PI-designed oral care guidelines for menopause. No comprehensive guidelines for oral care during menopause existed prior to the implementation of the current study.<sup>16</sup> Data from the study's care plans revealed that the participants were able to function as a team, even with minimal familiarity with each other. Results support small group, CBL using a pseudo-SP enhances knowledge acquisition as well as confidence in application of new skills supports previous research findings demonstrating that SP and CBL positively impacts students' confidence, understanding, communication, and clinical

skills.<sup>25,26,33</sup> Use of pseudo-SP and CBL incorporating the PI-designed IP A.D.P.I.E.D. Process of Care Algorithm, triggered the required decision points in the care plan. Similar to previous research, the current study demonstrates the integration of oral

manifestations of menopause into the A.D.P.I.E.D. process of care.<sup>60</sup> Study results suggest that the IP A.D.P.I.E.D Process of Care Algorithm may be a useful tool for educators charged with developing IP experiences. Furthermore, incorporation of this tool in DH curricula may enhance IP skills and confidence needed as dental hygiene scope of practice expands to meet population needs.<sup>61</sup>

Although no IPE curricula currently exists between DH and PA programs, this study validates that improvements in IP communication and understanding of roles and responsibilities may enhance opportunities for collaborative practice.<sup>10</sup> Debriefing data demonstrated that this workshop permeated some of the silos separating medicine and dentistry, providing hope that a new generation of practitioners will develop professional identities and categorizations that deconstruct traditional roles.

There were limitations to this study that should be noted. Data was collected from a one-time study of a small sample, thus limiting any broad generalizations. Due to the volunteer nature of the study and the IPE credit received for attending, participants may have been extrinsically motivated to participate in IPE. The effectiveness of the group work may also have been limited by student fatigue, a lack of knowledge regarding their respective examination standards and scope of practice as well as discomfort discussing certain women's health issues such as vaginal dryness. It should also be noted there was an unequal distribution of students representing the DH and PA professions in each team which may not have authentically represented the IP team dynamic in a real clinical setting. Team members also had varying levels of didactic and clinical experience.

Long-term studies are recommended to determine if the knowledge and skills gained from a one-time intervention regarding oral manifestations of menopause occurring as part of the education process, translates to incorporation into clinical practice. Future research is also recommended to identify evidence based oral care guidelines for menopause and to continue to evaluate the PI-designed, IP IPE A.D.P.I.E.D. Process of Care Algorithm. Future studies should include a larger more diverse group of students, and include other healthcare professions. It is also recommended that the variations in knowledge during the DH education process be evaluated to determine the ideal point for

introducing IPE in the curriculum.

## Conclusions

Patients experiencing meno-pause are susceptible to oral manifestations. Implementation of an IPE intervention demonstrated a correlation between an IPE experience and participants' knowledge, attitudes and confidence. Utilization of a process of care algorithm and guidelines for management of the oral manifestations of menopause promoted IP collaboration and comprehensive oral care management for the menopausal patient. Preparing students to meet the needs of menopausal women may ultimately decrease oral discomfort and improve overall quality of life. Additional IPE experiences, allowing DH and other health care disciplines to learn about, from and with each other has the potential to improve knowledge, perceptions, and confidence in patient care.

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## Hookah Smoking: Assessing College Students' Behaviors, Attitudes, and Knowledge

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### Abstract

**Purpose:** The objective of this study was to assess college students' behaviors, attitudes, and knowledge regarding hookah smoking.

**Methods:** A convenience sample of 200 students from various majors, including allied health and nursing students, was used to conduct this study at a university located in the Midwestern United States. Respondents were asked about any past, current, and future hookah smoking behaviors. Likert-scale questions were used to assess attitudes regarding hookah smoking. Respondents were also asked ten questions regarding the history of and health effects of hookah smoking. A knowledge score was calculated based on the number of questions answered correctly. Survey data were analyzed using independent sample t-tests and a one-way ANOVA test at a significance level of  $p < 0.05$ .

**Results:** A total of 200 out of 204 surveys were returned, yielding an overall response rate of 98%. Sixty-eight percent of respondents reported having participated in hookah smoking, with time of first-time use ranging from 14 to 21 years of age. About one third of the respondents (32%) reported participating in hookah smoking in the previous 30 days. The majority (68%) of respondents estimated that they would not participate in hookah smoking in five years time. Over half of the respondents reported that it is socially acceptable to participate in hookah smoking and 43% reported that hookah smoking has relaxation benefits. The overall mean knowledge score regarding the health effects of hookah usage was 4.4 questions correct out of 10. There was a significant difference ( $p = .038$ ) in the mean knowledge scores between hookah users (4.70) and non-users (3.81). When comparing the knowledge of allied health and nursing majors to all other majors, the allied health and nursing group scored significantly higher ( $p = .017$ ) than the non-allied health and nursing majors, with mean scores of 4.80 and 3.81, respectively. Thirty-nine percent of the respondents were unaware that hookah tobacco and related smoke can cause oral cancer.

**Conclusion:** Based on the high rates of college student use and the low knowledge scores, this study supports need for more education about hookah smoking and its health consequences.

**Keywords:** health promotion, oral health education, oral cancer, tobacco use, waterpipe tobacco

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### Introduction

Hookah smoking, commonly known as waterpipe smoking, has become a popular trend in recent years, especially among high school and college students.<sup>1-4</sup> While many students find hookah smoking to be socially acceptable, they may not understand the negative impact it can have on general and oral health.<sup>5</sup> Hookah smoking has recently been deemed a growing threat to public health due to its popularity and associated negative health effects.<sup>6,7</sup> An estimated 9,750 people in the United States (U.S.) will die from oropharyngeal cancer annually; many due to various forms of tobacco use, including hookah.<sup>8</sup> Even with the harmful effects of hookah smoking coming to

the attention of health experts, little research has been conducted on public knowledge about hookah smoking. Dental hygienists often spend 45-75 minutes with patients, placing them in a prime position to educate patients, particularly young people, about the dangers of hookah smoking.<sup>9</sup>

Hookah, or waterpipe smoking, is thought to have originated in the Middle East. It also has links to India and North Africa and is believed to have begun as a social tradition dating over 500 years ago.<sup>1, 6, 10, 11</sup> Hookah smoking is also known as narghile, argileh, hubble-bubble, shisha, and goza, depending on the culture and country.<sup>12</sup> Hookah continues to be

common in the Middle East, while it is increasing in popularity in countries such as Britain, France, Russia, and the United States.<sup>1-4</sup>

The basic hookah waterpipe consists of four main parts: the head, body, water bowl, and hose connected to a mouthpiece. (Figure 1)<sup>1,12</sup> Tobacco is placed in the head, which is often covered with perforated aluminum foil. Charcoal or burning embers are placed on top of the perforated foil to heat the tobacco. The user inhales through the hose that is connected to the mouthpiece, which in turn, draws air over the lit charcoal. The heated air then passes through the tobacco and produces the smoke which is drawn through the body of the waterpipe and is cooled as it passes through the water in the water bowl.<sup>11,13</sup>



**Figure 1.** Basic Hookah Waterpipe

Tobacco used in hookahs is frequently moist and sticky and often contains molasses, honey, and other sweeteners and flavorings. Frequently used flavors include strawberry, cappuccino, toffee, cotton candy, orange, white grape, and chocolate mint.<sup>6, 14</sup> The aromatic nature of the flavored smoke appeals to younger users and tends to mask the harshness of the tobacco.<sup>6, 11, 12</sup> Hookahs have also been reported to be used for smoking other substances besides tobacco, including marijuana.<sup>15</sup>

Hookah tobacco smoke contains many of the same hazardous chemicals found in cigarette smoking including: nicotine, tar, and carbon monoxide (CO). In addition, hookah smoking produces the carcinogenic polycyclic aromatic hydrocarbons released from the burning of tobacco as well as from the coal used to heat the tobacco.<sup>16-18</sup> The emissions produced from charcoal combustion create health concerns for both the users and bystanders.<sup>19</sup> Volatile aldehydes (formaldehyde, acetaldehyde, acrolein propionaldehyde, and methacrolein) are toxicants known to cause pulmonary disease. Additional hazardous exposures include phenols and heavy metals, such as cobalt, arsenic, chromium, and lead.<sup>16-18</sup>

Studies have shown that hookah smoking contains 1.7 times higher concentration of metals, 6.5 times the amount of CO, and 46.4 times the amount of tar when compared to the equivalent nicotine dose found in cigarettes.<sup>7, 11</sup> Because a hookah smoking session may last roughly 60 minutes, a hookah smoker may consume approximately 200 times

more smoke during a hookah session as compared to a single cigarette.<sup>7, 12</sup> In terms of inhalation of smoke volume, one 60-minute hookah session is considered the equivalent of smoking 60 to 100 cigarettes.<sup>18, 24</sup> Additionally, the literature indicates that hookah use may serve as a gateway to other tobacco products such as cigarette smoking.<sup>3, 20</sup> In light of these significant health risks, questions regarding hookah use should be part of the tobacco cessation and prevention conversations dental hygienists have with their patients on a regular basis.

Cigarette smoking has been linked to 480,000 deaths per year in the United States, including 42,000 deaths due to secondhand smoke exposure.<sup>21</sup> A limited number of studies have been conducted on the health risks of hookah use, although existing research suggests that the health risks are similar to those of cigarette smoking including the noteworthy risk of tobacco addiction.<sup>6, 22</sup> Hookah smokers inhale more smoke (including nicotine), in a single session compared to cigarette smokers, which increases their risk of addiction.<sup>2, 11</sup> Other health consequences of long-term tobacco use include: esophageal squamous cell carcinoma, nasopharyngeal cancer, lip carcinoma, cardiovascular disease, lung cancer, bladder cancer, pancreatic cancer, respiratory disease (chronic bronchitis and air inflammation), elevated heart rate and blood pressure, elevated carboxyhemoglobin levels, infertility, and changes in voice and pitch.<sup>5, 16, 23, 24</sup> Infectious diseases, acquired from sharing the hookah mouthpiece, include Mycobacterium tuberculosis, Hepatitis C, Helicobacter pylori, influenza, Epstein-Barr virus, herpes simplex virus and a variety of respiratory viruses.<sup>6, 23</sup> In addition to oropharyngeal cancers, specific oral health effects of hookah smoking include increased risk of periodontal disease, acute osteitis, oral candidiasis, and stained teeth and restorations.<sup>7, 16</sup>

Although firsthand smoke inhaled by the smoker poses significant health risks, it is important to note that the inhalation of secondhand smoke poses similar health risks.<sup>23</sup> Secondhand smoke from a hookah session is of particular concern since it contains smoke from the tobacco as well as the toxicants from the charcoal.<sup>12</sup> Hookah smoke contributes to a higher level of indoor particulate matter as compared to cigarette smoke and it common for people to smoke hookah indoors.<sup>19</sup> Over the last twenty years, approximately 200-300 hookah bars have opened in the United States, many are in university towns.<sup>19</sup> Patrons frequenting these establishments are not always aware of the dangers of the particulate matter or secondhand smoke related to hookah use. Additionally, statewide smoke-free air laws vary and hookah bars or cafes, cigar bars, and smoke shops may be exempt or fall into loopholes that are not fully addressed by city and state ordinances.<sup>6, 22, 25</sup>

There are many misconceptions among youth who are either smoking hookah or exposed to hookah via

secondhand smoke. Hookah smokers may have the perception that because these products are aromatic and sweet smelling, that they are less harmful than other forms of tobacco use.<sup>2</sup> In addition, because smoke is cooled as it passes through water, it produces a less irritating experience making inhalation more enjoyable.<sup>22, 26</sup> Other users have reported the erroneous belief that the water filters the toxins as the smoking session continues. Some hookah tobacco is marketed as “herbal tobacco,” which may lead consumers to believe that this is a healthier product than traditional tobacco. However, herbal and sweetened tobaccos, nonetheless, contain tar and carcinogens.<sup>10</sup>

Hookah use in the United States is a growing public health concern particularly in regards to college students, although differences have been reported in student gender, ethnicity as well as in the location and size of the university. A national survey completed over the fall of 2008 to the spring of 2009 (N=82,155) showed that 23% of college students reported smoking hookah.<sup>4</sup> Several other studies demonstrate that males are more likely than females to smoke hookah,<sup>5, 27, 28</sup> with students of Arab decent being more likely than non-Arab students to participate in hookah smoking.<sup>28</sup> Jarrett et al. reported that the prevalence of hookah smoking was significantly higher in university towns with populations greater than 500,000, particularly in Northeastern or Western states;<sup>4</sup> Midwestern states have been shown to have lower rates of hookah use.<sup>4, 5, 26, 27, 29</sup>

Despite increasing trends of hookah use and recognized oral health risks, little research has been published on hookah or waterpipe smoking in dental journals.<sup>24</sup> The purpose of this study was to assess college students’ behaviors, attitudes, and knowledge regarding hookah smoking and to examine the differences in knowledge between health care professional students and those in other disciplines as well as between those who engage in hookah smoking and those who do not.

## Methods

Institutional Review Board approval was obtained from the Minnesota State University (MSU), Mankato for this survey research study. The survey instrument consisted of questions about a student’s past, current, and future hookah smoking behaviors. Likert-scale questions were also used to assess attitudes regarding hookah smoking. Knowledge regarding the history and health effects of hookah smoking was also assessed. A researcher-developed series of ten true/false questions based on current hookah research was created and the survey items were reviewed by several experts in the health field. The survey was pilot-tested on 20 individuals with the purpose of testing the survey items for understandability and the appropriateness

of the instrument design. The pilot test results demonstrated that items were understandable and the response option “I don’t know” was added to the knowledge portion to eliminate respondents from simply guessing.

A convenience sample of MSU professors known to the primary investigator were emailed for permission to distribute the surveys during regularly scheduled class time. Professors from multiple disciplines agreed to allow the primary investigator to describe the study and distribute the surveys. Classes ranged in size from 15-30 students. The paper based paper surveys included the informed consent; students gave their implied consent by completing the anonymous survey. Only students enrolled at the university were invited to take the voluntary survey; there were no specific exclusion criteria. Surveys were distributed to a total of 204 students from various majors including allied health and nursing. Descriptive statistics, independent sample *t*-tests and a one way ANOVA test ( $p < 0.05$ ) were performed using SPSS version 21.

## Results

A total of 200 out of 204 surveys were returned, yielding an overall response rate of 98%. (Table 1) The average age of participants was 21 years, with an age range of 18-36 years. Overall, 68% of the respondents were female, and 85% were Caucasian. (Table II)

**Table I.** Reported Academic College of Participants’ Majors

College	n
Allied Health and Nursing	123
Arts and Humanities	15
Business	24
Education	3
Science, Engineering and Technology	13
Social and Behavioral Sciences	20
Other	2

## Hookah Users

Descriptive summary statistics were generated to describe behaviors of hookah users including: use and exposure over a lifetime and during the last 30 days; where and with whom users smoke hookah; smoking session length; self-predicted future hookah use. In this study, 68% (n=136) reported they have participated in hookah smoking, with a very minimum of one or two puffs in their lifetime. The average age of first use was 17.9 years, with a range of 14-21 years. This study found 83% of males and 61% of females had smoked hookah. Usage rate

**Table II.** Sex and Race/Ethnicity of Overall Participants, Users, and Non-users

	Overall n (%)	Users n (%)	Non-Users n (%)
Participants	200 (100%)	136 (68%)	64 (32%)
Male	64 (32%)	53 (82.8%)	11 (17.2%)
Female	136 (68%)	83 (61%)	53 (39%)
Caucasian	170 (85%)	115 (67.6%)	55 (32.4%)
Hispanic/Latino	2 (1%)	1 (50%)	1 (50%)
Multi-racial	3 (1.5%)	3 (100%)	—
Black/African American	7 (3.5%)	6 (85.7%)	1 (14.3%)
Native American	1 (0.5%)	—	1 (100%)
Asian	13 (6.5%)	8 (61.5%)	5 (38.5%)
Middle Eastern	2 (1%)	1 (50%)	1 (50%)
Other	2 (1%)	2 (100%)	—

**Table III.** Locales where hookah smoking occurs (n=136)

Location	n (%)
Hookah Café/Restaurant/Bar	8 (5.9%)
Home (apartment, condo, house)	32 (23.5%)
Dorm room	1 (0.7%)
Family member's house	2 (1.5%)
Fraternity/sorority house	—
Friend or acquaintance's home	86 (63.2%)
In someone else's dorm room	3 (2.2%)
Other	4 (2.9%)

**Table IV.** Length of hookah smoking session in previous 30 days (n=43)

Duration	n (%)
0-10 minutes	8 (18.6%)
11-30 minutes	14 (32.6%)
31-50 minutes	15 (34.9%)
51-70 minutes	5 (11.6%)
Greater than 90 minutes	1 (2.3%)

in Caucasian students (68%) was similar to non-Caucasian students (64%). Thirty-two percent of participants indicated that they have participated in hookah smoking in the last 30 days. Of those who participated in the last 30 days, 93% stated they smoked hookah between 1-5 times. Two respondents stated they smoked hookah 6-10 times in the last 30 days, and one respondent stated he/she smoked hookah 16-20 times in the last thirty days.

Locales where hookah is smoked are described in Table III, with a friend's or acquaintance's home cited as the most common location (62%). In addition, 93% of students reported that they smoke with more than one friend in most instances. Few reported smoking with just one friend or with family members, and none

reported smoking hookah alone.

Reported lengths of hookah smoking sessions ranged from under 10 minutes to greater than 90 minutes. (Table IV) The most common reported smoking session length was 31-50 minutes (35%). While the majority of users (68%) believed they will no longer be smoking hookah in five years, 28% believed they will smoke less than once per month, and 4% believed they will smoke monthly. None of the respondents reported believing that they will be smoking hookah on a daily or weekly basis in five years. Responses regarding exposure to secondhand hookah smoke included: no exposure (37%), annually (16%), monthly (33%), weekly (13%), and daily (2%).

#### Attitudes, Beliefs and Knowledge

In addition to hookah exposure and use, this study examined participants' familiarity, attitudes, beliefs, and knowledge regarding hookah. Seven percent of participants were not at all familiar, 74% were slightly-familiar to familiar, and 19% were very familiar with hookah smoking knowledge. The mean knowledge score for overall participants (N=200) was 4.4 questions correct out of 10; the "I don't know" response was calculated as an incorrect answer.

Over half of participants (54%) stated hookah smoking is socially acceptable, with 21% reporting positive social benefits. Almost half of participants (43%) believed hookah smoking has relaxation benefits. Users perceive greater positive social benefits from hookah smoking (25%) than non-users (11%). As expected, more users believe hookah smoking is socially acceptable (68%) than non-users (22%). However, the majority of both users (67%)

**Table V.** Response to knowledge questions for users (n=136) and non-users (n=64)

Knowledge Questions	Correct Answer	Users Correct n (%)	Non-Users Correct n (%)
Hookah smoke is filtered through water, so some of the harmful ingredients get filtered out.	False	59 (43.4)	19 (29.7)
Smoking hookah is not as addictive as smoking cigarettes.	False	49 (36)	26 (40.6)
Hookah contains higher levels of tar and carbon monoxide than cigarettes.	True	41 (30.1)	10 (15.6)
Hookah smoking delivers nicotine.	True	70 (51.5)	33 (51.6)
Smoking hookah began in the early 1900's.	False	32 (23.5)	6 (9.4)
Secondhand smoke from hookahs is not considered a health risk.	False	82 (60.3)	31 (48.4)
Hookah can cause clogged arteries and heart disease.	True	73 (53.7)	28 (43.8)
Hookah tobacco and smoke are known to cause oral cancers.	True	90 (66.2)	32 (50)
Sweetened and flavored non-tobacco products sold for use in hookahs are less harmful than non-sweetened.	False	68 (50)	33 (51.6)
A single hookah-smoking session typically involves inhaling less smoke volume than smoking several cigarettes.	False	75 (55.1)	26 (40.6)

**Table VI.** Knowledge scores among selected age groups (Bonferroni Post Hoc Test)

Age Group	n	Mean	Standard Deviation	Mean Difference	Sig.
18-19	34	3.29	2.50	-1.39	0.04
20-21	85	4.68	2.78		

**Table VII.** Knowledge scores among majors and users versus non-users (independent-samples *t*-test)

Major	n	Mean	Standard Deviation	t	Sig. (2-tailed)
Allied Health	123	4.80	2.82	2.41	0.02
Non-Allied Health	77	3.81	2.76		
Users	136	4.70	2.83	2.09	0.04
Non-users	64	3.81	2.75		

and non-users (69%) stated that hookah use is increasing in popularity.

In order to compare any differences in knowledge regarding hookah smoking between three separate categories of students' ages, a one-way analysis of variance (ANOVA) on participants' knowledge scores was conducted. Data analysis revealed a significant difference in age groups,  $F(2, 190) = 3.32$ ,  $p = 0.04$ . Bonferroni Post Hoc tests were performed to ascertain which specific age group comparisons were significant. The participant age group, 20-21 years, scored significantly higher in mean knowledge of hookah than the 18-19 year olds. ( $p = 0.04$ ) There were no significant differences in knowledge scores ( $p = .08$ ) between the 18-19 year old and the 22 and older age groups. (Table VI)

To examine the differences in knowledge regarding hookah smoking between allied health and nursing majors versus all other majors and the differences in users versus non-users, two independent sample *t*-tests were performed. Results indicated that allied health and nursing majors scored significantly higher than non-allied health and nursing majors ( $t(198) = 2.41$ ,  $p = 0.02$ ) and hookah users had significantly higher knowledge scores as compared to non-users. ( $t(199) = 2.09$ ,  $p = 0.04$ ) Knowledge scores among majors and users versus non-users are shown in Table VII.

## Discussion

Results from this study suggest that hookah smoking continues to be a growing trend among college-aged students, with over half of the respondents (68%) reporting that they felt hookah smoking was gaining popularity.

Approximately one third (32%) stated that they had participated in hookah smoking in the previous 30 days. In comparison, a 2008 national study of college students found that 10% of the students surveyed reported using hookah in the last 30 days.<sup>4</sup> While a direct comparison between the two studies cannot be made due to variations in sampling and the regions (national versus Midwest) surveyed, it can be inferred that hookah use among college students is increasing.

Previous studies indicate that hookah use is lower in the Midwest, the location of the university population surveyed in this study, when compared to other regions in the U.S.<sup>4, 5, 26, 27, 29</sup> Griffiths and Ford found that 6% of Midwestern college students reporting hookah use within the past 30 days,<sup>2</sup> however, 32% of respondents in this study reported smoking hookah in the last 30 days. In addition, this study takes place in a moderate-sized university town (population 40, 641), and despite the fact that there are no hookah bars within 100 miles, students are still participating in this form of tobacco use, with fewer than 6% reporting smoking hookah primarily in a hookah café or bar. (Table III) Results from this study suggest that the increased hookah use is not limited to larger cities where hookah cafés or bars are more common. Hookah smoking is common in social gatherings; 93% of the respondents stated that they were using hookah in the presence of more than one friend. Peer influence is also suggested to play a role in hookah use,<sup>26</sup> and results from this study indicate that students are smoking in residences, and size of the town or proximity to hookah bars may not be a critical factor.

In this study, 68% of Caucasian students reported ever smoking hookah, compared to 70% of non-Caucasian students. Similar studies have found that students of Arabic decent living in the U.S. were more likely than non-Arab students to participate in hookah smoking.<sup>28</sup> Demographic statistics in this study suggest that hookah use is accepted across different races, ethnicities, and cultures. Additionally, this study found that usage among Caucasian students was much higher than previously reported, indicating that the usage may be increasing on this group. Although there were not many Arab students to draw from for this study, the numbers of Caucasian and non-Caucasian users were very close, which may indicate that race may not be a significant factor. However, it is also noteworthy that the majority of students in this study were Caucasian, which may not give a comparative sample. In regards to gender, this study found that more males than females smoke hookah, supporting the findings of similar studies. However, this study also found that, overall, hookah use for both males and females was higher than other studies have previously reported and the results reflect findings suggesting that hookah

smoking is gaining popularity<sup>4-7, 26-29</sup>

Students in this study claimed to be familiar with the risks of hookah smoking but the majority of the respondents answered fewer than half of the questions (average score 4.4 out of 10) correctly indicating limited knowledge on the overall impact of hookah smoking on general and oral health. Allied health and nursing majors had higher scores (4.80) on the knowledge-based questions as compared to students with non-allied health and nursing majors (3.81). This may be due to the fact that allied health and nursing students have had more exposure to health-related courses in disease prevention as compared to students from other majors. However, even the allied health and nursing students answered less than half the questions correctly, which may indicate that they have not learned specifically about hookah usage in their programs. In addition, hookah users scored higher (4.70) than non-users (3.81) on the knowledge based questions. Nevertheless, they also answered less than half the questions correctly. Further studies could investigate the reasons why hookah users continue to smoke despite the known harmful effects of hookah use. Overall, the research indicates a need for education on the ill effects of hookah use across all demographics.

The very nature of hookah smoking process may be the reason students believe it is less harmful than cigarettes: roughly half of the respondents incorrectly indicated the belief that water filtered out the harmful ingredients, and half incorrectly believed that hookah smoking was less harmful because the tobacco is sweetened. Half of respondents also thought there was less smoke inhalation involved with hookah use, while in fact a person actually inhales 200 times the amount of smoke during a hookah session as compared to smoking a cigarette.<sup>7, 12</sup> In general, long-term tobacco use has been linked to cardiovascular disease; however, in this study, nearly half (46%) of the hookah users were not aware of this risk. In comparison to other knowledge questions, respondents had the highest awareness (60%) that hookah smoking caused oral cancer. Another concern was that while most students reported smoking hookah in a group, only 44% of the respondents believed that secondhand smoke from hookah is considered a health risk. Not understanding the dangers of first and secondhand hookah smoke may also indicate that hookah users may not realize their increased risks for cancer, cardiovascular, respiratory and infectious diseases.

Many students in this study reported predicting that they do not plan to be smoking hookah in 5 years. Yet 63% reported an unawareness that hookah smoking is considered to be equally addictive as cigarettes.<sup>23</sup> In addition, 49% of the respondents were unaware that hookah tobacco contains nicotine which leads to dependence by altering brain chemistry.<sup>9</sup> In addition,

previous research has identified that nicotine dependence resulting from hookah smoking, may encourage the transition to cigarette smoking.<sup>3, 20</sup> An unawareness of these nicotine qualities indicates, that students may actually become addicted to hookah smoking habit or possibly move on to other forms of tobacco.<sup>3, 20</sup>

Respondents in this study reported first-time hookah use occurred between 14-21 years of age, (17.9 years average) thus indicating the need for hookah usage to be included in tobacco education programs beginning in middle school and continuing through high school. Additionally, hookah smoking education should be incorporated into the dental and dental hygiene curricula, as well as inclusion in continuing education programs for all related health professions. Dental professionals are encouraged to participate in community health fairs, school education, and in public policy sessions promoting legislation restricting hookah smoking.<sup>30</sup> Future research should be conducted to assess dental hygienists' knowledge regarding hookah smoking as well as their ability and willingness to provide education on this important health issue.

There are a few noteworthy limitations to this study. This was a small convenience sample from a Midwest university and may not be generalizable to all college students across the U.S. The primary investigator recruited the participating professors and students, administered the survey and collected the data forms. Future studies should use an assistant or neutral party to conduct these aspects of the study. In addition, the survey knowledge questions and scoring were designed by the authors and were not validated.

## Conclusion

Tobacco is the leading cause of preventable death worldwide and is related to 5 million deaths annually. While significant research has been conducted regarding the harmful effects of cigarette usage, hookah smoking has generated little study. Results from this study indicate that hookah usage is increasing in popularity among college students. Furthermore, this study indicates a significant knowledge gap regarding the health effects of hookah smoking across all demographics of college majors, including allied health and nursing. This knowledge gap supports the critical need for incorporating the harmful effects of hookah smoking into the curricula of future health care professionals, especially dental hygienists. Incorporating information on the detrimental health effects of hookah use is links well with the overall tobacco education provided by dental hygienists on a regular basis, with the goal of educating future generations of students to the harmful effects of tobacco use regardless of the delivery.

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## Patients' Willingness to Participate in Rapid HIV Testing: A pilot study in three New York City dental hygiene clinics

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### Abstract

**Purpose:** One in eight people living with an HIV infection in the United States is unaware of their status. Rapid HIV testing (RHT) is an easily used and accepted screening tool that has been introduced in a limited number of clinical settings. The purpose of this study was to investigate patient acceptability, certainty of their decision, and willingness to pay for screening if RHT was offered in university-based dental hygiene clinics.

**Methods:** A cross-sectional survey was administered to 426 patients at three dental hygiene clinics in New York City over a period of four months. The survey questionnaire was based on the decisional conflict scale measuring personal perceptions; with zero indicating extremely high conflict to four indicating no conflict. Patients were assessed for their acceptance of RHT, provider preference for administration of the test and their willingness to pay for RHT.

**Results:** Over half (72.2%) indicated acceptance of HIV testing in a dental hygiene clinic setting; with 85.3% choosing oral RHT, 4.9% fingerstick RHT, and 8.8% venipuncture. Respondents were amenable to testing when offered by dental hygienists (71.7%) and dentists (72.4%). Over 30% indicated their willingness to receive HIV testing in the dental setting when offered at no additional cost. The mean decisional conflict score was 3.42/4.0 indicating no decisional conflict.

**Conclusions:** Patients are willing to undergo oral RHT when offered as a service and provided by dental hygienists in the dental setting. Patients appear to be aware of the benefits and risks associated with RHT. Further research is needed to evaluate the public health benefits and logistical challenges facing the delivery of RHT within in the dental setting.

**Keywords:** dental hygiene; dental hygienists; HIV; HIV testing; patient survey

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### Introduction

The Centers for Disease Control and Prevention (CDC) estimates that 1.2 million people age 13 and older are living with Human Immunodeficiency Virus (HIV) infection; one in eight are unaware of their infection.<sup>1,2</sup> Nearly 40% of the individuals who are newly diagnosed have a high probability of having been infected years prior to diagnosis, present with advanced states of disease, and will progress to Acquired Immune Deficiency Syndrome (AIDS) within one year.<sup>1</sup> Late diagnosis of HIV infection is common in the United States (U.S.) with 33% of people living with HIV developing AIDS within one year of their initial diagnosis.<sup>1,2</sup>

The number of persons living with HIV infection is growing, indicative of a chronic, manageable disease. New York City (NYC) continues to have one of the

largest prevalence of HIV infections in the U.S.<sup>3,4</sup> A reported 2,718 people were newly diagnosed with HIV infection in 2014 and 1,432 were diagnosed as having AIDS making a total of 119,550 people living with HIV/AIDS in NYC.<sup>4</sup> Disparities in mortality and survival rates of persons living in impoverished neighborhoods are evident, verifying the health inequities across NYC and the need to focus further screening and testing options/opportunities particularly in these areas.<sup>4</sup>

Salivary components are being used to assist in the diagnosis of oral and systemic diseases.<sup>5</sup> The U.S. Preventive Services Task Force (USPSTF) recommends routine HIV screening regardless of risk level, for all persons age 15 to 65 years.<sup>5-7</sup> The USPSTF has designated HIV screening as Grade "A", which assures, with high certainty that the net benefit

is substantial; currently there are four designated screening grades, with "A" being the highest to "D" being the lowest/not recommended.<sup>8</sup> The CDC has expanded Rapid HIV Testing (RHT) initiatives including support for the home test for HIV and as a result, screening has become more accessible to the public.<sup>8</sup> Treatment is also centered on prevention which includes routine screening, the use of pre-exposure prophylaxis (PrEP), a Food and Drug Administration approved preventative medicine taken daily, and the single-dose combination antiviral therapy for post-exposure prophylaxis (PEP).<sup>5,7</sup> Numerous studies have validated the significance of early detection, diagnosis and treatment of HIV-infected individuals resulting in reductions in morbidity and mortality.<sup>5,6,8</sup> Additionally, these studies also support the high accuracy rate of the oral RHT method as a suitable screening tool.<sup>5,6,8</sup>

In support of early disease screenings for undiagnosed medical conditions, studies have been conducted using population data, estimates of chronic disease prevalence, and rates of medication adherence to determine the overall cost savings of early detection. Nasseh et al. investigated the short-term annual health care cost savings when oral health care providers included screenings for various chronic diseases such as diabetes and hypertension.<sup>10</sup> Chronic disease prevalence and rates of medication adherence were used to estimate the cost savings for patients 40 years and older and who visited a dentist but had not visited a physician over a period of 12 months.<sup>10</sup> Nasseh et al. found that medical screenings in the dental office could potentially save the healthcare system between \$42.4 million to \$102.6 million over 12 months time and long term monitoring could possibly achieve further savings and health benefits.<sup>10</sup>

Dental hygienists and dentists can play a significant role in administering chair side health screenings, including HIV and other chronic diseases, as preventive services to aid in early detection and treatment. Educating patients and promoting healthier lifestyles may increase their lifespan and may also reduce the overall burden of health care costs.

Issues regarding HIV testing conducted within dental practice settings has been reported in the literature.<sup>7,11</sup> Dentists have expressed concerns about false-positive results, offending patients, view of HIV testing as outside the scope of licensure, low patient acceptance of HIV testing in the dental setting, inadequate reimbursement and potential negative impact on the dental practice.<sup>11</sup> A recent survey of general dentists examined their willingness to conduct RHT screening and assessed perceived compatibility with their professional role.<sup>7</sup> Significant findings include: 14 out of 1,802 respondents reported offering the RHT in their practices; fewer than one in eight dentists were familiar with 2006 revised CDC guidelines recommending routine HIV screening of patients in health care settings; African

American dentists were more than twice as receptive to RHT as part of the dentist's role than Non-Hispanic White dentists.<sup>7</sup>

The Ryan White HIV/AIDS program is the largest federally funded HIV care and treatment program in the U.S., providing a "safety net" for medical and social services for those individuals affected by the disease with limited or no coverage for the costs of care.<sup>12</sup> Ryan White areas are federally designated population centers that are the most severely affected by the HIV/AIDS epidemic.<sup>11</sup> Dentists practicing in non-Ryan White areas were shown to be less willing to perform RHT. Results from the electronic survey also demonstrated that the number of training hours received in RHT and counseling correlated with both the willingness to provide and the acceptance of HIV testing as part of their professional role; dentists with more than eight hours of training had almost twice the odds of being willing to provide testing and also deemed testing to be part of their role as a dentist.

Dental hygienists regularly administer oral health assessments, screenings, dental hygiene care planning, education, in addition to providing preventive and individual treatment services. As oral health care providers, dental hygienists routinely screen for hypertension, oral cancer, nutritional habits, and oral manifestations of systemic disease. Their educational background includes a thorough foundation in communicable diseases, thus establishing the dental hygienist as an optimal provider to conduct RHT.<sup>13,14</sup> The dental setting is a desirable non-traditional setting for RHT, as almost two-thirds of all Americans see a dental provider annually.<sup>15</sup> A national survey measuring dental hygienists' knowledge and attitudes towards RHT determined that dental hygienists, with additional training in HIV prevention and counseling and diagnostic testing, are willing to conduct RHT and therefore may be an appropriate health care provider to conduct this screening.<sup>13</sup> Approximately 75% (n=475) of respondents achieved a score of 75% or higher ('high scorers' group) on the knowledge test, and those remaining, 25.1% had scores under 75% were designated 'low scorers' group. The only significant difference between the two groups was the 'higher scoring' group had a higher proportion of participants identifying themselves as White than the low-scoring group (73.3% versus 60.4%, P=0.01). Both groups showed little difference in their opinion of whether dental offices should offer RHT and whether they would be willing to obtain training on RHT administration and counseling. A majority (58.53%) of the high scoring group indicated willingness to conduct RHT if offered within their individual practice setting.

VanDevanter, et al.<sup>16</sup> studied patients' attitudes towards HIV testing performed in the dental setting by conducting in-depth interviews of 19 new patients receiving dental care at a NYC University-based dental clinic. Patients were assessed for their attitudes, beliefs, and perceived acceptability of oral RHT in the dental clinic setting. Analysis of

qualitative interviews revealed three themes related to patients' views on RHT in dental settings. In regards to acceptability and perceived advantages to HIV testing in dental settings, 74% reported they would accept screening if it were offered as part of the dental visit. Convenience, free of charge, and universally administered (to all patients) were other notable responses by interviewees. Secondly, there was congruence between HIV screening and patients' view of dental settings; many participants perceived it as going "hand-in-hand." Thirdly, there were logistical issues related to implementation including handling positive results, the need for professional counseling services, linkage to the provision of care for HIV- positive patients, privacy concerns and preventive educational materials. Caution is needed in generalizing VanDevanter's study results due to the small sample size, however the authors conclude that RHT in the dental setting is promising for individuals who are unable to access primary care services in traditional settings.

Patient-centered care is considered to be a gold standard in dentistry and is essential throughout treatment. A pilot study seeking to evaluate the patient perspective on RHT was conducted in 2007 in an urban free dental clinic serving a diverse patient population in Kansas City. Patients completed an attitude assessment survey on RHT prior to their treatment. One hundred and fifty uninsured adults living in zip codes with a high prevalence of HIV reported willingness to take a free RHT during their dental visit supporting patients' overall acceptance of HIV screening in the dental setting.<sup>17</sup>

Dental hygienists are committed health care professionals. There is evidence supporting dental hygienists' willingness and readiness to effectively conduct RHT when provided with the necessary training skill sets. The purpose of this study was to investigate patient acceptability, certainty of their decision, and willingness to pay for screening if RHT was offered in university-based dental hygiene clinics.

## Methods

A cross-sectional survey was administered to 426 dental hygiene patients attending one of three NYC dental hygiene clinics representing all of the dental hygiene clinics in NYC. Eligibility criteria included being over 18 years of age and having the ability to read and write in English or Spanish. Data collection took place between November 2013 and February 2014. The survey was implemented by senior dental hygiene students who had completed the Responsible Institutional Conduct of Research (RCR) for Social and Behavioral Research via the Collaborative Institutional Training Initiative (CITI) human subjects' protection training. Participants also received additional training that included role-playing with a faculty written script, emphasizing the critical nature of maintaining patient confidentiality.

Institutional Review Board approval was granted by the University Committee on Activities Involving Human Subjects for New York University (IRB# 13-9662), the City University of New York for NYC College of Technology and Hostos Community College. (IRB# 489808-01)

Routine clinical patient protocol which includes a comprehensive review of each patient's medical history was followed. The study was introduced by the student dental hygienist during the medical history review and each interested patient was provided a patient information document outlining the study protocol. Participants provided verbal consent before self-completing the paper-based, chairside survey.

The survey instrument consisted of 17 questions. Seven questions captured respondent demographics including age, gender, ethnicity, highest level of education and residential zip code. Five questions measured HIV testing preferences including acceptability to receive an HIV test in the dental setting, type of HIV test preferred, type of dental provider preferred, history of HIV testing and willingness to pay for an HIV test. Five questions measured the participant's certainty of their decision using the decisional conflict scale.<sup>18</sup>

Decisional conflict takes place when there is uncertainty about an action. In most cases, an individual becomes uncertain when they are confronted with decisions involving risks or uncertainty of the intended outcomes.<sup>18, 19</sup> Uncertainty is highest when an individual experiences the following: feels uninformed about the alternative options, risks and benefits; is unclear about their personal values used to make the decision; feels lack of support in making the decision or feels pressured to choose a particular option.<sup>18-20</sup>

The survey instrument utilized the SURE (Sure of myself, Understanding information, Risk-benefit ratio, Encouragement test version) decisional conflict questions commonly used in clinical settings.<sup>21</sup> The four SURE items included: "Do you feel SURE about the best choice for you?; Do you know the benefits and risks of each option?; Are you clear about which benefits and risks matter most to you?; Do you have enough support and advice to make a choice?" The SURE items were summed; scores ranged from zero (extremely high decisional conflict) to four (no decisional conflict). Scores less than or equal to three indicated a decisional conflict.<sup>20</sup>

Face validity of the survey instrument was assessed by having dental hygiene students and other lay people review the draft tool, while content validity was tested by having oral health and HIV scholars and researchers assess the survey. Psychometric testing was performed on the SURE decisional conflict scale and the instrument was found to be acceptable, feasible and easy to administer. The validity alpha coefficient was found to be 0.86, while the internal reliability was moderate with a Cronbach  $\alpha$  of 0.65.<sup>18, 22</sup>

Data analyses were conducted using Statistical Analysis System (SAS) version 9.1. Differences between respondents who were and those who were not willing to have HIV testing in a dental setting were determined by a Chi-square tests statistic for categorical variables (gender, race and education). Age differences between participants who would or would not, or were unsure about receiving HIV testing in a dental setting, were determined by the analysis of variance (ANOVA). Differences in age between participants who had and those who had not been previously tested for HIV as compared to individuals willing to receive HIV testing in a dental setting, was determined by a t-test.

## Results

The overall response rate (n=426) was 100%. Of the 426 respondents, nearly three quarters were willing to have HIV testing administered by a dental professional (Table I). Respondents indicating a willingness to accept testing in the dental hygiene clinic were asked follow-up questions; however, some participants chose not to answer all of the survey items. More than half of the respondents indicated having had HIV testing in the past. The testing methods preferred by 285 respondents included the fingerstick (4.91%, n=14), venipuncture (8.77%, n=25), and the oral RHT (85.26%, n=243). Two hundred ninety-three respondents indicated that if HIV testing were offered that they were willing to have testing done by a dentist (72.35%, n=212) or a dental hygienist (71.67%, n=210). Willingness to pay

**Table I.** Respondent Characteristics

Mean Age (SD): 38.11 (15.14)	N (%)
<b>Gender</b>	
Female	231 (54.87%)
<b>Race</b>	
African American	96 (23.02)
Asian	57 (13.67)
Hawaiian	2 (0.48)
Hispanic	162 (38.76)
Native American	5 (1.20)
Other	106 (25.42)
White	151 (36.21)
<b>Education</b>	
Associates/Bachelors	171 (40.43)
Graduate or Doctoral	57 (13.48)
High School	148 (34.99)
Less than High School	21 (4.96)
Other	26 (6.15)

varied, with a third indicating they were not willing to pay for HIV testing (n=88), another third willing to pay \$10 (n=87), a quarter were willing to pay \$20 (n=69), and 15 percent were willing to pay \$30 or more (n=43). Respondents stated they knew the benefits and risks of each testing option (n=216), and were clear about which benefits and risks were most important (n=248). More than half (n=243) believed they had enough support and advice from others to

**Table II.** Respondent Preferences on HIV Testing

	N (%)
<b>Acceptability to have HIV testing performed by a dental professional</b>	
Yes	293 (72.17)
No	72 (17.73)
Unsure	41 (10.10)
<b>Respondents willing to have HIV testing done by a dental professional:</b>	
<b>Has had HIV testing</b>	
Yes	180 (62.72)
<b>Type of test</b>	
Regular HIV test	25 (8.77)
Rapid finger prick test	14 (4.91)
Rapid oral test	243 (85.26)
<b>Preferred dental professional</b>	
Dentist	212 (72.35)
Dental Hygienist	210 (71.67)
<b>Willingness to pay for HIV testing</b>	
Nothing	88 (30.66)
\$10	87 (30.31)
\$20	69 (24.04)
\$30	22 (7.67)
More than \$30	21 (7.32)
<b>Decisional Conflict</b>	
Knows the benefit and risks of each option	216 (75.79)
Clear about which benefits and risks matter most	248 (87.02)
Has enough support and advice from others to make a choice	243 (85.26)
Feels sure about the best choice for themselves	264 (92.63)

**Table III.** Respondent Willingness to Undergo HIV Testing

<b>Willingness to have HIV testing in a dental setting</b>				
	<b>Yes</b>	<b>No</b>	<b>Unsure</b>	<b>p-value</b>
Age, Mean (SD)	37.90 (15.16), N=29	37.41 (14.74), N=71	42.08 (16.87), N=40	ANOVA, p=0.24
	<b>N(%)</b>	<b>N(%)</b>	<b>N(%)</b>	<b>Chi-Square</b>
Gender - female	163 (55.63)	36 (50.00)	23 (56.10)	p=0.33
Race - White vs. non-White	109 (37.85)	28 (40.58)	12 (29.27)	p=0.48
Hispanic vs. non-Hispanic	118 (40.83)	21 (29.17)	12 (30.00)	p=0.11
Education-college vs. none	164 (59.21)	41 (62.12)	19 (48.72)	p=0.38
<b>Of those willing to have HIV testing in a dental setting, previously have had an HIV test</b>				
	<b>Yes</b>	<b>No</b>		
Age, Mean (SD)	38.34 (17.41), N=116	38.04 (13.75), N=192	t-test, p=0.87	
	<b>N(%)</b>	<b>N(%)</b>	<b>Chi-Square</b>	
Gender - female	112 (57.44)	61 (53.04)	p=0.54	
Race - White vs. non-White	57 (29.84)	52 (46.02)	p=0.01	
Hispanic vs. non-Hispanic	102 (53.68)	27 (23.48)	p<.0001	
Education-college vs. none	103 (57.54)	62 (56.88)	p=0.91	

**Table IV.** Odd Ratios comparing demographic differences between those who are and are not willing to have HIV testing in a dental clinic and those who have and have not previously had HIV testing

<b>Willing to have HIV testing in a dental setting?</b>			
	<b>Yes N(%)</b>	<b>No or Unsure N(%)</b>	<b>Odds Ratio and p-value</b>
<b>Gender</b>	163 (55.63)	59 (52.21)	1.20 (0.770, 1.87), p=0.42
Race - White vs. non-White	109 (37.85)	40 (36.36)	1.07 (0.68, 1.68), p=0.78
Hispanic vs. non-Hispanic	118 (40.83)	33 (29.46)	1.65 (1.03, 2.64), p=0.04
Education-college vs. none	164 (59.21)	60 (57.14)	1.09 (0.69, 1.72), p=0.71
<b>Of those willing to have HIV testing in a dental setting, already had an HIV test</b>			
	<b>Yes N(%)</b>	<b>No N(%)</b>	<b>Odds Ratio and p-value</b>
<b>Gender</b>			
Race - White vs. non-White	112 (57.44)	61 (53.04)	1.24 (0.78, 1.96), p=0.43
Hispanic vs. non-Hispanic	57 (29.84)	52 (46.02)	0.50 (0.31, 0.81), p=0.01
Education-college vs. none	102 (53.68)	27 (23.48)	3.78 (2.25, 6.33), p<.0001

make a choice regarding testing and more than 90% (n=264) reported being sure about the best choice for themselves. The mean decision conflict score was 3.42 out of four (SD 1.08). (see Table I)

Over half of the study population was comprised of women (n=231), multiple racial groups and educational backgrounds (Table II, Table III). White vs. non-Whites and Hispanics vs. non-Hispanics were compared; individuals with a college education were compared to those without a college education. Demographic differences were determined between those who had and those who had not had HIV testing, in addition to those who were and were not willing to accept HIV testing in a dental clinic setting. Amongst those who would accept HIV testing in a dental clinic, there were no statistically significant differences between the yes, no, and unsure responses when comparing white and Hispanic participants.

There was a significant difference in racial/ethnic distribution between those who previously had HIV testing already and those who did not. Specifically, there were more Whites amongst those who reported having had HIV testing than those who reported never being tested, and more Hispanics amongst those who had received HIV testing than those who had not had testing. No other statistically significant differences were identified based on demographic characteristics of the sample population when comparing those who had been previously tested for HIV and those who had not been tested. (Table II, Table III)

Odds ratios were performed comparing demographic differences between individuals who have and those who have not had HIV testing, as well as those who are and are not willing to have testing in a dental setting. Results demonstrated that Hispanics were more willing to have HIV testing performed in a dental setting than non-Hispanics (OR=1.65, 95% CI: 1.03, 2.64, p= 0.04). No other demographic differences were found between those who were willing to have HIV testing in a dental setting and those who were not or were unsure. Of the individuals who were willing to have HIV testing performed in a dental setting, Whites were less likely than non-Whites to have already had previous HIV testing (OR=0.50, 95% CI: 0.31, 0.81, p= 0.01) and Hispanics were more likely to have been previously tested (OR=3.78, 95% CI: 2.25, 6.33, p= <.0001). (Table IV)

## Discussion

Patient acceptance, perceptions and readiness to be screened for HIV is critical to RHT implementation. This study's findings indicate that the majority of dental hygiene clinic patients would be willing to accept HIV screening, perceive it as being important, and are agreeable to undergo screening if offered in the dental setting at no or low cost. The results of this study contribute to the previous research findings indicating patients' willingness to accept HIV screenings administered by dentists in dental clinics

at no cost,<sup>2, 5</sup> as the majority of patients surveyed in these three NYC dental hygiene clinics indicated that they would accept HIV screenings by dental hygienists, and that they would be willing to pay a nominal (\$10-\$20) fee for this service.

In 2006 the CDC revised its recommendations for HIV screening and testing. Prioritizing settings (including alternative settings) and advocating for screening and testing to become a standard component of a healthcare visit were two important highlights.<sup>23</sup> The CDC's inclusion of dental professionals in its preference provides a valuable alternative for patients. Studies on knowledge and willingness to conduct screenings by dentists and dental hygienists have determined the dental setting as an alternative site for consideration.<sup>7, 14</sup>

The CDC estimates that 82.3% of children aged 2-17, 61.6% of adults aged 18-64 and 61.8% of adults aged 65 and older had dental visits in 2012.<sup>15</sup> Dental care utilization studies have indicated that more people visit their dental professional on a regular basis than other health care providers, suggestive of dental health care professionals possibly being the only providers visited annually.<sup>24</sup> A brief description of three types of HIV testing: venipuncture, a fingerstick for a blood sample and oral swab for saliva, were included in the survey administered in the three dental hygiene clinics and the majority of the respondents interested in HIV screening chose the rapid testing via the saliva collection. Saliva containing biomarkers have many advantages as a diagnostic tool that include: high sensitivity and specificity, simple to perform, rapid results, non-invasive, economical, versatile in handling, storage and transport, and appropriate at chairside when screening for other oral and systemic diseases.<sup>26</sup>

Hispanics in the study sample, were more willing to have HIV testing in a dental hygiene clinic, and among the participants who were willing to accept testing in a dental hygiene clinic. Hispanic and non-Whites in this study sample also had a higher odds of already having been previously tested for HIV; this finding is consistent with what has been reported in previous studies.<sup>17, 23</sup> HIV diagnoses, prevalence, care outcomes and survival rates in NYC continue to disproportionately affect certain racial populations; African American (black) are among the highest followed by Hispanic and White.<sup>4</sup> Free or low-cost dental clinics serving diverse patient populations are ideal to offer and administer RHT in effort to reach racial groups with high prevalence,<sup>17</sup> as demonstrated among the respondent/patient racial characteristics treated at these three NYC dental hygiene clinics.

Despite the findings of this study suggesting that patients would be willing to undergo RHT administered by a dental hygienist in the dental setting, a few limitations can be noted. While 71.7% of participants stated that a preference for RHT administration by

a dental hygienist, it is possible these preferences were biased due to the survey being administered by dental hygienists and students in dental hygiene program clinic settings. A convenience sample was used for this study however, a diverse group of participants was involved. While the research instrument gathered participants' geographic information, the data was not evaluated for varied responses based on whether or not the participants resided in urban or suburban areas. It is also unclear if the sample size was an appropriate subset of the total number of dental hygiene patients seen at the three dental hygiene program clinics. Reasons for declining participation and demographics were not gathered from patients who declined to participate in the survey.

Future research should address barriers concerning administering HIV screenings at no or low cost. Further investigation and discussion is also needed to determine the feasibility of incorporating oral rapid HIV testing and education into dental and dental hygiene school curricula. HIV training for all dental professionals in didactic as well as clinical settings should include all aspects of the RHT process and become a permanent, delegable procedure incorporated as one of the professional roles of the oral health care provider.<sup>26-28</sup> Patients surveyed in this and previous studies indicate acceptance of the potential offer for oral rapid HIV screening at no or low cost when provided in public dental hygiene clinics, however further investigation and comparison should be considered for those patients receiving care in private practice dental settings.<sup>16, 17</sup>

## Conclusion

Patients are willing to undergo oral RHT when offered as a service and provided by dental hygienists in the dental setting. These non-traditional settings have the potential to provide supplemental HIV screening avenues in an effort to increase early detection. Further research is needed to evaluate the public health benefits and logistical challenges facing the provision of HIV testing in the dental environment. Dental hygienists, with proper training can administer the RHT during routine, comprehensive patient care, and can play a significant public health role in the early diagnosis, treatment, longevity and improved quality of life for people living with HIV infections.

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## The Value of Interprofessional Education: Assessing the Attitudes of Dental Hygiene Administrators and Faculty

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### Abstract

**Purpose:** The purpose of this study was to assess the attitudes of dental hygiene administrators and faculty members about the value of interprofessional education (IPE) within dental hygiene curricula and to determine whether administrator and faculty perspectives were associated with their professional role, gender, experience, knowledge about IPE, and their use of collaborative teaching strategies.

**Methods:** A 34-question survey was used to evaluate dental hygiene administrators' and faculty knowledge, attitudes, and practices related to IPE. Electronic surveys were distributed to 224 program directors and faculty members of all entry-level dental hygiene programs located within the Northeast region of the United States. Responses were tabulated and analyzed using Statistical Package for the Social Sciences 23. Descriptive statistics, the Spearman's rho correlation coefficient, and ordinal regression analyses were used to report on each survey item.

**Results:** The response rate was 41% (n=91). Overall, respondents viewed interprofessional pedagogy in high regard. Administrators and faculty agreed that IPE would enhance views towards other professions, benefit patients, and assist students in becoming effective members of health care teams. Although the basis for these perspectives was distributed, most (36%) were attributed to being in favor of working with other professionals. Significant correlations were found between respondent attitudes and their understanding and use of collaborative education strategies. Knowledge levels ranged from limited (38%) to adequate (58%). Approximately half of respondents (48%) reported that they are in the very initial stages of incorporating IPE into the curriculum.

**Conclusion:** The majority of the dental hygiene administrators and faculty members surveyed see the value and significance of using IPE to effectively prepare students to enter a collaborative workforce. These perspectives demonstrate that dental hygiene is on the appropriate path for incorporating interprofessional strategies into program curricula.

**Keywords:** dental hygiene education, interprofessional education, interdisciplinary collaboration, collaborative practice

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### Introduction

Today's health care system utilizes a collaborative approach to patient care. This team-based style, in part, results from the increased prevalence of chronic illnesses, deficits in the provision of medical care, growing life expectancy rates, and the complexities of the modern health care system.<sup>1</sup> Heightened realization of these issues has prompted health care professionals to work together with patients, families, and communities in an attempt to deliver comprehensive care and achieve favorable health and well-being outcomes through interprofessional collaborative practice.<sup>2</sup>

Given the paradigm shift from a siloed to multiprofessional approach, health science academia is charged with preparing students to enter a

collaborative workforce. Interprofessional education (IPE) has been proposed as a viable solution to meet the current demands, as its intent is to promote effective communication, foster teamwork, improve health outcomes, and increase one's appreciation and understanding of other health care professionals.<sup>2</sup>

Numerous health science disciplines, including medicine and nursing, have already adopted IPE in their curricula.<sup>3</sup> However, research shows that many dental hygiene programs have not started to incorporate shared teaching and learning experiences into their courses of study.<sup>4-6</sup> One obstacle may be due to the fact that only a small percentage of dental hygiene programs in the United States (U.S.) are located within dental schools or on health

science campuses, thus limiting IPE opportunities.<sup>4</sup> Professional education and training experiences have also been shown to greatly influence knowledge, skill sets, and confidence. Dental hygiene students do not always perceive themselves as fundamental members of collaborative health care teams, an issue likely due to a lack of exposure to collective learning experiences.<sup>7</sup> Additionally, dental hygiene students may be unfamiliar with the roles and responsibilities of other health care providers.<sup>5</sup> These circumstances create the setting for subsequent self-perceptions and abilities. Research by Bell et al. revealed that many of the dental hygienists surveyed felt that their knowledge levels of certain oral-systemic diseases in addition to their confidence levels associated with the management of specific at-risk patients, needed improvement.<sup>8</sup> This lack of knowledge and self-confidence may have developed due to the unavailability of IPE, which is problematic considering academic goals of dental hygiene education programs should support the current collaborative practice concepts in order to graduate competent health care providers.

Evidence demonstrates a strong correlation between oral and systemic health, and calls for dental hygienists to be primary members of interprofessional teams based on their expertise in the prevention and treatment of oral diseases. In spite of the demand, dental hygienists are not frequent collaborators on these interprofessional health care teams.<sup>6</sup> An additional emphasis has also been placed on uniting the long-standing divide between dental and medical professions.<sup>9</sup> In view of the limited IPE opportunities for many dental hygiene students, bridging this divide can be challenging.

The American Dental Hygienists' Association (ADHA) has recognized the critical need for interprofessional collaboration, and contributed to the development of a transformative vision to advance dental hygiene through restructuring the educational system.<sup>4,10</sup> IPE was a recurring theme at the September 2013 symposium, "Transforming Dental Hygiene Education: Proud Past, Unlimited Future."<sup>10</sup> The resulting white paper, *Transforming Dental Hygiene Education and the Profession of the 21<sup>st</sup> Century* further elaborated on the strategies highlighted at the conference.<sup>4</sup> Incorporating interprofessional teaching methodologies and creating interdisciplinary experiences within dental hygiene curricula will enable the profession to remain relevant in an constantly evolving health care system. Additionally, IPE experiences are expected to contribute to the amalgamation of oral and medical services, raise the standard of care, and graduate professionals that are primed to enter a collaborative health care system.

As this transformation must begin within the educational system, attention is placed on the

academic leaders who bear the responsibility of developing and facilitating interprofessional action strategies. However, educators' perceived lack of value and commitment towards IPE impedes advancement,<sup>3,11</sup> and has been identified as a primary obstacle to successful actualization.<sup>5</sup> A team-based approach is not always a vision shared among academic leaders. Historically, health science faculty are accustomed to operating in uni-professional environments and the majority of these faculty members were trained prior to the emergence of IPE, making it difficult to recognize the value of this approach.<sup>12</sup> Subsequently, this perception has led to some resistance to embracing interprofessional teaching.<sup>12</sup> Understanding faculty convictions and aligning attitudes with the objectives of collaborative education and health systems are essential to creating a comprehensive needs assessment and successful IPE program development as the basis for transforming the education process.

The attitudes of dental hygiene administrators and educators towards IPE have not been well documented. Current literature suggests that there is a need to evaluate faculty feelings about shared teaching and learning as well as the attitudinal and institutional factors influencing IPE execution.<sup>13,14</sup> Dental hygiene administrators and faculty are responsible for the implementation of interprofessional education, ultimately bridging the gap between education and the requirements and realities of clinical practice. Examining these administrator and faculty perceptions may foster further discussion and create new opportunities for transitioning dental hygiene education to the collaborative, interprofessional model. The purpose of this study was to assess the attitudes of dental hygiene administrators and faculty members about the value of IPE within dental hygiene curricula and to determine whether administrator and faculty perspectives were associated with their professional role, gender, experience, knowledge about IPE, and their use of collaborative teaching strategies.

## Methods

The Institutional Review Board of the University of New England, Maine approved this quantitative, cross-sectional study. The study population consisted of the program directors and faculty members of all Commission on Dental Accreditation (CODA) approved, entry-level dental hygiene programs located within the Northeast region of the United States (U.S.).

A combination of snowball and convenience sampling was used to select the study sample using the program website and department contact information available via the ADHA website.<sup>15</sup> Program directors were also contacted personally in an attempt to obtain their email addresses in addition to those of their faculty members. In the case of an unresponsive

program director, available email addresses were obtained directly from the program website.

The 34-question self-reported survey was comprised of three demographic items, one item assessing knowledge of IPE, one item on current use of IPE, one item about the basis for reported viewpoints, and two Likert scales (totaling 28 items) assessing attitudes towards IPE and interprofessional learning in the academic setting. Both Likert scales used a 5-point rating system, with 1 equaling "strongly disagree" and 5 equaling "strongly agree." The 15-item Likert scale, *Attitudes towards Interprofessional Education*, was adapted from Parsell and Bligh by Curran, et al.<sup>16,17</sup> Curran et al. has also adopted the 13-item Likert scale, *Attitudes towards Interprofessional Learning in the Academic Setting*, from Gardner, et al.<sup>17,18</sup> Permission was granted via email correspondence by Curran to use both scales in this study. Although previously validated, Cronbach's alpha was calculated, demonstrating high internal consistency and reliability across both scales. Cronbach's alpha for *Attitudes towards Interprofessional Education* was 0.88 and for *Attitudes towards Interprofessional Learning in the Academic Setting* was 0.78.

The survey was developed and administered via SurveyMethods online software.<sup>19</sup> Dental hygiene administrators and faculty in the Northeast region of the U.S. were invited to complete the survey by means of an electronic mail containing a recruitment cover letter and a customized link containing the research consent form and study details, followed by the survey. Survey completion indicated consent to participate in the study. To maintain the anonymity and confidentiality of respondents, no identifying information was collected, including details about their specific institutions. Additionally, software settings were programmed to ensure that Internet Protocol (IP) addresses were not captured and the secure socket layer (SSL) feature was used. After the initial launch of the survey, three follow up emails were sent to non-responders to increase the response rate.

Survey data was downloaded from SurveyMethods as an excel file, and then entered into Statistical Package for the Social Sciences (SPSS) 23. Descriptive statistics were used to measure attitudes by calculating the mean (*M*) score of all Likert scale items. Additionally, the mode emphasized the most frequently selected underlying factor explaining viewpoints. Inferential statistics were used to ascertain if perspectives were correlated to the following survey variables: professional role, gender, experience, knowledge, and use of IPE. The Spearman's rho ( $r_s$ ) correlation coefficient detected and computed any significant associations present among variables. Ordinal regression analyses were used to draw inferences between these relationships. Data was checked to ensure that all assumptions

for running this test were met, validating results. Statistical significance was determined by *p*-values that were less than or equal to 0.05.

## Results

Of the 224 administrators and faculty members invited to participate in the study, 91 completed the survey, resulting in a response rate of 41%.

### Demographic Characteristics

Demographic information about survey respondents was collected and shown in Table I. Most of the respondents reported that they were females in the role of a faculty member. Their experience in higher education was similarly distributed in intervals ranging from two to 10 years and from 11 to more than 20 years, respectively.

**Table I.** Demographic Characteristics of Survey Respondents (n=91)

	Percent
<b>Gender*</b>	
Male	11%
Female	89%
<b>Professional Role*</b>	
Administrator	19%
Faculty	81%
<b>Experience in Higher Education*</b>	
Less than 1 year	1%
2 – 5 years	9%
6 – 10 years	9%
11 – 20 years	40%
Greater than 20 years	42%

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

### Attitudes Towards IPE

Likert scale items and the mean scores of the 15 statements for *Attitudes towards Interprofessional Education* are exhibited in Table II. Similarly, Table III presents the 13 Likert scale items and associated mean ratings for *Attitudes towards Interprofessional Learning in the Academic Setting*. Mean calculations were used to determine the perspectives towards each statement. Separate measurements of each item was key to the assessment of the individual attitudes towards the multiple components of IPE thus revealing elements that were favored and identifying areas that were not held in the same regard. Scores closer to 5.00 indicated positivity, whereas those closer to 1.00 indicated negativity. Reversed scored items, shown on Tables II and III, were appropriately calculated.

**Table II.** Summary of Mean Scores on Attitudinal Scale: Attitudes Towards Interprofessional Education<sup>16,17</sup>

Item No.	Likert Scale Item	Mean Score (M)
1	Interprofessional learning will help students think positively about other health care professionals	4.28
2	Clinical problem solving can only be learned effectively when students are taught within their individual department /school*	3.69
3	Interprofessional learning before qualification will help health professional students to become better team-workers	4.22
4	Patients would ultimately benefit if health care students worked together to solve patient problems	4.40
5	Students in my professional group would benefit from working on small-group projects with other health care students	4.17
6	Communication skills should be learned with integrated classes of health care students	3.85
7	Interprofessional learning will help to clarify the nature of patient problems for students	3.98
8	It is not necessary for undergraduate health care students to learn together*	3.75
9	Learning with students in other health professional schools helps undergraduates to become more effective members of a health care team	4.27
10	Interprofessional learning among health care students will increase their ability to understand clinical problems	4.16
11	Interprofessional learning will help students to understand their own professional limitations	3.98
12	For small-group learning to work, students need to trust and respect each other	4.39
13	Interprofessional learning among health professional students will help them to communicate better with patients and other professionals	4.26
14	Team-working skills are essential for all health care students to learn	4.41
15	Learning between health care students before qualification would improve working relationships after qualification	4.22

\*A negatively worded item that was reverse-scored to calculate the mean score

According to mean scores, survey respondents expressed favorability towards interprofessional pedagogy. They felt most strongly about the importance of health care students acquiring team-working skills ( $M = 4.41$ ). High levels of agreement revealed that this will better prepare them to work in groups ( $M = 4.22$ ) once they enter the collaborative practice workforce, and being impactful when doing so ( $M = 4.27$ ). Respondents believed that IPE would improve communication skills with patients and other professionals ( $M = 4.26$ ). Positivity was expressed towards students having a higher quality understanding of clinical issues because of joint learning ( $M = 4.16$ ). Administrators and faculty deemed a collaborative approach as essential when resolving patient problems ( $M = 4.40$ ), and felt that if learning within these collaborations is to be effective, individuals need to have a common trust and esteem for each other ( $M = 4.39$ ). IPE is expected to enhance students' outlooks towards other health care professionals ( $M = 4.28$ ). Furthermore, respondents anticipated that it would assist learners in recognizing their professional shortcomings ( $M = 3.98$ ). Overall, they agreed that IPE, taking place before qualification, would improve actual practice ( $M = 4.22$ ).

Administrators and faculty believed that IPE should be a goal of their campus ( $M = 3.96$ ). This viewpoint can be clarified through agreement expressed with the following statements: "students like courses that include students from other academic departments" ( $M = 3.42$ ), "faculty like teaching to students in other academic departments" ( $M = 3.42$ ), and "faculty like teaching with faculty from other academic departments" ( $M = 3.49$ ). Respondents felt that in order for interprofessional efforts to be successful, support from administration is requisite ( $M = 4.39$ ). They agreed that health science campuses should encourage faculty to become involved in teaching multidisciplinary courses ( $M = 4.07$ ), which could satisfy the notion that institutions should offer their students shared learning experiences ( $M = 4.09$ ).

Additional mean scores identified in Tables II and III mostly reiterated the stated results. Based on the respondents' levels of agreement with the majority of the statements, more positive than negative attitudes were expressed.

**Table III.** Summary of Mean Scores on Attitudinal Scale: Attitudes Towards Interprofessional Learning in the Academic Setting<sup>17,18</sup>

Item No.	Likert Scale Item	Mean Score (M)
1	Interprofessional learning better utilizes resources	3.82
2	It is important for academic health center campuses to provide interprofessional learning opportunities	4.09
3	Interprofessional learning should be a goal of this campus	3.96
4	Students like courses taught by faculty from other academic departments	3.22
5	Students like courses that include students from other academic departments	3.42
6	Faculty should be encouraged to participate in interprofessional courses	4.07
7	Faculty like teaching to students in other academic departments	3.42
8	Faculty like teaching with faculty from other academic departments	3.49
9	Interprofessional efforts weaken course content*	3.91
10	Interprofessional efforts require support from campus administration	4.39
11	Interprofessional courses are logistically difficult*	2.53
12	Faculty should be rewarded for participation in interprofessional courses	3.69
13	Accreditation requirements limit interprofessional efforts*	2.93

\*A negatively worded item that was reverse-scored to calculate the mean score

### The Basis for Attitudes

The mode served as an indication of the factor that was the most commonly selected explanation for the attitudes of survey respondents towards IPE (Table IV). The basis for perspectives was distributed across the study population. Some respondents specified that their viewpoints could be described by positive factors, such as being in favor of working with other professions (36%); whereas others attributed their feelings to negative factors, such as the barriers perceived to be associated with this educational typology (12%).

### Perspectives Related to Knowledge and Use

Respondents' understanding of IPE and the extent to which they apply it in dental hygiene curricula was explored (Table V). Of the surveyed population, 58% (n=53) were knowledgeable about interprofessional pedagogy, while 38% (n=35) possessed limited knowledge. Furthermore, 48% (n=44) reported that they were in the beginning stages of applying IPE in the dental hygiene curriculum of their affiliated institutions, while 24% (n=22) indicated it is not being applied in the curriculum on any level.

The Spearman's rho correlation coefficient, implementing a two-tailed test of significance, was used to determine any existing relationships between respondents' attitudes and their professional role, gender, experience, knowledge about IPE, and utilization of this teaching methodology. Significant correlations were revealed between perspectives and knowledge ( $r_s = .303$ ) as well as perspectives and use ( $r_s = .269$ ).

Ordinal regression analyses were calculated for each Likert scale item (Tables II and III) and for each level of the variables knowledge and use (Table V), further exploring the relationships identified by the Spearman's rho correlation coefficient. Statistically significant associations ( $p \leq 0.05$ ) were noted, detailing the connection between respondents' attitudes towards IPE and their understanding as well as its use. (Tables VI and VII)

**Table IV.** Factors Explaining Perspectives Towards IPE (n=91)

Factor*	Percent
Favor working with others	36%
Benefits associated with IPE	12%
Perceived barriers to IPE	12%
Familiarity with IPE	9%
Lack of IPE training	9%
Lack of leadership for IPE	8%
Presence of leadership for IPE	6%
Unfamiliarity with IPE	5%
Risks associated with IPE	2%
Presence of IPE training	1%
Against working iwth others	0%

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

**Table V.** Respondents' Understanding and Use of IPE (n=91)

	Percent
<b>Level of Knowledge*</b>	
No knowledge	1%
Limited knowledge	38%
Knowledgeable	58%
Extensive knowledge	2%
<b>Level of Use*</b>	
Not applied in curriculum	24%
Beginning stages of application in curriculum	48%
Intermediary stages of application in curriculum	22%
Extensively applied in curriculum	6%

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

Significant relationships between attitudes and knowledge about IPE were demonstrated. (Tables VI and VII) The 1% of survey respondents with no knowledge ( $p=0.00$ ) of IPE in addition to the 38% with limited knowledge ( $p=0.00$ ) of it, felt that multidisciplinary learning would bring about positive feelings towards other health care professionals. Additionally, those with no knowledge ( $p=0.00$ ) and minimal comprehension ( $p=0.00$ ) of inter-professional practices, felt that patients would benefit from a collaborative care approach. This same 1% ( $p=0.00$ ) and 38% ( $p=0.00$ ) of the population believed that IPE is a necessity for health science programs. Respondents reporting no ( $p=0.00$ ) or little familiarity ( $p=0.00$ ) with collaborative education, still strongly agreed that exposure to IPE during training, produces competent members of integrated medical groups. Even with limited understanding ( $p=0.00$ ) of interprofessional concepts, administrators and faculty strongly believed that team-based learning is only effective in the presence of mutual trust and respect. Little acquaintance ( $p=0.00$ ) with IPE was still sufficient for recognizing how it enhances communication skills. Respondents with different knowledge levels, varying

**Table VI.** Significant Associations Between the Attitudes Towards Interprofessional Education Scale Items, Knowledge, and Use

Item No.	Likert Scale Item	Associated Knowledge and Use Levels	Sig.*
1	Interprofessional learning will help students think positively about other health care professionals	No knowledge Limited knowledge	0.00 0.00
4	Patients would ultimately benefit if health care students worked together to solve patient problems	No knowledge Limited knowledge	0.00 0.00
8	It is not necessary for undergraduate health care students to learn together	No knowledge Limited knowledge	0.00 0.00
9	Learning with students in other health professional schools helps undergraduates to become more effective members of a health care team	No knowledge Limited knowledge	0.00 0.00
10	Interprofessional learning among health care students will increase their ability to understand clinical problems	Beginning stages of application in curriculum	0.04
12	For small-group learning to work, students need to trust and respect each other	Limited knowledge	0.00
13	Interprofessional learning among health professional students will help them to communicate better with patients and other professionals	Limited knowledge	0.00

\* $p \leq 0.05$

**Table VII.** Significant Associations Between the Attitudes Towards Interprofessional Learning in the Academic Setting Scale Items, Knowledge, and Use

Item No.	Likert Scale Item	Associated Knowledge and Use Levels	Sig.*
4	Students like courses taught by faculty from other academic departments	Limited knowledge Knowledgeable	0.02 0.02
9	Interprofessional efforts weaken course content	No knowledge Limited knowledge Not applied in curriculum	0.00 0.00 0.03
10	Interprofessional efforts require support from campus administration	Limited knowledge	0.00
11	Interprofessional courses are logistically difficult	Not applied in curriculum Beginning stages of application in curriculum	0.04 0.04

\* $p \leq 0.05$

from limited ( $p=0.02$ ) to well informed ( $p=0.02$ ), expressed more agreement with the concept that students would enjoy working with faculty from departments other than their own. Responders citing no awareness ( $p=0.00$ ) of, or having minimal insight ( $p=0.00$ ) into interprofessional practices, believed that IPE does not diminish course material. Thirty-eight percent of the population reporting some knowledge ( $p=0.00$ ) of IPE, felt that institutional support is necessary in order for joint efforts to be successful.

Statistically significant associations were also identified between attitudes and the extent to which IPE is applied within dental hygiene curricula as shown in Tables VI and VII. The 48% of the respondents who are beginning to implement IPE ( $p=0.04$ ) felt that by doing so, they are fostering students' capacity to better grasp clinical issues. Even the 24% of respondents who have not adopted interprofessional teaching ( $p=0.03$ ), felt that this approach does not devalue course content. Furthermore, respondents who are not implementing IPE ( $p=0.04$ ) and those in the very beginning stages of doing so ( $p=0.04$ ) agreed that the orchestration and execution of such efforts is onerous.

## Discussion

This study surveyed dental hygiene administrators and faculty members to determine their attitudes about the value of interprofessional education within dental hygiene curricula. Additionally, it sought to document whether these perspectives are associated with participants' professional role, gender, experience, knowledge about IPE, and use of collaborative teaching strategies.

Although previous research has assessed attitudes towards IPE, minimal studies focus specifically on dental hygiene administrators and educators. This

study allows for the discipline of dental hygiene to be included in the literature with the results demonstrating overall positive attitudes toward IPE among the majority of the population surveyed. In comparison to other studies assessing the standpoints from other health care disciplines, the current research was similar in that both program directors and faculty value shared educational pedagogy.<sup>17,18,20</sup>

Data analysis confirmed that the respondents in this study expressed a strong affirmation in regard to IPE benefitting students as well as patients. Interprofessional learning is believed to enhance student viewpoints about other health care professionals. IPE experiences are also expected to effectively prepare students to be highly competent members of the collaborative practice workforce by focusing on the clarification of patient problems and fostering team-working skills. As a result of increased student abilities, a higher quality of care will be delivered to patients, heightening health outcomes and overall well-being. Approbatory attitudes reveal that collaborative pedagogy is perceived as a frontrunner for maintaining the relevance of dental hygiene while simultaneously confronting the demands of today's health care system.

Respondents' positive perspectives towards IPE were associated with their comprehension of IPE. Since only 1% of the population reported no comprehension of this educational methodology, the primary relationships were between supportive feelings and knowledge levels ranging from limited to adequate. Sentiments correspond with the intention to develop and boost the understanding of IPE. Therefore, positivity is enhancing one's desire to learn more about interprofessional practices, increasing the adoption of them. Curran's et al. study on the attitudes of health sciences faculty members

towards interprofessional teamwork and education demonstrated equivalent results indicating that there is a direct correlation between positivity and the interprofessional experience.<sup>17</sup> The familiarity and proficiency of collaborative teaching and learning are higher when the importance, worth, and usefulness of it are better perceived by the participants.

Sentiments held by those expected to design and facilitate interprofessional initiatives influence successful implementation. Findings from this study reveal that positive attitudes are related to the extent in which the participants apply IPE within dental hygiene curricula; specifically, at two application levels: not using IPE and beginning to implement it. Although favorable sentiments towards IPE were widespread, the majority population in this study were not affiliated with program curricula structured on an IPE framework. In reality, the use of interprofessional strategies varied greatly among the respondents. An estimated one-quarter of the population do not utilize any shared teaching in their curriculum, approximately one-half are in the infancy stages of IPE execution and approximately one fifth are in the intermediary phases of implementation, and only 6% reported extensive application of interprofessional practices. While these findings reinforce previously reported data indicating that collaborative learning is restricted in dental hygiene education,<sup>4,5</sup> they also illustrate the impact of positive viewpoints on the commencement and evolution of IPE which in turn can help overcome inherent limitations. This evidence also reinforces the views held by the Association of Academic Health Centers acknowledging the importance of positive perspectives among faculty in supporting implementation efforts.<sup>21</sup>

Examining the rationale behind the reported attitudes is key to the development of a descriptive needs assessment, an essential step towards the successful implementation of interprofessional strategies in the curriculum.<sup>22</sup> Respondents indicated the basis for their feelings by selecting factors related to leadership support, knowledge, risks, benefits, training, and barriers to IPE. Identification of these attitudes can help serve as the foundation for transformative efforts so that movement towards IPE implementation within dental hygiene education can take place. As a next step, administrators and faculty should reference the information provided to assist with facilitating the development of IPE plans at institutional and individual levels. Specific faculty interests and concerns should be addressed in this process. As many of the respondents in this survey demonstrated limited or adequate understanding of interprofessional pedagogy, efforts should be directed at improving the skills, knowledge, and abilities of those individuals expected to carry out IPE initiatives. Findings from this assessment may be used to inform professional and organizational development, in-

service training, informal and formal experiences, as well as other interventions identified to effectively and efficiently prepare faculty to implement IPE into dental hygiene curricula. Faculty involvement in shared teaching and learning requires training; without supportive training experiences, the willingness to be involved in IPE will be minimal.<sup>23</sup> The affirmative attitudes identified in this study provide a positive environment for IPE that needs to be fostered.

While these results provide useful information about dental hygiene administrator and faculty perspectives regarding IPE, there are limitations to this study. First, respondents were affiliated with dental hygiene programs located exclusively in the Northeast region of the U.S. and cannot be generalized to dental hygiene programs across the nation. Also, the study findings do not reflect other health science disciplines outside of dental hygiene. Second, although all of the various dental hygiene departments in the Northeast were contacted, there was no way of determining if individuals from each program completed the survey as all identifiers were removed to protect the confidentiality of the participants. Additionally, individuals who support IPE may have been more inclined to participate in the study. Finally, survey questions were self-reported and could have been construed differently among respondents.

Recommendations for future study include the following: a nationwide exploration of dental hygiene administrator and faculty attitudes towards IPE to provide generalizable findings; an investigation of pre- and post-IPE training faculty perspectives to examine the role knowledge plays in influencing viewpoints; an assessment of negative attitudes towards IPE to foster understanding of the basis for resistance; a survey of the attitudes of administrators and faculty members that are affiliated with programs that vary in the extent in which IPE is implemented; an investigation into student learning and clinical practice behavior outcomes following graduation from programs implementing IPE in the curriculum.

## Conclusion

Dedicated administrators and faculty members are required to successfully address the paradigm shift in health science academia. Graduates must be well prepared to enter the collaborative practice environment expected of the health care workforce and the attitudes of educators towards IPE plays an important role in this process. The majority of the dental hygiene administrators and faculty members surveyed in this study recognize the value and significance of using IPE to effectively prepare students to enter this new, collaborative workforce. Articulated perspectives by administrators and faculty revealed an interest in moving towards more interdisciplinary teaching methodologies

and the findings exposed points of interest and concerns, which can be referenced in advancing future collaborative efforts. Perspectives from this study demonstrate that dental hygiene is on the appropriate path for incorporating interprofessional strategies into program curricula.

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## Compensation and Position Characteristics of Dental Hygiene Program Directors

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### Abstract

**Purpose:** The purpose of this study was to collect information about dental hygiene program directors (PD) in order to create a comprehensive position profile for the profession and add to the current literature regarding employment trends and compensation in dental hygiene education. Information gained through this study addresses a gap in the literature and could be utilized by current and future educators considering a dental hygiene program director role or for recruitment purposes.

**Methods:** An electronic survey, consisting of 38 items addressing areas including job characteristics, requirements, compensation, and anticipated retirement, was sent to PDs of all the Commission on Dental Accreditation (CODA) accredited dental hygiene programs in the United States (n=314). Descriptive and inferential statistics were used to analyze the data. ANOVA analyses were used to determine whether significant differences existed regarding salary and compensation, contact hours, total working hours, contract characteristics, and job expectations.

**Results:** Directors from 122 programs responded yielding a response rate of 39%. Seventy-one percent of respondents were aged 50-59 years and 46% reported having held the program director position for 3 years or less. Thirty-five percent of participants plan to retire from their program director position in the next five years. In regards to compensation, 47% of respondents indicated making between \$60,000 and \$79,999 and 3% reported earning less than \$40,000 while 4% indicated salaries over \$100,000. Total number of teaching years and highest degree held demonstrated a positive impact on adjusted monthly salary. PDs employed in university settings were significantly more likely to have ongoing requirements for scholarly activity; those employed in settings associated with a dental school had a longer average contract length than directors in other institutions. Potential dental hygiene PDs should expect an average workweek of 40-50 hours, with the majority of the time spent on administrative duties. Additional responsibilities include teaching, scholarly activity, and committee work.

**Conclusion:** A position profile detailing the range of employment expectations for dental hygiene PDs has been created and can serve as a guide to inform and recruit potential program directors.

**Keywords:** dental hygiene education, dental hygiene faculty administrators, faculty development, dental faculty supply, credentialing

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### Introduction

Dental hygiene education has been evolving and growing over the last fifty years. This continuous growth has also created a surge in the number of dental hygiene faculty who have either retired or are reaching retirement age,<sup>1</sup> thus creating an increased need for dental hygiene educators.<sup>2</sup> Faculty shortages has been well-documented in both dental as dental hygiene schools, primarily due to faculty departures as opposed to newly created positions.<sup>3-6</sup> Carr and colleagues estimated that almost half of dental hygiene educators will be retiring by the year 2020, in their study on dental hygiene faculty shortages.<sup>7</sup> Increasing age among faculty has also been recognized as an

issue. Collins et al. reported in 2007 that the average dental hygiene faculty member age was 50.2 years.<sup>8</sup> In the 2016 American Dental Education Association (ADEA) survey of allied dental PDs, nearly a third of current faculty members were found to be between the ages of 50-59 (29%), with the second largest group between 40-49 years of age (24%).<sup>9</sup> As the retirement rates and average age of educators has not significantly changed between the 2007 and 2016 surveys, these numbers suggest that faculty shortages due to retirement remain persistent. Additional reasons cited in studies examining dental hygiene faculty vacancies include a lack of qualified applicants, or a lack of applicants in general, retirement, and insufficient

compensation. Salary has also been identified as a barrier for those entering the field of dental hygiene education due to the typically higher wages available in clinical practice.<sup>7,9,10</sup>

Given the large number of dental hygiene educators nearing or at retirement age, many in the PD position, it is critical for the profession to recruit future educators and leaders while still retaining current faculty. One strategy has been to introduce dental hygiene students to education as an identified career path within the program curriculum.<sup>7,11,12</sup> However, recent graduates often cite student debt, concerns over a lower salary, lack of interest and the inability to envision a long-term career plan as reasons not to seek a career in dental hygiene education.<sup>7</sup> Further challenges include the current focus on faculty development issues rather than faculty retention and recruitment.<sup>13,3,6</sup>

Academic credential requirements can also be a barrier to potential dental hygiene educators. It is considered desirable, and may be required, for full-time faculty members to hold a degree one level higher than what is granted by their institution. Commission on Dental Accreditation (CODA) standards also require all program directors to either hold or be in pursuit of a master's degree or higher.<sup>14</sup> Research indicates that possessing a master's degree, or higher, better prepares educators for holding leadership positions such as dental hygiene PD.<sup>15,16</sup> There has been a growth in the number of master's degree programs, currently 21 related to dental hygiene, to give aspiring educators increased opportunities to gain the necessary credentials for an academic position.<sup>17</sup>

The American Dental Hygienists' Association (ADHA) has had policy advocating the baccalaureate degree as the entry level degree for dental hygiene since 2005.<sup>18</sup> The process of transitioning to a bachelor's degree is difficult since the majority of dental hygiene programs are delivered in community college settings, which traditionally award associate's degrees exclusively. Recently, a number of community colleges, two located in the Pacific Northwest, have been successful in transitioning their program coursework and degree awarded from an associate's to a bachelor's.<sup>19,20</sup> Increases in this trend, can potentially enable more individuals to pursue advanced education, particularly since one-third of the current dental hygiene educators hold a bachelor's degree as their highest degree.<sup>9</sup>

The American Dental Education Association (ADEA) Allied Dental Program Directors survey is conducted on a regular basis to monitor employment trends within all allied dental education; including dental hygiene, dental laboratory technician, and dental assisting faculties. Among other variables, the ADEA survey assesses percentages of time spent on different job duties, vacant positions, salary information, and demographic characteristics. Results from the 2016

survey state that during the 2015-16 academic year there were 43 retirements of dental hygiene faculty and project that by the year 2020 there will be an estimated 415 additional retirements.<sup>9</sup> The ADEA survey also reported salary averages of \$70,000-79,999 for administrators, and a contract length of 12 months for most administrative positions. While the ADEA survey addresses many of the facets of the program director position, these topics were examined broadly, utilizing descriptive statistics.

Educators interested in advancing to a PD position would likely need to consider a large shift in their professional responsibilities and workload. Little information has been found in the current literature related to the position expectations and compensation for PDs. The purpose of this study was to collect information about PDs in order to create a comprehensive position profile for the profession and add to the current literature regarding employment trends and compensation in dental hygiene education. Information gained through this study addresses a gap in the literature and could be utilized by current and future educators considering a dental hygiene PD role or for recruitment purposes.

## Methods

A cross-sectional survey of PDs was conducted during the month of October, 2015. The author-developed survey instrument, created to address issues not included in the most recent ADEA allied dental program director survey, was considered exempt by the Pacific University Institutional Review Board (IRB). The validity and reliability of the survey instrument was pilot tested by five program directors and revisions were made based upon feedback. The final instrument consisted of 38 items addressing the following areas: position characteristics; required duties and expectations of PDs; director compensation; anticipated retirement dates of PDs as well as faculty members; and general demographics, including age and geographic region. The survey was developed using Qualtrics software (Qualtrics, Provo, UT) and administered via email. Authors manually collected names and email addresses of PDs from the American Dental Hygienists' Association website. An email invitation to participate was sent to all PDs of CODA accredited dental hygiene programs in the United States. A total of 328 invitation emails were sent, of which 14 were undeliverable, yielding 314 successfully delivered email invitations.

Data were analyzed using SPSS (version 23, IBM), using descriptive and inferential statistics. ANOVA analyses were used to determine whether significant differences existed regarding salary and compensation, contact hours, total working hours, contract characteristics, and job expectations. Explanatory variables for these analyses included: highest degree held, institution type, and geographical region of the country. Linear regression

analyses were used to determine if salary was influenced by number of years in the program director position and total number of years in education. Due to the variations in contract length (9-12 months), total yearly salary as well as an adjusted monthly salary (AMS), in which the yearly salary was divided by the number of months in the contract, was analyzed. Statistical significance was set at 0.05.

## Results

Responses were received from 122 (n=122) PDs yielding a response rate of 39%. Comprehensive demographic information is summarized in Table I. Seventy-six percent of respondents indicated employment in a community college or technical school. The highest degree held by the majority of PDs (70%, n=78) was a master's degree. Forty-six percent of respondents have been in their current position for 3 years or less. It is also noteworthy that 60% of responding PDs have been in their positions for five years or less. In regards to number of years of experience in education, responses varied widely however 59% reported having more than 15 years of experience. Most respondents (71%) were between the ages of 50 and 69, and 94% identify as being white or Caucasian. Thirty-five percent of those surveyed (n=39) indicated that they plan to retire sometime in the next five years.

Respondents reported averaging 45.5 hours of work per week (Table II), with peaks identified at 40 and 50 hours. (Figure 1) The majority of the PD's time was spent on administrative duties with a mean of 21.5 hours per week (Table II), with peaks occurring at 20 and 30 hours. (Figure 2) Total student contact hours, or time spent with students varied greatly with the mean amount of time between 11.4 hours per week. (Table II) Peaks in the student contact hour data were identified at 8, 9, 10, and 15 hours. (Figure 3) In regards to the number of hours spent with students in a clinical setting, 6.2 hours were reported on the average with peaks occurring at 1, 5, and 9 hours. (Figure 4) Respondents reported spending an average of 4.4 hours per week teaching in the classroom, with a peak shown at 4 hours. (Figure 5) When asked about additional institutional expectations for PDs, 90% of respondents indicated committee work requirements, while only one third (32% n=37) were expected to participate in scholarly activity. A majority of program directors indicated that they were required to

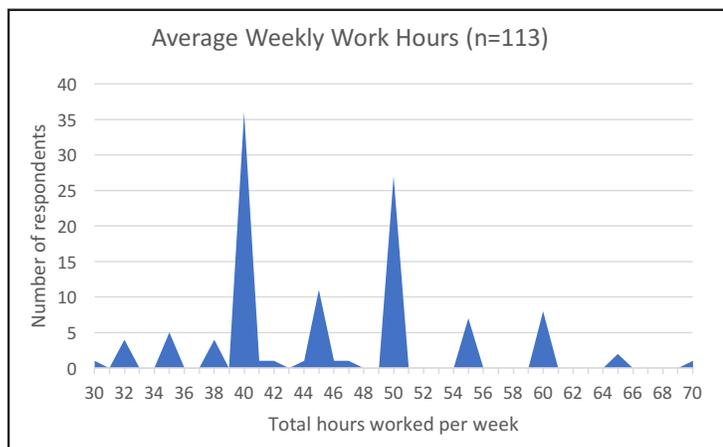
**Table I.** Respondent Demographics

<b>Years in current Position (n=110)</b>	<b>n (%)</b>
1 year or less	18 (16%)
2 years	17 (16%)
3 years	16 (14%)
4 years	9 (8%)
5 years	6 (6%)
6-10 years	22 (20%)
11-15 years	12 (11%)
16-20 years	3 (3%)
>20 years	7 (6%)
<b>How many total years have you worked as an educator? (n= 111)</b>	<b>n (%)</b>
≤5 years	7 (6%)
6-10 years	18 (16%)
11-15 years	21 (19%)
16-20 years	26 (23%)
21-30 years	25 (23%)
31-40 years	13 (12%)
>40 years	1 (1%)
<b>Participant Race (n=110)</b>	<b>n (%)</b>
White	103 (94%)
African American	2 (2%)
Asian	1 (1%)
American Indian/Alaska Native	1 (1%)
Native Hawaiian/Pacific Islander	1 (1%)
Other	2 (2%)
<b>Participant Ethnicity (n=106)</b>	<b>n (%)</b>
Hispanic or Latino	8 (8%)
Non-Hispanic	98 (92%)
<b>Participant Age (n=109)</b>	<b>n (%)</b>
≤29 (born 1986 or later)	1 (1%)
30-39 (born1976-1985)	8 (7%)
40-49 (born1966-1975)	21 (19%)
50-59 (born 1956-1965)	56 (51%)
60-69 (born 1946-1955)	22 (20%)
≥70 (born 1945 and before)	1 (1%)
<b>Institutional Setting (n= 122)</b>	<b>n (%)</b>
Community College/Technical College	93 (76%)
University Affiliated w/Dental School	10 (8%)
University Not Affiliated w/Dental School	19 (16%)

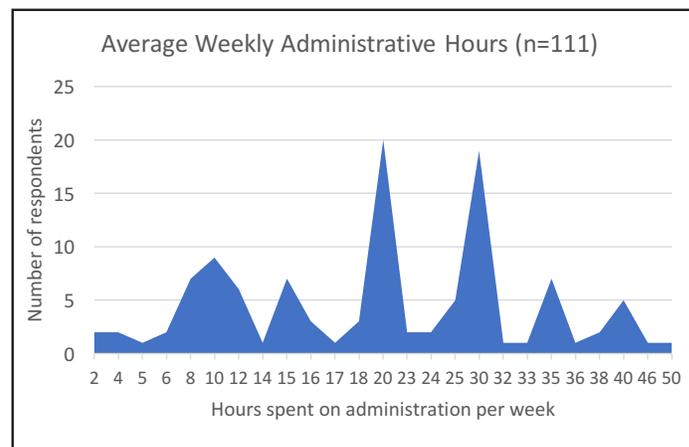
have a master's degree (91%).

Respondents reported spending an average of 3.9 hours per week on scholarly activity. (Table II) Scholarly activity peaked at 3 hours, however there was a range from as little

**Figure 1.** Average weekly work hours



**Figure 2.** Average weekly administrative hours



**Table II.** Work distribution and job expectations of program directors

Number of hours allotted to activities	Mean (SD)
Administration (n=111)	22.5 (10.7)
Total contact hours (n=110)	11.4 (6)
Classroom Teaching (n=111)	4.4 (3.1)
Clinical Teaching (n=110)	6.2 (4.6)
Scholarly Activity (n=36)	3.9 (2.8)
Committee work (n=99)	3.3 (2.4)
Total work hours per week (n=113)	45.5 (8)
Requirements/Expectations of Program Director Position:	n (%)
Committee work (n=114)	102 (90%)
Scholarly activity (n=115)	37 (32%)
What counts as scholarly activity at your institution? (n=37)	n (%)
CE course presentations or other professional presentations	34 (92%)
Original research publications in peer reviewed journals	26 (70%)
Research poster presentations	26 (70%)
Textbook/textbook chapter writing	24 (65%)
Published literature reviews in peer reviewed journals	22 (59%)
Other published work	13 (35%)
Mentoring graduate students	4 (11%)
Grant writing	3 (8%)
Additional Requirements	n (%)
Required to present at professional meetings (n=114)	27 (24%)
Minimum educational requirement (n=115)	n (%)
Bachelor's degree	6 (5%)
Master's degree	105 (91%)
Doctoral degree	4 (4%)

as 1 hour to as much as 11 hours. PDs employed in university settings were required to complete scholarly activity significantly more often than those in community college settings ( $p < 0.0001$ ) as shown in Table III. Of the respondents (n=37) who indicated that scholarly activity was required at their institution, the types of scholarly activity included the following: continuing education (CE) course presentations or other professional presentations (92%); original research publications in peer-reviewed journals (70%); research poster presentations (70%); textbook chapter writing (65%); published literature reviews in peer reviewed journals (59%); other published work (35%); mentoring graduate students (11%); and grant writing (8%) shown in Table II. There were no statistically significant findings when evaluating the relationship between institution type and differences between student contact hours, clinical hours, administration, and total working hours.

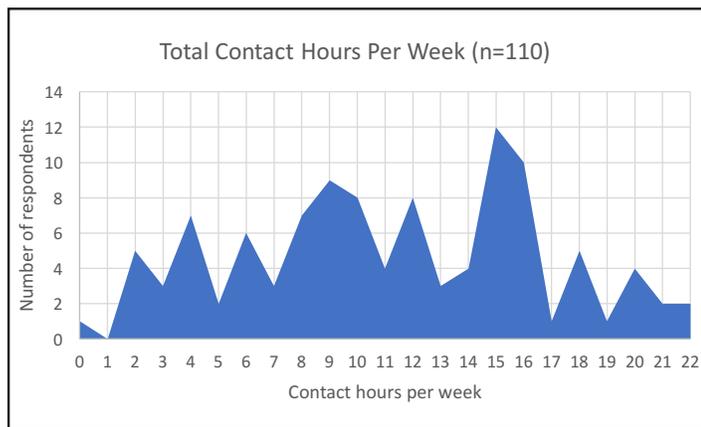
In regards to compensation, 47% of respondents indicated earning between \$60,000 and \$79,999, while 3% earned less than \$40,000 and 4% indicated salaries over \$100,000. (Table IV and Figure 6) The majority of the PDs surveyed indicated having a 12-month contract (55%), while others had contracts ranging from 9 to 11 months. (Table IV) PDs employed in a dental school setting had a longer average contract length when compared to directors in a community college environment ( $p = 0.031$ ) as shown in Table V. Some respondents also reported receiving additional pay for administrative duties, CE courses, additional service to the

**Table III.** Scholarly activity requirements by institution type. (n=115)

Institution Type	Scholarly Activity Required n(%)	Scholarly Activity Not Required n(%)
Technical School	1 (5%)	19 (95%)
Community College	14 (21%)	53 (9%)
University within a dental school	6 (67%)	3 (33%)
University not within a dental school	16 (84%)	3 (16%)

P<0.0001

**Figure 3.** Total contact hours per week



institution, teaching during non-contract time, and participation in faculty practices. (Table IV)

Adjusted monthly incomes varied substantially, with with the respondents receiving a mean monthly salary of \$6,726 with a standard deviation of \$1,530. ANOVA analysis determined no statistical statistically significant differences regarding monthly salaries as compared by geographical region. (Table VI) The total number of teaching years had a positive impact on adjusted monthly salaries (p=0.001) with survey respondents receiving an additional \$75.47 per month for each year of experience. When examining the total contract salary, PDs earned \$493.14 more per year for each year of teaching experience (p=0.017). Table VII shows that PDs holding a doctorate degree earned higher salaries than PDs with a master’s degree or those progressing toward a doctorate degree (p=0.001). Adjusted monthly salary and total salary compensation for PDs when compared to the number of years in their current position and institution type was not significantly different.

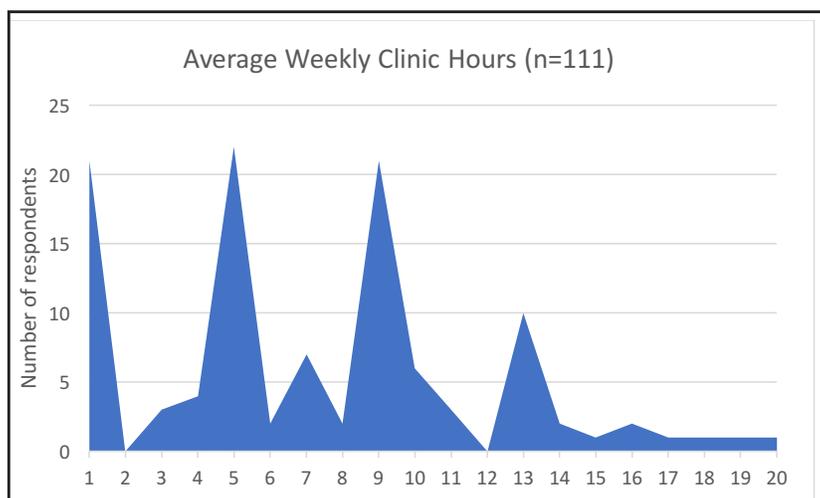
Employee benefit packages varied. One hundred percent of the respondents reported receiving medical insurance, 93% were offered dental insurance, and 91% received life/disability insurance. The majority of respondents (92%) indicated employer contributions to a retirement account with average contribution levels ranging from 3-10%. (Table VIII).

**Table IV.** Contract salary, length, and additional Income

Contract Salary (n= 70)	n (%)
<\$40,000	3 (4%)
\$40,000-49,999	2 (3%)
\$50,000-59,999	5 (7%)
\$60,000-69,999	24 (34%)
\$70,000-79,999	9 (13%)
\$80,000-89,999	15 (21%)
\$90,000-99,999	8 (11%)
>\$100,000	4 (6%)
Contract Length (n=103)	n (%)
9 mos	20 (19%)
10 mos	13 (13%)
11 mos	13 (13%)
12 mos	57 (55%)
Additional Pay Received for:	n (%)
Administrative duties	30 (25%)
CE courses	22 (18%)
Additional Service to institution	13 (11%)
Teaching during non-contract time	35 (28%)
Faculty practice participation	5 (4%)

Eighty-eight percent reported receiving institutional funding for travel to professional conferences; 65% reported receiving up to \$1,500 annually and 15% received \$3,000 or more. (Table VIII). Sixty-seven percent reported that their employer supports the pursuit of advanced degrees with 47% receiving financial support, 15% release time, and 30% received a combination of release time and funding.

**Figure 4.** Average weekly clinic hours

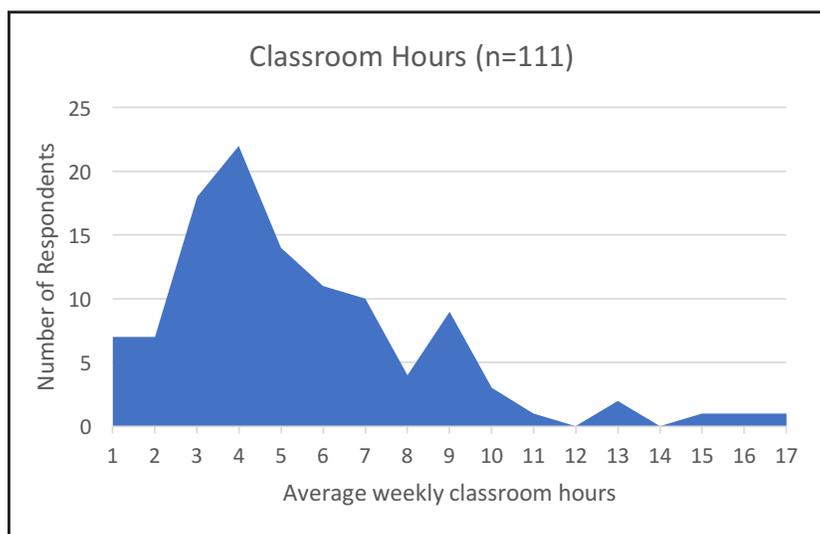


**Table V.** Average contract length in months based in institution type. (n=103)

	Contract Length in Months	Standard Deviation (+/-)
Technical School (n=16)	11.3	.294
Community College (n=60)	10.8	.152
University within a dental school (n=9)	12	.392
University not within a dental school (n=18)	11.2	.277

P=0.031

**Figure 5.** Average weekly classroom hours



(Table VIII) Sixty-four percent (n=71) indicated receiving 3-6 weeks off during their contract time annually while some outliers reported having 14 to 16 weeks off during their contract. (Figure 7)

### Discussion

Results from this study support the existing literature regarding the potential shortage of dental hygiene educators and more specifically PDs due to retirement as evidenced by the findings that 46% of PDs surveyed have held their position for three years or less and 35% anticipate retiring in the next 5 years. The recent ADEA survey does separate projected retirement rates between PDs and faculty members.<sup>9</sup> A high number of new PDs with fewer than three years in their current position, may be indicative of an increased PD turnover rate in recent years. These findings concur with previous research concluding that increasing numbers of PDs have either retired or otherwise vacated their positions, and that there are many new PDs in dental hygiene education settings.<sup>1</sup> The majority of the respondents in this study indicated a requirement of a master's degree to hold the position of program director which is consistent with CODA standards.<sup>14</sup> Considering that approximately one third of the dental hygiene education workforce currently only holds a bachelor's degree as their highest credential,<sup>9</sup> these individuals will not be qualified to assume the PD positions that are predicted to be vacant in the next five years.

Unlike previous ADEA Allied PD surveys, this study examined number of hours per week dedicated to specific activities rather than percentages of time.<sup>9</sup> Total contact hours were separated into clinical and classroom time. PDs can expect an average workweek of between 40 and 50 hours similar to that of full-time faculty members. These findings are similar to Collins et al. demonstrating that full-time baccalaureate faculty work approximately 50.5 hours a week, with the majority of this time spent teaching undergraduate students.<sup>21</sup> However, Hinshaw et al. found the dental hygiene program administrators, including PDs, commonly experience personal and professional patterns of stress and burnout.<sup>22</sup> Sources of professional stress include unsupportive administrators, faculty conflicts, staffing shortages, student issues, accreditation procedures, heavy teaching loads and limited resources.<sup>22</sup> Clearly defined PD roles and responsibilities

**Table VI.** Mean adjusted monthly salary by region of the country. (n=68)

Region of the Country	Mean Monthly Salary	Standard Deviation (+/-)
South (n=21)	\$6,110	\$411
Mid-Atlantic (n=6)	\$6,148	\$768
Mid-West (n=19)	\$6,311	\$432
West (n=15)	\$6,980	\$486
New England (n=3)	\$7,145	\$1,086
Southwest (n=4)	\$8,264	\$941

p=0.316

\*For this table, authors divided the dollar amount of contract salary by the number of contract months to determine an adjusted monthly salary.

**Figure 6.** Contract salary in thousands



**Table VII.** Average annual salary by highest degree held. (n=68)

Highest Degree Held	Mean Annual Salary	Standard Deviation (+/-)
Master's Degree (n=47)	\$71,198	\$2,151
Doctorate Degree (n=17)	\$86,741	\$3,577
Progress Toward a Doctorate (n=5)	\$66,200	\$6,596

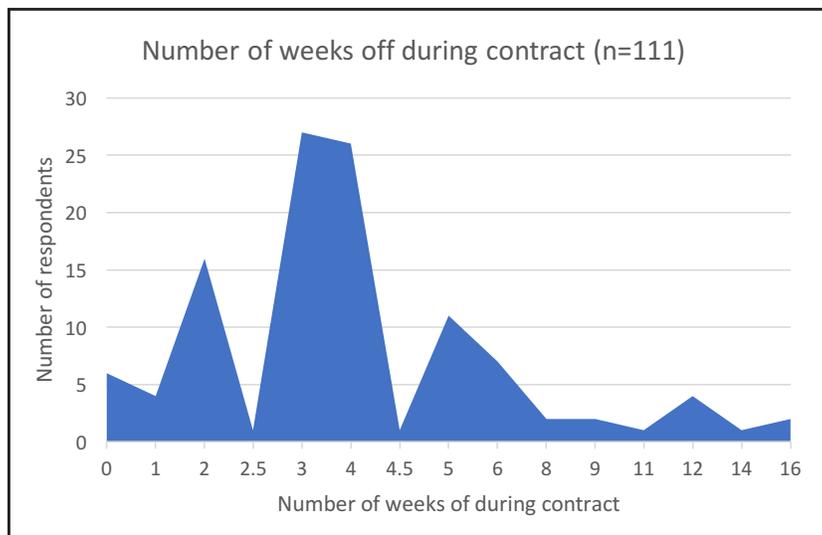
p=0.001

along with incorporation of stress management strategies should be a part of PD retention and recruitment strategies.<sup>22</sup>

Transitioning from a full-time faculty position to a program director position should ideally entail a shift of duties rather than a significant increase in total working hours. With an average 11.4 total contact hours per week, program directors continue to have a great deal of direct contact with students. Time spent on scholarly activity varied significantly with a higher number of PDs in university settings still required to engage in scholarly activity in addition to their administrative duties however continuing education and professional presentations were the most frequently selected options over submissions to peer-reviewed publications. This trend may be indicative of a movement from the more traditional view of scholarship to an environment that embraces Boyer's model of discovery.<sup>23</sup> Faculty scholarship as described by Boyer includes the discovery of new knowledge, integration of knowledge across disciplines, application of knowledge in addressing problems in society and the professions, and the development of teaching models, practices and approaches to achieve optimal learning.<sup>23</sup> While there appears to be more flexibility in the range of acceptable scholarly activity, future PDs should expect more requirements in this area when pursuing positions in university settings.

With respect to compensation, the more detailed results from this survey were consistent with average salaries of PDs as reported by the most recent ADEA survey.<sup>9</sup> A PD can expect to earn between \$60,000 and \$79,000 per contract salary depending on experience and the educational institution, with contracts ranging from 9-12 months. No significant differences in salaries were identified between different types of educational institutions or geographic regions of the country in spite of the assumption that with regional variations in the cost of living across the U.S. would influence compensation. However, there was a significant correlation between salary and number of years

**Figure 7.** Number of weeks off during contract



**Table VIII.** Additional benefits of program director positions

Does your employer...	n (%)
Provide group medical insurance? (n=111)	111 (100%)
Provide group dental insurance? (n=108)	100 (93%)
Provide life/disability insurance? (n=111)	101 (91%)
Contribute to a retirement account on your behalf? (n=111)	102 (92%)
For retirement account contributions, is there a matching requirement? (n=102)	68 (67%)
Does your employer provide money for travel to professional conferences? (n=111)	98 (88%)
<b>How much money is provided for travel each year? (n=80)</b>	
<\$500	18 (23%)
\$500-1000	19 (24%)
\$1,000-1,500	14 (18%)
\$1,500-2,000	9 (11%)
\$2,000-2,500	7 (9%)
\$2,500-3,000	1 (1%)
>\$3,000	12 (15%)
Does your employer provide support for pursuit of advanced degrees? n=111	74 (67%)
<b>In what way does your employer support the pursuit of advanced degrees? (n=74)</b>	
Financial support	35 (47%)
Release time	11 (15%)
Both	22 (30%)
other	6 (8%)

of educational experience and higher educational credentials. Based on this information, it may be assumed that a PD applicant with experience as an educator and a doctoral degree would command a higher salary regardless of the geographic location of the educational institution.

Employer provided benefit packages, an area not previously studied, demonstrated that the majority of the respondents were provided medical and dental insurance as well as life or disability insurance. In addition, most employers contributed to a retirement account on the employee's behalf and provided some level of an allowance for travel to professional conferences. However, it is worth noting that the travel allowances were relatively low and cover limited travel opportunities to professional conferences regardless of their location. Attending professional conferences is a particularly important aspect of being PD with benefits ranging from networking with other leaders in the profession to increasing the visibility and reputation of the dental hygiene program.

Limitations of this study include its sample size of 122 respondents as compared to the 2016 ADEA Allied Dental Program Directors survey. However, the limited generalizability of the results due to a smaller sample size can be mitigated by the additional detail collected on PD duties. Additionally, there were two questions with significant outliers in the survey results; the number of weeks off during contract period; and the employer contribution to retirement. These outliers may be due to misinterpretation of the question. Figures have been provided to visually represent all of the responses allowing for visualization of the data peaks.

Future research on this topic could include further investigation into identifying the skill sets required for success as a dental hygiene PD. Following a round table discussion held at the 2016 ADEA annual session led by the study authors, soft skills and types of professional development activities designed to assist interested candidates in preparation for the role of PD were identified. Responses included: conflict resolution and management among both students and faculty members; negotiation skills, specifically the ability to handle mid-level management; and leadership development.<sup>24</sup> Considering that open program director positions are commonly

filled by promoting qualified faculty members already employed by the institution, additional professional development in the identified areas may assist all candidates in preparation for a PD role. Another aspect of future study would be to survey PD as well as full-time dental hygiene faculty members regarding their job satisfaction similar to what has previously been done for dental faculty members.<sup>25</sup>

## Conclusion

A position profile detailing the range of employment expectations for dental hygiene program directors has been created and can serve as a detailed guide to inform and recruit potential program directors. Strategies to recruit qualified individuals into the program director position should be explored to ensure dental hygiene education continues to have highly qualified leaders.

## Acknowledgement

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## Disclosures

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# 2017 ADHA ANNUAL CONFERENCE RESEARCH ABSTRACTS

The American Dental Hygienists' Association (ADHA) Annual Conference Research Poster Session provides clinician researchers and educators an opportunity to present their work and exchange information and effective strategies for teaching and mentoring research with their colleagues and other oral health care professionals. The following abstracts were part of the Research Poster Session presented at ADHA's 2017 Annual conference in Jacksonville, FL .

\*Indicates poster presenter

## Experiences and Challenges of Dental Hygiene Clinicians as they Transition into Clinical Teaching

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**Problem:** Challenges often exist for novice clinical faculty as they transition from private practice into health professions education, and a lack of programs exist to aid and mentor novice clinical faculty as they transition into their new roles and responsibilities. Despite the research identifying challenges in many allied health education programs, the experiences of novice dental hygiene clinical instructors and any strategies they found to be helpful during their transition is unknown.

**Methodology:** A phenomenological qualitative study was performed using focus groups, with data collected from the responses provided from novice faculty during semi-structured interviews. Each of the focus groups were comprised of three to four novice faculty members. During the focus group interviews, study participants were asked open-ended questions regarding their experiences, and any challenges they encountered, as they entered the clinical teaching setting.

**Results:** Participants were both female (n=16) and male (n=1), were 25 to 60+ years of age, and had clinical teaching experience ranging from 1 to 5 years. The emergent themes, identified from the analysis performed on the participants responses, revealed many strategies and challenges novice faculty encountered as they entered their clinical teaching roles. The strategies found to be helpful during the transition into clinical teaching included: shadowing experienced faculty, the availability of resources such as textbooks and course materials as

teaching aids, and orientation sessions held prior to the beginning of each semester. The younger novice faculty members (aged 20 to 30) shared challenges in regard to being taken seriously by students due to their young age, while older faculty members (ages > 40) found relearning course content and terminology to be challenging.

**Conclusion:** The increased understanding of the experiences of novice clinical faculty, and the identified successful strategies and challenges they encountered, may aid in developing effective approaches and programs for novice faculty as they enter clinical teaching roles. "There was no funding provided for this project by any financial organization or institution."

## A Survey of Uncivil Behaviors in the Dental Hygiene Clinical Setting

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**Problem:** To create and maintain an effective learning environment general social civility by all persons concerned is required. Evidence suggests incivility in colleges is a growing concern and impedes learning. When uncivil behaviors are demonstrated in the learning environment, emotions such as fear, anger, uneasiness, resentment and or hostility often develop, negatively impacting learning outcomes.

**Methodology:** The IRB approved survey was made available online to a convenience sample of 75 dental hygiene students and 24 faculty with a 100% response rate. The survey instrument included two demographic items, one open ended question and two quantitative questions. Participants used a four point Likert- type scale to determine the degree to which ten behaviors were considered uncivil in the

clinic and also reported how often they occurred. Descriptive statistics were used to analyze all items on the questionnaire.

**Results:** Most faculty (83%) and students (78%) agreed that challenging faculty credibility and dismissing patient concerns were behaviors of incivility. Two-thirds of the participants agreed that eating or drinking in clinic (66% faculty; 72% students) was uncivil and most agreed that arriving late (75% faculty; 76% students) was more of a concern than leaving early (63% faculty; 59% students). Faculty perceived some clinical behaviors to be more uncivil than students such as working on non-clinical assignments during clinic (faculty 83%; students 61%) and being unprepared (83% faculty; 71% students). All 10 behaviors had been observed by faculty and students over the past 12 months at least 1 to 3 times. The most frequently reported behavior was students being unprepared although more students (51%) than faculty (26%) reported observing this in the past 12 months. Arriving late, using a computer for social media browsing and challenging the instructors' credibility were all reported as occurring more than 3 times over the past 12 months by most participants. Making offensive gestures was the least frequent behavior observed by both faculty and students.

**Conclusion:** Results from this study suggest uncivil behaviors in the clinical environment are problematic and frequently occur. Fostering awareness of uncivil or disruptive behaviors is critical in order for educators to develop effective ways to target the problem and promote optimal teaching and learning.

### Rethinking the Role of Technical Standards in Dental Hygiene Education Programs

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**Problem:** The term technical standard is often misunderstood by educators. Technical standards refer to the skills and activities that all students are required to demonstrate in order to be deemed competent to graduate from a health professions program. Frequently educators confuse technical standards with eligibility criteria or physical ability when considering applicants for acceptance into an educational program. This confusion, although unintentional, may be deemed as discrimination against otherwise qualified candidates. Appropriate technical standards establish objective criteria that does not exclude students from admission to a program based on a perceived disability. The purpose of this model is to encourage dental hygiene

education programs to rethink the role of technical standards.

**Significance:** A sample review of dental hygiene programs published technical standards revealed criteria that excluded candidates based on physical ability. Well-designed technical standards benefit both applicants and dental hygiene programs. This educational model clarifies the role of technical standards for dental hygiene education program administrators and faculty emphasizing the need for implementing and utilizing technical standards appropriately.

**Key features:** The approach to evaluating/developing technical standards begins with identifying what is required of all students for successful completion of a program through a comprehensive review of existing program competencies, standards, and requirements. Once this is complete, the dental hygiene program can assess the appropriateness of the standards by evaluating them against a set of established criteria. Do the technical standards focus on what must be accomplished and not how it is accomplished, are they observable/measurable, is there no distinction made between individuals with or without a disability, and do they reflect the knowledge and/or skills that are taught to all students in the program. Standards that meet the criteria are deemed appropriate.

**Evaluation Plan/Results:** The process for establishing appropriate technical standards was initiated at the University of New Haven in response to the increasing number of students who qualified for accommodations. The intent of the process was to develop technical standards that make it clear to applicants what is expected of students in the program, that emphasize learning outcomes, to eliminate standards that could be considered discriminatory, and focus on what must be accomplished rather than how it is accomplished without compromising program standards. Four years following the implementation of the technical standards the number of applicants and enrolled students remains relatively unchanged. The key impact has been to the culture of the institution with regards to how individuals that qualify for accommodations are perceived, how standards are communicated to students, and how both didactic and clinical standards are achieved.

## Erosive Effects of Frequently Consumed Juices on Primary Teeth

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**Problem:** The purpose of this study was to measure the erosive effects of children's beverages upon extracted primary teeth. Previous research has been conducted to determine the effects of dental erosion among children relative to the frequency and consumption time of a sugary beverage. The group of juices chosen for this study were a variation of juices utilized in other studies, as noted in literature review. Other studies utilized apple, orange-lime, and lime juices. The researchers of this study ascertained that the juices selected for this study were more appropriate of those consumed by children. For this study, the change in enamel was determined by the difference in weight to the nearest thousandth of a gram utilizing an electronic scale.

**Methodology:** This was primary research, experimental study design with a control group of teeth submerged in H<sub>2</sub>O. A group of 20 exfoliated incisor primary teeth were collected, washed with nonabrasive soap, and rinsed with distilled water. The teeth were divided into five groups of 4 teeth and steam under pressure sterilized. Following sterilization and cooling, the teeth were weighed, and dried in an oven for 40 minutes at 250 degrees F. The teeth were cooled again, re-weighed, and viewed under 4x microscopy to determine visible erosion. The teeth were then immersed into either apple juice, grape juice, orange juice, a fruit-vegetable blend juice, or distilled water (control). The teeth remained immersed for four days with solution changes at 24 hour intervals. At the conclusion of the 4th day, all teeth were rinsed with distilled water and weighed. The teeth were dried, re-weighed, and examined at 4x microscopy.

**Results:** Results indicated that apple juice demonstrated the greatest amount of weight loss of 0.1243 grams and the fruit-vegetable juice demonstrating the least weight loss of 0.0308 grams. Further, grape juice was found to be the most acidic with a pH value of 3.0 while the control was the least acidic with a pH of 5.0. The teeth soaked in grape juice revealed crystal formations, discoloration, and a difference in weight. The crystal formation was considered a limitation due to the possibility of affecting the final weight. Visual signs of erosion on the enamel under 4x microscopy, had an etched appearance.

**Conclusion:** Results indicated that apple juice was found to be the most erosive of the selected beverages with visible signs of erosion of the enamel when examined by 4x microscopy. It has been concluded the consumption of grape juice leads to tooth discoloration and erosion. Without constant submersion in grape juice, it is unlikely a crystal formation would occur within the oral cavity on tooth surfaces.

## Attitudes Toward Interprofessional Education: Comparing Dental Hygiene and Physical Therapy Students

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**Problem:** Interprofessional education (IPE) has the potential to improve student and patient outcomes. Dental hygiene educators are faced with an ever-expanding curriculum and are looking for creative ways to expose students to IPE activities in order to meet Commission on Dental Accreditation (CODA) standards. With increased IPE opportunities, future dental hygiene professionals will be better prepared to effectively participate as an interprofessional team member. There is a lack of research regarding dental hygiene student perceptions of IPE. The purpose of this study was to explore student perceptions and attitudes about IPE, interprofessional teaching, and collaborative learning following an observational job site analysis and educational session between physical therapy and dental hygiene students. The study intended to increase the understanding of student attitudes towards interdisciplinary education and readiness for IPE.

**Methodology:** This study used a primary quantitative cohort study design. The data sample consisted of first year dental hygiene students (n=11) and third year physical therapy students (n=39). Data was collected using a paper version of the Readiness for Interprofessional Learning Scale (RIPLS) survey. The RIPLS is a 19 question validated instrument designed to assess students attitudes towards IPE. It uses subscales including teamwork and collaboration, professional identity, and roles and responsibilities. Nonparametric tests were used for statistical analysis through SPSS software. Institutional Review Board approval was obtained.

**Results:** The demographics of the samples were fairly representative of corresponding populations of students enrolled in physical therapy and dental hygiene programs throughout the United States. A majority of participants were female, dental hygiene students (73%) and physical therapy students

(66%). Few dental hygiene students (27%) reported prior IPE experiences. Whereas, more (46%) of the physical therapy students reported prior IPE experiences. Overall, the difference in the RIPLS scores between the two groups of students were not statistically significant. However, there was statistically significant differences ( $p < .01$ ) in the student perceptions of the roles and responsibilities and sense of professional identity scales of the RIPLS. Overall, data analysis showed students from both groups perceived themselves as being ready to engage in IPE learning activities.

**Conclusion:** Results suggest dental hygiene and physical therapy students expressed a high level of satisfaction regarding IPE activities. The students from both programs valued these shared learning experiences with students from other health professions. The findings of this study can contribute to future efforts to help dental hygiene programs engage in meaningful IPE and contribute to developing interprofessional health care teams. Further research is necessary.

### Dental Hygiene Student Perspectives on Utilizing Magnification Loupes and LED Headlights

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**Problem:** Magnification loupes and LED headlights are increasingly used in dentistry during patient care. Although research has demonstrated positive effects of this technology on ergonomics and dental treatment, many dental hygiene programs do not require the use of this equipment. This study evaluated the perspectives of dental hygiene students regarding the impact that utilizing loupes and headlights have on their patient care experiences.

**Methodology:** This IRB approved study was conducted using an online survey developed, collected and analyzed with Qualtrics software. The 24-question survey was distributed through university email to all students within the 2016, 2017 and 2018, dental hygiene classes at The Ohio State University, where loupes are mandated. The responses from this convenience sample were collected anonymously.

**Results:** Of the 92 surveys distributed, 54 were completed for a return rate of 59% ( $n=54$ ). Respondents who agreed or strongly agreed that loupes improve efficacy and efficiency of patient care were 98% and 96%, respectively, with a slight drop to 93% for both questions when a headlight was considered. 100% perceived an improvement in

ergonomics with loupes, 84% with a headlight. Only 5.6% felt that they would be as comfortable providing patient care without loupes while 18.3% indicated they would be as comfortable without a headlight. 78% agreed or strongly agreed that loupes should be required of students, 93% of whom indicated that this equipment should be introduced during pre-clinical instrumentation courses. The number of positive responses dropped to 50% regarding a mandate for headlights. Less students felt strongly, at 69%, that faculty be required to use loupes and only 35% responded that headlights should be required of faculty.

**Conclusion:** Dental hygiene students within a program mandating loupes felt that this technology contributed to improved ergonomics, efficacy and efficiency of patient care. Respondents supported the loupes mandate for dental hygiene students and, to a lesser extent, for clinical faculty. Loupes were perceived as more valuable for patient care than headlights and the respondents were evenly split regarding a headlight mandate for students. Respondents indicated that they would feel compromised in providing patient care without magnification or a headlight.

### Comparison of two manual toothbrushes in effectiveness of plaque removal: A pilot study

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**Problem:** A novel toothbrush designed to facilitate the use of the Bass tooth brushing technique had not been tested for efficacy in plaque removal. Effective plaque removal is important to maintain optimum oral health. As new products are developed, it is important to conduct research to evaluate their effectiveness.

This quantitative pilot study evaluated the effectiveness of plaque removal of this novel manual toothbrush and obtained qualitative feedback on the ease and comfort of its use. The significance of the study was to provide scientific evidence to support toothbrush recommendations by oral health professionals.

**Methodology:** Primary quantitative research was conducted with a convenience sample (n=38) of first year dental hygiene students. Students meeting specific criteria consented to participate and were randomly assigned to one of two groups. A reference toothbrush was used as the control vs. the novel toothbrush.

For familiarization, subjects were given both study toothbrushes eight (8) days prior to data collection to use on alternate days for two (2) minutes twice daily. Subjects refrained from any oral hygiene procedures for twenty-four (24) hours prior to data collection when a baseline plaque score was recorded using the O'Leary Plaque Control Record. A split mouth experimental design was used for gathering plaque scores. Timed brushing was supervised by a research assistant, followed by a post-brushing plaque score. All plaque scores were recorded by the same examiner blinded to group assignment. Additionally, satisfaction data was gathered using a survey. Pre- and post-brushing scores were compared using t-tests and analysis of variance (ANOVA) to determine differences.

**Results:** In comparison of overall plaque scores, no significant differences were found between the two brushes or when comparing all interproximal surfaces, all smooth surfaces and left vs. right sides. Both brushes performed better on the left side. The control brush was shown to be slightly more effective than the novel toothbrush at removing plaque in the mandible (ADA, -0.29 vs MD, -0.21, p=0.0222) and on the lingual surfaces (ADA, -0.27 and MD, -0.21, p=0.0169). Results of the survey showed that the subjects significantly favored the novel brush. (p<0.0001). Survey comment results showed that the novel brush handle was the most liked characteristic (Chi-square p-value <0.001).

**Conclusion:** Both brushes were effective, although the reference brush was slightly more effective in plaque removal than the novel brush in the mandible and on lingual surfaces; however, the novel brush was preferred by participants. Upon completion of the study, participating students, then in their second year of dental hygiene school, learned about hypothesis, results, statistical tests and the differences in the quantitative and qualitative results.

## Older Adult Oral Health Education Curriculum

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**Problem:** Oral Health America (OHA) has piloted Tooth Wisdom: Get Smart About Your Mouth, an oral health education curriculum for community-dwelling older adults to be delivered in settings where they congregate, designed to empower them with knowledge and a sense of self-efficacy to care for their mouths. The workshop covers oral hygiene care basics and modifications that can be made to overcome barriers that are encountered with age.

**Significance:** The oral health of older Americans is in a state of decay. Limited access to dental services, affordable dental insurance, and programs that support oral health prevention and education are significant factors that contribute to the unmet dental needs among older adults. Concern is warranted for the 10,000 Americans retiring daily, as it is estimated that only 9.8 percent of older adults retire with dental benefits. Daily oral hygiene, ability to access professional services, and oral health education are all key factors that can improve the oral and overall health of older Americans.

**Key features:** The implementation model consists of identifying three partners in each market. The older adult workshops are coordinated by 1) an aging organization; 2) presented by registered dental hygienists, recruited in partnership with the American Dental Hygienists' Association and promoted through the oral health community by 3) the states oral health coalition. Before leading the workshops, dental hygienists are required to attend a curriculum training to build skills in effectively communicating with older adults and to deliver the material with sensitivity to cultural competency. The oral health knowledge of workshop participants is assessed by use of a pre- and post-questionnaire.

**Evaluation Plan/Results:** The initial 2014 pilot workshops, implemented in Chicago, exceeded the goal to reach 100 older adults, instead educating 238. OHA expanded the workshops in five markets throughout the country in 2015: Nashville, Chicago, Minneapolis, Portland, and Michigan. The results of the 2015 expansion illustrated the need for the curriculum and its impact on participants and continued in these markets in 2016. To date, OHA has trained 237 hygienists, delivering the curriculum to approximately 2,750 older adults. 2016 questionnaire data reveals 94% of participants felt more confident to manage their oral health after attending the workshop. The 2017 pilot is set to begin in the existing markets with improvements to the implementation model.

## Assessing and Impacting Research Utilization among Dental Hygiene Educators in Georgia

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**Problem:** As calls for incorporation of evidence-based practice (EBP) have increased, the concept of research utilization (RU) is gaining awareness in the dental hygiene (DH) profession. RU is the dissemination and translation of learning into practice, and an important component to implementing EBP. However, barriers thwart knowledge uptake. The aim of this intervention study was two-fold. First, to assess RU types—overall, conceptual, direct, and persuasive—among DH educators in Georgia (GA). Second, to improve the relationship between RU and GA DH educators through implementing an intervention addressing barriers and access to information sources.

**Methodology:** A cross-sectional study design employed a previously developed RU questionnaire as a pretest/posttest to the intervention, and contained 33 questions related to the following areas: demographic characteristics, RU types, and items regarding knowledge and information sources. The intervention, a problem-focused, online continuing education (CE) course incorporated five modules: (a) publications and research terminology, (b) information sources and databases, (c) searching techniques, (d) accessing findings, and (e) document formatting style. The theoretical framework of Rogers' Diffusion of Innovations guided intervention assessment. To measure diffusion of innovations five perceived attributes, a 14-item survey was developed using construct scales modified for DH and administered after each CE module. DH educators' email addresses (n=112) were acquired from GA DH program's (n=16) website or requested from directors if not listed. All educators were invited to participate in the CE course.

**Results:** Twenty-two DH educators (10.2%) completed the pretest and eight (36.4%) completed the posttest. RU mean responses were highest for overall (4.41) followed by conceptual (3.91), direct (3.57), and persuasive (3.19). Posttest RU responses were not statistically significant. Direct RU had a negative correlation with education ( $p=0.04$ ) and employment setting ( $p=0.026$ ). Post-hoc power analysis revealed the sample size required exceeded the total number of GA DH educators to detect smaller statistical differences. Respondents' knowledge mostly derived from attending in-services or conferences (100%) and information learned about patients (100%). Fifteen DH educators

(68.2%) progressed to the intervention. Respondents attribute agreement level remained positive for each CE module as means ranged from 3.87 to 4.8.

**Conclusion:** DH educators integrate differing RU types teaching practice and most commonly utilize conceptual RU. An intervention aimed at providing knowledge and materials to promote action had subtle impact to shift RU type. Rogers' theory has applicability to assess an interventions rate of adoption by measuring perceived attributes. Potential limitations to conclusions exist based on sample size and number of respondents.

## A Cross-Sectional Analysis of Dental Hygiene Students and Registered Dental Hygienists Professional Identity Perceptions

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**Problem:** Professional identity is uniquely developed by each profession and separates it from other professions. Given the fact that dental hygiene is a profession and that dental hygienists are taught professional traits, ethics and skills, it is crucial to develop a better understanding of how dental hygiene students develop their professional identity. This research project fills a void in the literature concerning how dental hygiene students develop professional identity.

**Methodology:** This study was determined to be exempt by the University of Michigan IRB (HUM00100425). A convenience sample of N=215 DHSs and N=352 RDHs in Michigan participated in this cross-sectional survey. DHSs were recruited electronically, RDHs via postal mail and electronically through the professional organization. The surveys consisted of demographic information followed by questions regarding 19 professional identity characteristics that fell into four major domains. The DHS survey asked questions regarding the current and prospective importance of their professional identity/role. The RDH survey asked subjects to assess the importance of these aspects currently as professionals and retrospectively as a DHS. Descriptive and inferential statistics were used to analyze the data.

**Results:** Students rated the importance of their future professional pride even higher than the current importance while attending a dental hygiene program (future: 4.83 vs. current: 4.77;  $p < .001$ ). RDHs rated the importance of professional pride higher in the current time than as students (past: 4.24 vs. current 4.45;  $p < .001$ ). Comparing the four domains, the current Professional pride and Patient relations were higher than the mean retrospective responses for RDHs importance ratings of their current versus student professional role perceptions. Furthermore, RDHs rated being a member of the ADHA higher as a student than as a licensed hygienist (past: 3.43 vs. current 2.66;  $p < .001$ ).

**Conclusion:** While the data indicated that the majority of the nineteen characteristics were important to both groups, significant differences exist between RDHs and DHSs perceptions of professional identity. Professional association membership, providing community service, and advocating for the profession were highly valued by DHS respondents but undervalued by RDHs respondents. Future studies should explore the devaluing of these particular characteristics by licensed hygienists once they complete their education.

### **Saudi Dental Hygienists Attitudes and Opinions Regarding Establishing a Professional Association**

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**Problem:** Professional associations provide resources for members to support and enhance their careers. Even though dental hygiene has been a licensed profession in Saudi Arabia since 1980, there is no professional association.

**Methodology:** A cross sectional electronic survey using Qualtrics was developed by the investigators to assess dental hygienists' professional needs in different regions of Saudi Arabia, and their opinions and attitudes about establishing a professional association. IRB exemption was obtained. The survey was pilot tested by five Saudi dental hygienists and revised prior to distribution. Email addresses were available for 101 licensed Saudi dental hygienists, obtained by direct contact. Subjects were emailed a link to the survey and asked to participate. An email reminder was sent to non-respondents two weeks after the initial email. Descriptive statistics were generated for each survey item using Fishers Exact test. Level of significance was set at 0.05.

**Results:** Seventy-seven subjects responded to the survey, 6 only provided demographic information, yielding a response rate of 70.3% ( $n=71$ ). Of the respondents 91.5% favored the establishment of a Saudi Dental Hygiene professional association. Additionally, 88.1% ( $n = 59$ ) agreed that an association would promote development of the profession in the country and 86.6% agreed that their professional needs could be met by its establishment. Sixty-two individuals (92.5%) indicated that they would become members of the future dental hygiene association, and (82.1%) indicated interest in potential leadership positions. Interestingly, half of those who did not support the creation of the professional association believed it would promote development of the profession and meet professional needs.

**Conclusion:** Dental hygienists in Saudi Arabia support the establishment of a professional association and feel that it would advocate and promote the dental hygiene profession in the country while meeting their professional needs.

### **Dental Hygienists Knowledge, Attitudes, and Comfort Level in Treating Patients with Dental Anxiety**

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**Problem:** Dental anxiety has been ranked as the 5th most common fear in the general population and affects approximately 20% of adults in the United States. It is a common cause of delayed dental care, resulting in declining oral health and oral health related quality of life. Dental hygienists are in a paramount position to educate patients on the causes, risks, and treatment of a patient with dental anxiety.

**Methodology:** Institutional Review Board (IRB) granted exemption status for this study. A survey was developed, pilot tested, and administered to participants at the University of North Carolina (UNC) Annual Dental Hygiene Lecture continuing education (CE) course in April 2016. The survey consisted of five main domains: 1) demographics; 2) practice setting; 3) practice behaviors; 4) dental anxiety awareness; and, 5) opinions and attitudes. The quantitative survey utilized a Likert Scale ranked from extremely frequent to never and strongly agree to strongly disagree. Descriptive statistics for each response item were produced.

**Results:** Of the 157 participants of the study, 153 met the inclusion criteria (97.5%). Approximately 1/3

of the participants had been practicing for <10 years (N=30.3%). When participants were asked how to identify a patient's dental anxiety, only 19.7% Often or Always use dental anxiety questionnaires. Only 43% of participants knew all of the common signs and symptoms of a patient suffering from dental anxiety. Most (92%) were confident in their ability to perceive patient stress. Many (78%) are interested in learning about dental anxiety questionnaires and 82% want information about treatment options and referral for patients with severe dental anxiety. Over half (58%) reported their dental hygiene education prepared them for treating patients with mild dental anxiety, 37% with moderate dental anxiety, 22% with severe dental anxiety.

**Conclusion:** Although the majority of dental hygienists felt confident in identifying anxiety in patients, few utilized validated questionnaires to determine the level of anxiety. Dental hygiene education programs should include content on anxiety management for patients with all levels of dental anxiety. Dental hygienists are in a pivotal position for discussing the risks, characteristics, and treatment options

### Assessing Temporomandibular Disorder in Music Performance Students

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**Problem:** There is a lack of evidence in the literature on the incidence of temporomandibular disorder (TMD) in voice students undergoing a rigorous program of study. A risk assessment may be useful to evaluate this population.

**Methodology:** All subjects, 23 voice majors and 14 non-voice majors, were students (mean age = 20.3 years) enrolled full-time in a university setting. Instruments administered at the start of the semester, and again 5 months later, included the Oral Behaviors Checklist to determine the presence of parafunctional behaviors and the Jaw Functional Limitation Scale of the masticatory system. The Research Diagnostic

Criteria for Temporomandibular Disorders (RDC/TMD) exam was implemented by a calibrated dental hygienist to determine self-reported pain in the previous 30 days and current pain on palpation in the temporalis, masseter, other muscles of mastication, and the TMJ. Incidence of headache, comorbid to TMD, was also recorded as part of the exam.

**Results:** Voice majors reported singing 4-7 nights/week (52%), 1-3 nights/week (39%), 1-3 nights/month (8.7%), while none of the controls sang more than 1-3 nights/month. Days of reported pain in the previous 30 days pre-semester for voice students was M=4.26 (SD=5.10) and post-semester M=4.65 (SD=7.77), while controls pre-semester reported M=1.14 (SD=2.79) and post M=0.85 (SD=1.83). Data limitations occurred because the distribution was non-normal. Controls were negative for arthralgia pain on palpation, while 43.5% of singers were arthralgia positive both pre and post-semester. Only one control responded positively for myalgia pain on palpation, however, 56.5% of singers reported myalgia pain from various locations. When looking at overall females from both groups (N=26), 50% reported incidence of facial pain in the last 30 days, representing a higher rate than males both pre and post-semester. The highest rate of days of pain were reported by 7 female singers with 10 or more days in the previous 30 days, however, there was variance in whether the worst pain occurred before or after the semester.

**Conclusion:** The RDC/TMD Axis I examination and Axis II self-report instruments are used routinely in TMD research. This pilot study demonstrated an overall greater incidence of TMD pain in voice students over controls, but without a significant increase post-semester. Consistent with the literature on gender, females in general had a greater incidence of pain than males. Future analyses with larger sample sizes, onset of pain, years of voice study, with possible inclusion of professional singers, may be feasible.

### Compensation and Job Characteristics of Dental Hygiene Program Directors

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**Problem:** There has been a high rate of turnover in program director positions in recent years. Research suggests a large number of anticipated retirements in the coming years, which could potentially lead to an administrative void in dental hygiene education.

**Purpose:** The purpose of this cross-sectional study was to collect information about program directors to create a comprehensive job profile for the profession and add to the current literature regarding trends in dental hygiene education positions and compensation.

**Methodology:** An electronic survey was sent to all directors of accredited dental hygiene programs in the United States (n=314) in October 2015. The survey instrument was submitted for approval by the Pacific University Institutional Review Board (IRB). The IRB determined that the project was outside of their jurisdiction and did not require approval. The survey consisted of 38 items which addressed the following areas: job characteristics; required duties and expectations of program director positions; compensation of program director positions; anticipated retirement of program directors; and demographics, including geographic region. The survey was developed using Qualtrics software (Qualtrics, Provo, UT) and administered via email. Descriptive and inferential analyses were completed using SPSS (version 23, IBM).

**Results:** Responses were received from 122 program directors (response rate of 39%). Seventy-one percent of respondents were ages 50-59 and 46% of respondents have held the program director position for 3 years or less. Thirty-five percent of participants plan to retire from their program director position in the next five years. Forty-seven percent of respondents indicated making between \$60,000 and \$79,999, while 3% answered less than \$40,000 and 4% over \$100,000. Total number of teaching years and degree held had a positive impact on adjusted monthly salary ( $p=0.001$ ). Directors working in university settings were significantly more likely to have requirements for scholarly activity ( $p<0.0001$ ). Respondents spent the majority of their work week on administrative duties (mean=22.5 hours), with other responsibilities including teaching, scholarly activity, and committee work, with an average workweek of 40-50 hours.

**Conclusion:** A job profile has now been created and will serve to inform potential program directors and to support the recruitment of program directors. Those considering a program director position should expect the majority of their workload to be administrative, followed by teaching and scholarly activity, and could likely expect a salary between \$60,000 and \$80,000.

### Access to Oral Health for a Homebound Population in an Oral Healthcare at Home Pilot Program

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**Problem:** Evidence shows significant disparities in access to oral health care for the homebound population. This population continues to suffer from more chronic health conditions, disabilities, and a worse current health status than the general population. The homebound also struggle with lower socioeconomic status, therefore contributing to challenges in access to oral health care. Understanding comorbidities and barriers the homebound population, while evaluating the oral health needs will help guide future research.

**Methodology:** A mixed methods design was used to gather qualitative data through in-depth interviews and quantitative demographic and retrospective data. Participants for this study were individuals who received dental care through the Oral Healthcare at Home pilot program with the Certified Public Health Dental Hygienist (CPHDH), met the Medicare definition of being homebound, and provided informed consent. A retrospective review of an intake survey (16 items), initial oral health assessment survey (14 items) and post oral health assessment (8 items) was conducted for each participant. In-depth interviews were conducted with participants, audio-recorded, and a thematic analysis was conducted. Descriptive analysis was done for retrospective assessment and intake survey data.

**Results:** Of the 17 eligible participants, 94% agreed to take part in the evaluation (n=16) and of these 88% completed the demographic surveys (retrospective chart review, intake survey) and the in-depth interview (n=15). The mean age of the participants was 59.87 years old. The majority (73%) suffered from co-morbidities. The average number of medications was 10. Caries risk was high, a mean of 22.2 teeth were present, mean number of coronal caries 2.5 and root caries 2.3. Approximately 26.7% exhibited moderate periodontitis and 6.7% had severe periodontitis. Forty percent had oral infection that could not be treated by the CPHDH. The themes identified from the qualitative data included: lack of

dental care, oral health status, resources (costs and transportation), positive experience with program, satisfaction of care from the CPHDH, and improved access (convenience and comfort).

**Conclusion:** The homebound population in this study reported a positive experience and satisfaction with care by the direct access dental hygienist (CPHDH) suggesting this is an approach to effectively providing preventive oral health services and identifying those in need of referral for more complex dental needs.

**Interleaving So They Don't Leave without Understanding: Using Interprofessional Examples and Theoretical Content to Foster Development & Transfer**

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**Problem:** The purpose of this research was to examine the viability of participatory instructional techniques (graduated prompting and alternative modeling) in promoting retention of theoretical material, critical thinking, and application of course material to professional practices scenarios.

**Significance:** Addressing the preconceptions first- and second-year allied health professional students bring with them is an instructional challenge. These preconceptions may influence students' ability to understand and apply theoretical course material and perceive how such material relates to their future careers. Their limited clinical experience compounds the challenges of associating current learning with their future practices.

**Key features:** Data were collected through written student reactions to real-life clinical stories presented by a registered dental hygienist. This in-class activity was conducted over seven semesters in a medium-sized human development class of aspiring health care professionals from various disciplines (dental hygiene, nursing, pharmacy, health psychology, and radiological sciences), n = >350, and with limited clinical experience. Qualitative analysis of the students written reactions examined their use of theoretical material and their ability to construct a patient-centered response (students' choice of words, students' tone of their responses).

**Evaluation Plan/Results:** The instructional techniques did make the students thinking visible, allowing the instructors to quickly grasp students understanding and providing opportunities to immediately address student misconception. The

instructional techniques also provided students with alternative models and opportunities to think critically. The sequential nature of the activities in each class stimulated some students' ability to relate the stories to the theories they were learning and expand their understanding of the scope of practice for a dental hygienist. But, students varied in their ability to effectively incorporate course material in their responses to a real-life clinical scenario. Furthermore, many students initially could not accept that patients would discuss specific medical conditions outside of their perceptions of the scope of practice for a dental hygienist. Notably, some students felt that discussion of anything not related to the dental appointment was inappropriate. Helping students grasp theoretical content and develop their metacognitive and transfer skills is challenging. Exposing health professions students to real life scenarios, early in their education, may help foster the importance of developing their metacognitive and transfer skills to their future practice.

**California Dental Hygienists' Knowledge, Attitudes and Practices Regarding Polypharmacy and Off-label Drugs**

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**Problem:** Off-label prescribing of medications gives freedom to healthcare practitioners to utilize therapeutic options based on the latest evidence. Due to the increasing number of patients and professionals utilizing polypharmacy and drugs off-label, it is imperative that dental hygienists are able to recognize and evaluate these situations for comprehensive patient assessment and education. To date, there have been insufficient studies published concerning the knowledge, attitudes and practices of dental hygienists regarding polypharmacy and off-label drug recognition and use. This study addressed the U.S. Department of Health and Human Services Healthy People 2020 initiative specifically related to the goal of ensuring the safe use of medical products. Objectives MPS-4 and MPS-5 for this health initiative included increasing the number of safe and effective drugs and reducing the numbers of drug related medical emergencies. Additionally, this study supports the National Dental Hygiene Research Agenda created by the American Dental Hygienists' Association by examining the dental hygienists' role in oral health care, specifically as it relates to patient assessment and safety related to polypharmacy and off-label drug use.

**Methodology:** In a cross-sectional design, knowledge, attitudes, and practices (KAP) related to

off-label drugs and polypharmacy were assessed via an online survey tool. The sample included licensed dental hygienists who were registered with the Long Beach and Tri-County Dental Hygienists Associations in Southern California (N=360). Participant characteristics were calculated using descriptive statistics. ANOVA was used to assess differences in knowledge, attitudes and practices when compared to three key variables: highest academic/professional degree, experience and license type.

**Results:** One hundred seven surveys were returned for a 34% response rate. Over half of respondents (53%) held an Associate degree for their license, most (72%) worked in a general dentistry setting and 46% had practiced 15 years or less. Results revealed very low knowledge levels with 25% of respondents answering zero knowledge items correctly. Furthermore, no significant differences in knowledge and practices related to off-label drugs or polypharmacy were found based on type of licensure, highest degree achieved, or years of experience. However, participants holding a Bachelor degree or higher were significantly more confident ( $p=.011$ ) in discussing polypharmacy with patients and colleagues.

**Conclusion:** Participants showed a general low-level of knowledge related to off-label drugs and polypharmacy regardless of their level of education, years of experience, or type of dental hygiene licensure. These results indicate a grave need for increasing content in pharmacology in both entry-level programs and continuing education courses.