American Dental Hygienists' Association

Journal of Dental Hygiene

The American Dental Hygienists' Association

December 2015 • Volume 89 • Number 6

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Volume 89 • Number 6 • December 2015

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

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The *Journal of Dental Hygiene* is published bi-monthly online by the American Dental Hygienists' Association, 444 N. Michigan Avenue, Chicago, IL 60611. Subscription rates for nonmembers are one year, $60.

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Features

EDITORIAL

Leadership and Research: Do They Impact Decision Making in Dental Hygiene?

Rebecca S. Wilder, RDH, BS, MS

How does leadership impact decisions that are made about our profession? We will explore these areas in the coming year. For example, in September the ADHA published the white paper on Transforming Dental Hygiene Education and the Profession for the 21st Century. As I write, the members of the ADHA Council on Research are revising and updating the National Dental Hygiene Research Agenda. A proposal is underway for the first doctoral program in dental hygiene in the United States. All of these initiatives take leadership and vision to make them happen. But how does research and scholarship impact these decisions?

Thousands of articles and books have been published on effective leadership skills. We know that leaders have certain qualities that can assist them in leading employees, organizations and associations, members, students, etc. Some of these qualities frequently listed of leaders are passionate, visionary, courageous, great communicator. Passion is important for a leader, believing in a greater cause that will improve people and organizations in the future. Vision is important as it helps the leader look "outside of the box" and see how the future could be different. Knowing that change does not come with a roadmap, the leader must be able to guide the team though seeing the vision the same way the leader sees it. Communication skills are essential. If one is to lead and promote change, the leader must be able to clearly and succinctly describe what he/she wants to do or change. Courage is important because change is hard! The leader will not always be embraced and liked for his/her ideas. A true leader will listen, make a decision and have the courage to move toward the vision or re-think and revise. But one thing that is certain…not everyone will be pleased.

While leaders need to have particular qualities to be effective, I would also add that they need to have investigative skills. They need to consider research evidence when making decisions that will impact others. Beginning with the February issue of the Journal of Dental Hygiene, six different leaders in dental hygiene will write about how leadership and evidence help guide decisions. Each leader will write about a different area that will impact the future of the dental hygiene profession and how they have used their leadership skills along with research data/evidence to make decisions and promote change. Topics include education, research, professional development programs, and others. I look forward to hearing from the experts who will contribute to the JDH editorials in 2016 and encourage you to read and share what they have to say with others!

As we close 2015, I want to thank you for being a part of the American Dental Hygienists' Association and particularly for your support of the scholarship and research of the profession.

Sincerely,

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

Antimicrobial Photodynamic Therapy as an Adjunct to Nonsurgical Periodontal Therapy

Denise M. Bowen, RDH, MS

The purpose of Linking Research to Clinical Practice is to present evidence based information to clinical dental hygienists so that they can make informed decisions regarding patient treatment and recommendations. Each issue will feature a different topic area of importance to clinical dental hygienists with A BOTTOM LINE to translate the research findings into clinical application.

The Bottom Line

Adjunctive photodynamic therapy (PDT or aPDT) is a low-power laser (diode laser, 660 to 810 nm) used in combination with a photosensitizing agent for antimicrobial purposes in the nonsurgical treatment of periodontitis. Mechanical therapy, including periodontal debridement or scaling and root planing, has been shown to effectively reduce periodontal pathogens, inflammation, bleeding and probing depths, and to increase clinical attachment levels. The effectiveness of mechanical nonsurgical periodontal therapy (NSPT), aimed at the reduction or elimination of periodontal pathogens and conditions which harbor them, is diminished in the presence of difficult access including deep pockets, furcation defects and root concavities. Many periodontal pathogens are susceptible to low-power lasers in the presence of photosensitive dyes, for example, methylene blue, toluidine blue or phenothiazine chloride. These light-activated photosensitizers are cytotoxic to microorganisms associated with periodontal disease, resulting in cell death. Thus, aPDT has been suggested as an antimicrobial adjunct to NSPT. The term phototherapy differs from aPDT, as phototherapy refers to the use of lasers in conjunction with mechanical periodontal treatment to perform soft tissue debridement or curettage as well as to reduce periodontal pathogens in the periodontal pocket.

Based on the findings of these 2 studies, the ensuing conclusions regarding aPDT can be drawn:

- Although additional research is needed to strengthen the evidence and make a clinical recommendation for aPDT use, there is some evidence to support the use of aPDT as an adjunct to scaling and root planing (SRP), but not as a monotherapy, in the treatment of chronic and aggressive periodontitis (AgP).
- The findings of these articles regarding aPDT support the findings of a systematic review and meta-analysis on the nonsurgical treatment of chronic periodontitis by means of scaling and root planing with or without adjuncts conducted and published by a panel of experts convened by the American Dental Association Council on Scientific Affairs.[1]
  - There was a low level of evidence supporting the non-PDT DL (809 to 980 nm) based on a small gain in clinical attachment loss (CAL) (0.21 mm) compared with SRP alone, although the ADA found a moderate level evidence supported the use of the PDT DL in conjunction with a photosensitizing agent (0.53 mm gain in CAL).
- Studies regarding use of lasers in NSPT show significant heterogeneity in techniques used including power settings, laser wavelengths, length of exposures, fiber diameter, and number of applications. Standardized parameters for use are needed for research and practice.
- Clinicians need to consider the initial investment for required laser devices as well as the cost of photosensitizing agents and maintenance. These factors should be weighed against the low level of evidence supporting the use of aPDT for the treatment of periodontitis in practice.

Al Habashneh R, Asa'ad FA, Khader Y. Photodynamic therapy in periodontal and peri-implant diseases. *Quintessence Int*. 2015;46(8):677-690.

Abstract: In recent years, photodynamic therapy (PDT) using a combination of photosensitizer and laser light source has been used in periodontal therapy. The aim of this review is to provide an overview of the current status and use of PDT.

Data Sources: A review of pertinent literature was carried out in PubMed to determine the current position of PDT applications in periodontal and peri-implant diseases.

Conclusions: In spite of different results and suggestions from various researchers, the present review showed that use of PDT may help improve

periodontal outcomes. Therefore, it could become a new method for antibacterial treatment and may be used as an adjunct to or as conventional therapy for the treatment of periodontal and peri-implant diseases. Based on the results presented herein, there is promising, albeit preliminary, information regarding the benefits of PDT use on periodontal treatment outcomes. However, the conclusions are a reflection of a relatively small sample size and therefore need to be demonstrated in the general population.

Clinical Relevance: Periodontal diseases and peri-implantitis are among the specific targets where PDT can be applied.

Commentary

In this article, Al Habashneh et al reported the results of a review of the literature designed to evaluate the current status and use of PDT as an adjunct to SRP during initial nonsurgical and supportive periodontal therapy for periodontitis and peri-implantitis. The review is not a systematic review, so it cannot be considered the highest level of evidence available. The authors explain a meta-analysis would have been misleading because differences in published studies related to populations, methods, interventions and types of indices used to measure outcomes. A meta-analysis is a research approach which statistically combines results of several individual studies to increase the power of the results and strengthen the conclusions. When data collected in different studies are not similar, this approach is precluded. The next highest level of evidence; however, is the systematic review, an approach that involves a detailed and comprehensive plan and search strategy derived in advance to answer a specific research question, with the goal of reducing bias by identifying, appraising and synthesizing all relevant studies on a particular topic. The systematic review can be conducted without taking the next step of meta-analysis. A narrative literature review, such as this one, is mainly descriptive and does not involve the same level of systematic search of the literature. Nonetheless, this review of the literature is informative and provides an overview of pertinent literature gathered through a search of PubMed regarding PDT in initial NSPT and maintenance therapy.

PDT has been shown to kill periodontal pathogens such as *Porphyromonas gingivalis*, *Fusobacterium nucleatum* and *Aggregatibacter actinomycetemcomitans* (previously *Actinobacillus actinomycetemcomitans*) to name a few, within dental biofilm. Although many studies have shown effects in vitro, this article is focused on the clinical effects of PDT in vivo. The findings presented in the literature review by Al Habashneh et al showed agreement regarding the fact that PDT must be used in conjunction with mechanical periodontal therapy and not as a monotherapy to provide clinical benefits. Results of the in vivo studies indicated that PDT kills periodontal pathogens when used in conjunction with NSPT; however, findings regarding bleeding on probing, pocket depths and clinical attachment levels following PDT as an adjunct to SRP were mixed. The authors presented a summary of findings of many randomized controlled trials (RCTs) using these parameters. All RCTs included in the review used a split-mouth design. Despite the mixed results of these published RCTs, as well as differing conclusions drawn on the basis of the systematic reviews and meta-analyses discussed by these authors, they concluded that the evidence indicates PDT in conjunction with NSPT may improve periodontal outcomes for healthy patients with chronic periodontitis. The authors indicated, however, more research is needed to determine effectiveness of PDT in medically compromised patients and aggressive periodontitis, as well as in treatment of peri-implant disease and during supportive periodontal therapy. The exact protocol for using PDT as an effective adjunct to periodontal therapy also needs to be defined and standardized. However, according this review by Al Habashneh et al, PDT is safe to use given that the patient and clinicians wear protective glasses for protection of the eyes from inadvertent irradiation.

Readers are cautioned to consider conclusions of narrative literature reviews in relation to stronger evidence presented in reports of meta-analyses, systematic reviews and RCTs. However, the findings of this literature review are supported by the findings of a 2015 systematic review and meta-analysis on the nonsurgical treatment of chronic periodontitis by means of SRP with or without adjuncts conducted and published by a panel of experts convened by the American Dental Association Council on Scientific Affairs.[1] That review found that a moderate level evidence supported the use of the PDT diode laser (0.53 mm gain in CAL) beyond root planing alone.

Vohra R, Akram Z, Safii SH, et al. Role of antimicrobial photodynamic therapy in the treatment of aggressive periodontitis: A systematic review. *Photodiagnosis Photodyn Ther*. 2015. pii: S1572-1000(15)30001-6.

Abstract: The aim was to assess the efficacy of antimicrobial photodynamic therapy (aPDT) in the treatment of aggressive periodontitis (AgP).

Methods: The addressed focused question was "Is aPDT effective in the treatment of AgP?" MED-LINE/PubMed, EMBASE, Scopus, ISI Web of knowledge and Google-Scholar databases were searched from 1977 till May 2015 using combinations of the following keywords: antimicrobial; photochemotherapy; photodynamic therapy; photosensitizing agents; AgP; scaling and root-planing (SRP). Reviews, case reports, commentaries, and articles published in lan-

guages other than English were excluded.

Results: Seven studies were included. In 5 studies, aPDT was performed as an adjunct to SRP. Laser wave-lengths and duration of irradiation ranged between 660–690 nm and 60–120 s, respectively. Laser power output as reported in 2 studies was 75 mW. One study showed significant improvement in periodontal parameters for subjects receiving aPDT as an adjunct to SRP as compared to treatment with SRP alone at follow up. However, comparable periodontal parameters were reported when aPDT as an adjunct to SRP was compared to SRP alone in the treatment of AgP in one study. One study showed comparable outcomes when aPDT was compared to SRP in the treatment of AgP. In two studies, adjunctive antibiotic administration to SRP showed significantly better outcomes when compared to application of adjunctive use of aPDT to SRP.

Conclusion: aPDT is effective as an adjunct to SRP for the management of AgP, however, further randomized clinical trials with well-defined control groups are needed in this regard.

Commentary

This study was a systematic review and meta-analysis conducted to assess the efficacy of adjunctive photodynamic therapy, or aPDT (PDT), laser therapy for patients with AgP. AgP is a rapidly progressive form of periodontitis that generally is found without congruent systemic diseases or dental deposits, such as biofilm and calculus. Although SRP is a common nonsurgical treatment approach for AgP, its effectiveness is limited in deeper pockets and areas of difficult access. Systemic antibiotics have been studied with some evidence supporting their use as an adjunct to SRP, although risks of resistant strains and side effects present concerns. Thus, aPDT has been studied as an adjunct to SRP to reduce the bacterial load.

The authors described the specific system for the literature review including databases searched (Cochrane CENTRAL and MEDLINE PubMed), search terms used and criteria for inclusion of quality studies designed to address a specific questions. Following the systematic review, data from the 7 articles included in the systematic review were statistically combined in a meta-analysis. Thus, the findings of this study provide the highest level of evidence available regarding using aPDT in the treatment of AgP.

Similar to the literature review previously discussed, all of the seven RCTs included in this systematic review used a split-mouth design. Comparisons made in split mouth designs involve using a different intervention on each half of the mouth in the same patient, in this case SRP plus aPDT versus SRP. The advantages of this design include controlling for individual variations between subjects and allowing for lower numbers of subjects in the clinical trial without a loss of statistical power. Results, however, might be affected by differences in disease patterns on one side of the mouth versus the other unless randomized or controlled. Effects of the 2 treatments may also carry over from one side of the mouth to the other. A split-mouth design should only be used when it is known that no such crossover exists, and it has been assumed that there is none for laser therapy. The methods outlined for aPDT use in the studies included differed in terms of power output, wavelengths used, fiber diameter, time of exposure and number of applications. This heterogeneity is less than ideal for the combination of data from all 7 studies in the meta-analysis. The lack of a defined protocol for aPDT also is a disadvantage to practitioners using the antimicrobial laser therapy as the evidence regarding effectiveness is not based on a given procedure that has been determined to be safe and efficacious. However, this review concluded more than 1 application is needed to sustain an antimicrobial effect for 12 weeks.

Outcomes and comparisons with other nonsurgical periodontal therapies used for AgP varied in the seven studies included in this systematic review. Findings indicated that aPDT as a monotherapy was comparable to SRP, and aPDT plus SRP was either comparable or better in reducing bleeding and pocket depths and increasing CAL. The 2 studies comparing SRP with adjunctive systemic antibiotics or aPDT showed more favorable outcomes for the antibiotics. All 3 studies that measured microbial patterns, found significant reductions in periodontal pathogens with aPDT use, especially *Aggregatibacter actinomycetemcomitans*. Mixed results were found in the studies that measured gingival crevicular fluid for inflammatory markers associated with immune response.

The authors concluded the evidence supports aPDT as an effective adjunct to SRP in treatment of AgP. However, more RCTs with specific control groups, standardized protocols, and comparisons with localized application of antibiotics are needed to interpret the efficacy of aPDT plus SRP in patients with AgP.

Summary

Dental hygienists are preventive professionals responsible for providing NSPT to address treatment needs of patients with periodontitis. Among other laser therapies, aPDT has been studied as an adjunct to SRP based on reported benefits in reducing periodontal pathogens in areas where SRP is less effective due to access challenges. The authors of these 2 articles concluded that evidence presented supports this laser therapy application for treatment of chronic periodontitis and AgP, despite mixed results

of studies conducted to date. Although aPDT may show some promise in outcomes such as periodontal disease parameters and reducing periodontal pathogens in periodontitis, standard protocols for use in practice and research are needed. Robust, parallel studies are needed with consideration given to adequate controls and treatment comparisons.

Denise M. Bowen, RDH, MS, is Professor Emeritus in Dental Hygiene at Idaho State University. She has served as a consultant to dental industry, as well as numerous government, university and private organizations and presently is a member of the National Advisory Panel for the National Center for Dental Hygiene Research in the U.S. She has served as Chair of the American Dental Hygienists' Association Council on Research and Chair of the Research Committee for the Institute for Oral Health and has received national awards for excellence in dental hygiene. Professor Bowen is widely known through her published articles and textbook chapters and dynamic continuing education programs related to nonsurgical periodontal therapy, preventive oral self-care, research methodology, and dental hygiene education.

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Self-Assessment: A Review of the Literature and Pedagogical Strategies for Its Promotion in Dental Education

Cynthia C. Gadbury-Amyot, MSDH, EdD; Janet L. Woldt, MS, PhD; Kylie J. Siruta-Austin, RDH, MSDH, ECP-III

Abstract

Purpose: In response to several publications drawing attention to self-assessment and revised Commission on Dental Accreditation standards that state graduates should possess and demonstrate the ability to self-assess, dental hygiene and pre-doctoral dental programs find themselves searching for ways in which to incorporate self-assessment practices into the curriculum. Research indicates that students are often not familiar with self-assessment strategies nor are they effective at self-assessment upon entering professional programs. Therefore, students must be taught strategies to self-assess and be given opportunities to practice and refine these skills. Opportunities to develop and demonstrate self-assessment skills can be incorporated across the curriculum at the classroom level and at the global level. Both the A.T. Still University Arizona School of Dentistry and Oral Health and the University of Missouri-Kansas City School of Dentistry utilize a capstone portfolio project to incorporate self-assessment throughout the curriculum. By combining artifacts from their dental and dental hygiene school experience with reflective writing essays, students can demonstrate attainment of program competencies. As more faculty members and students become involved and engaged in assessment strategies such as portfolios, they are also gaining a greater appreciation for the value of self-assessment.

Keywords: self-assessment, portfolio assessment, portfolios, dental education

This study supports the NDHRA priority area, **Professional Education and Development:** Validate and test measures that evaluate student critical thinking and decision-making skills.

Introduction

When the ADEA-CCI issued a white paper outlining core principles that should characterize dental education and inform and guide dental curricula in 2006, one of the core principles was assessment.[1] The white paper aligned with one of the propositions suggested in the 1995 Institute of Medicine (IOM) report on dental education, which was the need for dental education to promote self-assessment.[2] Likewise, the call for dental education to incorporate curricula that engages students in self-assessment has gained even more attention since the Commission on Dental Accreditation (CODA) revised standards for pre-doctoral dental programs. As of July 1, 2013 Standard 2-10 states that graduates must demonstrate the ability to self-assess, as opposed to the previous Standard 2-22 where graduates were required to recognize the role of self-assessment.[3]

The hallmark of a competent individual has been defined as the ability to accurately self-assess.[4] Self-assessment has been defined in numerous ways. Gordon defines valid self-assessment as "judging one's performance against appropriate [valid] criteria."[5] He further states that accuracy in self-assessment means "gaining reasonable concurrence" between one's own self-assessment and other validated measures. The process of developing this skill involves providing the student with expected standards of professional behavior, including the capacity to recognize one's own abilities and limitations. Key to Gordon's definition of self-assessment is the necessity of having criteria or standards that are both appropriate and valid. He contends that to assess one's own performance against standards that are anything less would be futile. It is understandable then why a critical component to self-assessment in the educational arena is ensuring that students possess a clear understanding of the criteria/standards. Boud describes self-assessment in terms of involving students in the process of identifying the criteria/standards they will use to apply to their work and then making decisions about whether or not they have met these criteria/standards.[6] While self-assessment requires faculty experts for the development of appropriate and valid criteria, and instructing students on the how and why of the criteria, it ultimately is the student's responsibility to learn the criteria and work at applying them to their work products. In essence, the idea is to "flip" the assessment strategy from being solely a faculty

domain, to involving students in the activity of assessing. It becomes the students' responsibility to assess their work, identifying where they meet the standards and criteria and where they do not. Taking it the next step then involves students as reflective practitioners in identifying where knowledge, skill or value gaps exist and determining strategies for filling those gaps. When self-assessment is viewed and practiced through these lenses, it becomes an activity done with the students rather than to the student.

With the above as background for change (i.e., IOM report, competency-based education, ADEA-CCI and CODA revisions) dental hygiene and pre-doctoral dental programs find themselves exploring various strategies to ensure that their graduates meet the new standards of demonstrating the ability to self-assess. This paper provides a review of the literature on self-assessment and suggests how dental hygiene and pre-doctoral dental programs can incorporate pedagogical strategies in the form of individual course-level assignments to global strategies like portfolio assessment that require students to "demonstrate" self-assessment.

Self-Assessment in Review

Self-assessment is not new and in fact has been of interest to researchers for decades and yet adoption into educational settings, dental education in this case, has been slow at best. Literature supports the concept that making judgments about one's own learning is integral to the learning process.[6] It is through the formative aspects of assessment that self-assessment motivates further learning, encourage students to take ownership for their learning, and can accommodate different learner readiness, experience and backgrounds. Interestingly, until 1989 there had been no major review of the literature on self-assessment conducted.[7] In 1991 Gordon published a comprehensive review of the validity and accuracy of self-assessment in health professional training as a follow up to the review conducted by Falchikov and Boud.[5] In 2010 a Best Evidence Medical Education Systematic Review was published on the topic of self-assessment.[8] Collectively these reviews called for better research methodologies in studying the impact of self-assessment on learners. However, with that said, there are several themes or consistencies found in the literature that are outlined in the 2010 Best Evidence Medical Education Systematic Review and discussed below.

First, all the studies agree that self-assessment skills remain underdeveloped during the educational process. While self-assessment is recognized as integral to the development of health professionals, self-assessment skills are rarely taught and the ability to self-assess seldom tested. This has been validated in the dental hygiene literature by a study conducted by Mould et al, where it was found that students entered dental hygiene education unprepared to engage in self-assessment.[9] As with any instance where change is required, changing assessment strategies to incorporate self-assessment is met with resistance. Students predominantly come from educational backgrounds where the process of increasing metacognition, self-awareness and responsibility for one's learning is atypical.[10] Uncertainty and discomfort are sure to arise when students are required to assume increased responsibility for their learning. In educational environments where assessment has been the domain of faculty, it is understandable why students would initially feel uncomfortable with taking on the process of self-assessment. Likewise, faculty are products of educational experiences that also followed a faculty-centered learning environment and so much like students, they have little experience with the implementation of student self-assessment in the learning environment. Yet in professions such as dentistry that operate under the principles of self-regulation and autonomy, the competent clinician must be a self-directed, lifelong learner.

A second theme found in the self-assessment literature involves differences in self-assessment abilities between high performing students versus lower performing students. Specifically, students in the bottom quartile of class tend to overestimate their abilities while those in the top quartile tend to underestimate their performance. While students in the top quartile underestimate their performance, they have been found to be more accurate in their self-assessment abilities than those in the bottom quartile. It was found that poor performers with additional training in logical reasoning and meta-cognitive skills, could improve their ability to recognize when they performed poorly.[8] In other words, it was the improved metacognitive skills that enabled the less competent to become more accurate in self-assessment.

Third, students tend to give their peers a more balanced assessment in comparison to how they rate themselves (self-assessment), in terms of the ability to identify one's own strengths and weaknesses as compared to peers. Curtis et al, who examined dental student self-assessment, suggests that the ability to more accurately assess peers than oneself could be related to societal pressures as opposed to educational needs, where students perceive mistakes as a sign of weakness, and are therefore reluctant to acknowledge them.[11] Therefore, in order for self-assessment to be effective, educators need to develop an environment in which mistakes are openly shared, discussed and accepted as part of the total learning experience. Boud would agree that it is through this type of forma-

tive assessment process that students are able to develop their self-assessment skills.[6]

Fourth, an examination of individual characteristics which could account for differential ability in self-assessment found gender to be influential. While studies are inconclusive when it comes to gender differences, there does appear to be a trend of males expressing higher levels of confidence than their female counterparts. The researchers agree that this provides fertile ground for future research.

Fifth, research suggests that self-assessment of practical skills tends to result in higher accuracy than assessment of cognitive skills. It is not entirely clear why practical skills may be better self-assessed than knowledge. One explanation extended is that practical tasks involve criteria that are specific and when combined with feedback on self-assessment makes practical skills more amenable to self-assessment. Another explanation is that outcomes on practical skills are harder to dispute so the potential for self-deception is lessened.

Finally, there is some evidence to support that student's with more experience are able to demonstrate greater skills in self-assessment. For example, senior dental hygiene and fourth year dental students versus first year dental hygiene and dental students will have a greater knowledge foundation and skills practice to reflect on and self-assess their abilities.

One thing that is clear in the literature on self-assessment is that accurate self-assessment is very difficult. Falchicov, Boud and Gordon all found that generally, self-assessors were poor to moderate judges of their performance.[6,7,12] Therefore, educators are faced with the issue of determining the most appropriate instructional strategy for students to demonstrate the ability to self-assess. More recent literature suggests a change in terminology that takes the focus away from being summative and punitive and instead focuses on the process or formative aspects of self-assessment and self-directed learning. This process allows for trial and error, it is forgiving of mistakes, and serves to reinforce the steps necessary for achieving a competent endpoint.

Self-Directed Assessment Seeking

While the value of self-assessment has been supported through many decades of research, recent publications debate the validity or stability of self-assessment.[13,14] Eva and colleagues concur with the work of Falchicov, Boud and Gordon[6,7,12] that in general, self-assessors are poor to moderate judges of their performance. Further Eva and colleagues contend that self-assessment is not a stable skill but rather varies by content, context and perspective.[13,14] The authors conducted a theory-oriented literature review with the hope that it might refine our understanding of self-assessment. Some of their findings follow. Self-efficacy, for example, consists of "an interaction between self-concept beliefs about one's skills or abilities and the specific context in which those skills or abilities will be applied for the attainment of a particular goal."[13] Rather than worrying about the accuracy of self-assessment, researchers in the field of self-efficacy concern themselves with how self-assessment is used in problem solving situations. Research in social psychology informs a discussion of self-assessment in that it posits people believe themselves to be better than what they are, and these self-deceptions lead to less depression and more persistence. It is because of these tendencies to overestimate one's ability that social psychologists suggest the necessity of looking outward on how others react rather than simply reflecting inward. Evans et al discuss the concept of self-deception in relation to professional students.[15] They suggest that because these are students who have performed well consistently in school and received positive feedback from a young age, they perhaps have gained a self-confidence that may be resistant to modification. Further, when asked to self-reflect, they tend to score based on the potential or ideal performance versus their actual performance. In total, this line of research that has borrowed from theory would suggest self-assessment is tied to self-concept and self-worth.

Recognizing that self-assessment skills can vary by content, context and perspective, improvement can only occur if students are taught how to seek out critical feedback from others and are instructed in methods used to evaluate their own performance. Specifically, Eva and Regehr state that, "…the route to self-improvement is not through becoming a more accurate self-assessor, but through seeking out feedback from reliable and valid external sources (experts, self-administered tests, etc.), and … making a special effort to take the resulting feedback seriously rather than discounting it: to reflect rather than ruminate."[13] They refer to this method of self-improvement as self-directed assessment seeking and describe it as a process, rather than viewing it as ability. They further define self-directed assessment seeking as "a habit one needs to acquire and enact rather than an ability one needs to master."[13]

A later article by the same authors attempts to further elucidate the discussion of whether or not professionals can accurately self-assess by making distinctions between self-assessment (defined as an ability), self-directed assessment seeking and reflection (defined as pedagogical strategies and process), and self-monitoring (defined as immediate contextually relevant responses to environmental

stimuli).[14] As is the case in research, it is critical to develop operational definitions to define variables and concepts so that all people involved in the research, and those individuals that will read the research in the future, are able to stand on common ground. Whether one speaks of self-assessment, self-directed assessment seeking, reflection, or self-monitoring, clear operational definitions establish common ground.

In the end, too much literature exists validating the benefits of self-assessment to abandon the concept completely. In addition, CODA standards use the term "self-assessment."[3,16] For these reasons, the term self-assessment will be used for the remainder of this paper with the understanding that the theory behind self-assessment and self-directed assessment seeking have relevance for the following discussion on pedagogical strategies and gaining competency in pre-doctoral dental education.

Pedagogical Strategies for Promoting Self-Asssessment

One of the factors that contribute to inaccuracies in self-assessment include students not understanding what is expected of them.[15] Further, faculty may also "assume" that students enter dental hygiene and dental school with the ability to self-assess. Research shows this is not the case, and as with any skill, self-assessment must be learned.8 In order for this to happen, it must be incorporated into the curriculum and taught to students.

Self-Assessment Across the Curriculum

To effectively incorporate self-assessment, programs should identify specific assignments and assessment methods that provide exposure to the process. By adopting the concept of self-directed assessment seeking, a process that allows for trial and error, is forgiving of mistakes, and serves to reinforce the steps necessary for achieving a competent endpoint, students may demonstrate improved accuracy in evaluating their performance.

Self-Assessment at the Classroom Level

Examples of incorporating self-assessment within a course can be found in Curtis et al and Gadbury-Amyot et al.[11,17] A critical element of these learning experiences was the establishment of sound standards and criteria, developed by faculty content experts, for students to follow, along with a requirement that students self-assess their work using those standards/criteria. The grading rubric for student self-assessment and faculty evaluation was one in the same. Ideally, the evaluating faculty member would meet with the student to discuss areas where there was a lack of calibration and encourage self-reflection on ways to address filling those gaps with the goal of becoming more competent in that skill.

The reflection aspect is a vital component in taking self-assessment skills full circle. By providing guidance to those students that inaccurately self-assess initially, improvement can be observed. Curtis et al was able to show modest improvement in the calibration of students to faculty with multiple self-assessment trails. It was noted that student scores differed by an average of 5% from faculty assessments, but improved to a 3.3% difference after a four-month trial.[11]

Self-Assessment at the Global Level in the Form of Portfolio Assessment

In addition to individual assignments at the classroom level, dental hygiene and dental programs are also exploring global or capstone methods of assessment to help students develop and "demonstrate" self-assessment skills. Using portfolios within the curriculum provides a student-centered tool that encourages the student to assess his or her performance both at the classroom level and from a holistic or global perspective. The value of portfolio assessment in developing self-assessment skills is in the form of reflection and reflective writing. Brown and Glasner discuss the relationship of the 2 acts by stating that self-assessment involves the process of reflection, but not all reflection leads to self-assessment.[18] By completing portfolios, students are encouraged to reflect on intentions, actions, thoughts, and feelings. Through this reflective process, students can create personal meaning from their own experience, in this instance their experience in dental school, and take a critical stance towards their meanings and interpretations.

Students need to be introduced to basic reflection strategies to allow them to reach Bain et al's higher levels of reflection.[19] Likewise, faculty should be educated on prompts and questions to utilize when providing feedback that will challenge and promote deeper levels of reflection.[20] High-level challenging feedback that focuses on the process and levels of reflective writing is considered most effective. Providing structure through the use of templates and rubrics can also promote thoughtful reflection. An excellent resource for faculty and programs on rubrics can be found in MedEdPORTAL.[21]

Reflective Writing and Self-Assessment: Two Examples

At the A.T. Still University Arizona School of Dentistry & Oral Health (ASDOH), students complete a capstone portfolio project, based on the school's 14 program competencies (previously described in

Gadbury-Amyot 2012).[20] As a graduation requirement, dental students assemble and submit a portfolio that demonstrates their progression and attainment of the competencies, which contains information from all four years of dental school. For each of the 14 competencies, students submit at least two pieces of evidence (artifacts) and one "reflection" essay. Students are oriented to the portfolio during their first year and are given a handbook for the Portfolio Capstone Project as well the syllabus.

The purpose of the portfolio capstone project is to demonstrate that each student has progressed from a novice to a professional, thereby theoretically meeting the A.T. Still ASDOH competencies. Since ASDOH dental students also receive a public health certificate or a master's in public health degree upon graduating with their DMD degree, they can present artifacts from either of those programs in their portfolios. Artifacts can be written assignments, exam results, pictures, case studies, treatment plans, models, videos, patient radiographs, interactions with others, or outreach trips. Choosing artifacts and reflectively writing about them is individual and personal. There is really no "wrong" artifact as long as it relates to the competency, is meaningful to the student, and the student can justify why he/she choose it and can write reflectively about it.

Since portfolios are designed to show progress and growth throughout the curriculum, it is stressed to the students that a portfolio artifact can be a thing or an experience they have had and that is not necessarily their best work. Presenting an artifact from early in their education in which they may have not performed well and then submitting a similar assignment from the end of the program in which they did perform well provides a method of demonstrating growth and progress towards attaining competency. All work cited in the portfolio must be completed while students are enrolled in these programs.

Students are assigned a portfolio mentor who guides them and helps them to identify information relevant to each competency, such as, providing input on artifacts collected and progress made throughout the portfolio creation process. Students meet with and are advised by their portfolio mentor on a regular basis throughout the portfolio process. The portfolio mentors are faculty members who have demonstrated abilities in teaching and learning and have shown an interest in the portfolio process. Additionally, all mentors are trained in portfolio methodology and reflective writing, and attend multiple calibration sessions for grading of portfolios offered by the Student Portfolio Committee.

The use of a portfolio assessment strategy provides a robust assessment methodology, using both formative and summative assessments and reflective analysis, to help determine attainment of competency at the end of a four-year dental school curriculum. The portfolio is but one piece of the school's assessment strategies utilized to determine student attainment of the program competencies.

Reflection Essays

Students write and submit Reflection Essays for each competency summarizing why the artifacts presented in the portfolio address a particular competency and how the artifacts demonstrate progression and attainment of that skill. Further, students write and submit an Integrative Essay, assessing the entire portfolio process, toward the completion of the Student Portfolio Capstone project.

Competencies and Reflection Essays for the portfolio are submitted in groupings of two or three, according to established deadlines. For example, Competencies 7 and 10 are due in December of the third year; Competencies 3 and 4 are due in February of the third year; Competencies 2, 6 and 12 are due in May of the third year, and so on. Dates of submission for the Competencies are chosen based on curricular content and clinical experience. The final portfolio is due at the end of January in the fourth year.

Reflective Writing Workshops

Before the first grouping of competencies is due, in spring of the second year, students complete a reflective writing workshop. At this workshop, reflective writing as a learning tool is discussed at length as it relates the portfolio project. Reflective writing, has been defined as the "evidence of reflective thinking" and typically involves: "looking back at something (often an event, i.e., something that happened, but it could also be an idea or object); analyzing the event or idea (thinking in depth and from different perspectives, and trying to explain, often with reference to a model or theory from your subject); and, thinking carefully about what the event or idea means for you and your ongoing progress as a learner and/or practicing professional."[22]

Once the theoretical aspect of reflective writing is covered, students then complete a small group reflective writing exercise. They are first asked to write down three books they would want to have with them if they knew they were going to be stranded on a desert island for a period of time. Additionally, they are to think about and write down why they chose those three books. Their selections and justifications are then shared with the group. In the next phase of the exercise, students are told

that after three years they are rescued from the desert island. At this point, students are asked to reflect upon, write down and then share with the group how the books they chose influenced them as a person.

Subsequent to that brief exercise during the workshop, well-written reflection essays along with artifacts previously submitted from earlier classes are reviewed with the group as a whole. Then, the large group is broken into smaller groups, facilitated by portfolio mentors, for the second reflection exercise. In these small groups, mentors choose one competency (e.g., Competency 2 Ethics) and encourage discussion among the group as to what artifacts students might submit for this competency and why they would submit them.

Prompts for reflective writing are discussed with the students and noted in Figure 1. A basic reflection essay format, as follows, is also presented to students:

- Introduction to the competency: thoughts, ideas, theories studied
  - Description of artifacts and each artifact's story: what it is and why it was chosen.
- Interpretation: How do the artifacts chosen and their stories, when looked at as a whole, tell the student's story of how they are competent in that particular area, e.g., ethics, leadership, communication, etc.
- Conclusion: What did the student learn from this?

In the Reflection Essays, students include their rationale for inclusion of artifacts in relationship to attainment of each competency and analyze and summarize why he/she believes the competency has been met. Students may also identify for each competency, if appropriate, where they will include additional work in this area as part of future professional development goals. Reflection essays guidelines are generally that they be 500 to 1,000 words in length or 1 to 2 pages double–spaced.

In addition to the individual Reflection Essays, students also write an Integrative Essay regarding the portfolio project and their 4 year dental school educational experience. The purpose of this essay is to provide an opportunity for students to assess and comment on their growth as they've progressed through the program to finally arrive as a candidate for the Doctor of Dental Medicine degree. Students are encouraged to write their Integrative Essay not as a summary of what they learned, but as a discussion of what the journey has meant to them as an individual and how it has shaped him or her as a professional.

Figure 1: Reflective Writing Prompts

- Where did these artifacts come from?
- Why did you choose these artifacts?
- How do they relate to the competency?
- What did I learn from these artifacts? How did you feel about this and why?
- Can the artifacts work for other competencies?
- Who were you with when you did/completed these artifacts?
- Did things go well with the artifacts?
- Did things go poorly with these artifacts?
- Who do these artifacts affect?
- Did you receive a grade or evaluation on these artifacts?
- How do you feel you performed on these artifacts?
- Did these artifacts include problem solving?
- Were these artifacts mandatory for a module?
- How can these artifacts help you to behave or do things differently?
- Would you do these artifacts over again? If so, what would you do differently?
- How would you have put these artifacts together differently?
- How do these artifacts relate to one another?
- What do others think of these artifacts? Is it the same as what you think of it? If not, why are there differences?

These essays are expected to be 1,000 to 2,000 words in length (2 to 4 pages double-spaced) and should describe the portfolio in which overall progress has been charted toward attainment of the 14 A. T. Still ASDOH competencies. In this essay, students take one last opportunity to reflect back upon and holistically consider their time in dental school, integrating their experiences with the curriculum, clinic, external rotations, and other experiences into a unified experience. It is an opportunity for the student to take time and review the portfolio from beginning to end and reflect upon their clinical skills; interpersonal and communication skills; overall professional development; and, critical thinking skills.

The portfolio capstone project and its reflective writing component have made a positive impact on the culture of the A.T. Still ASDOH and its faculty, staff, students. The movement of better and more effective means of assessing student's critical thinking has grown within the ranks of A.T. Still ASDOH faculty. More faculty are getting involved in the portfolio project and as a result, more are becoming engaged in this assessment strategy. As this project is presented to each incoming class, the interest and enthusiasm grows, resulting in a greater appreciation of self-assessment and the capstone portfolio project.

University of Missouri-Kansas City School of Dentistry (UMKC-SOD)

Similar to A.T. Still ASDOH, portfolios at the UMKC-SOD are only one piece of the total assessment strategy. In contrast to ASDOH, UMKC-SOD predoctoral portfolios are built around 6 to 10 of the program competencies. The reasoning behind this model comes from the belief that other assessment strategies within the curriculum adequately capture competency for the remaining 4 program competencies. Unlike the predoctoral portfolios, dental hygiene portfolios at UMKC SOD encompass all program competencies.

Also similar to A.T. Still ASDOH, UMKC-SOD dental hygiene and predoctoral students are introduced to portfolio assessment during their orientation to dental school. In contrast to A.T. Still ASDOH, UMKC faculty have pre-determined exactly what evidence is to be included in student portfolios. This approach was taken based on the literature around validity and reliability of performance/portfolio assessment which shows that having consistent items for review increases reliability of faculty evaluation.[23-24] Review of the curriculum map outlining which competencies are tied to which courses, including assignments, projects and assessment measures, was integral to this process. In the predoctoral program, a faculty portfolio committee, including the Academic Dean and the Associate Dean of Instructional Technology and Faculty Development, determined what were some of the exemplar examples of course assignments, projects, and events in the curriculum that contribute toward student development of knowledge, skills and values to meet program competencies. The UMKC SOD Division of Dental Hygiene global portfolio assessment project has been explained in detail previously.[25]

Faculty development has been as crucial to the implementation of portfolio assessment as student development. In many instances assignments were tweaked/modified to strengthen student development of required knowledge, skills and values. In all instances grading rubrics were developed or revised to better capture what was expected from the assignments. The last criteria on the grading rubric requires that students reflect on what knowledge, skills and values were gained from the assignment and taking it to the next step, indicate how this will lead them toward meeting program competencies.

Similar to ASDOH, UMKC students complete a global reflection toward the completion of their coursework for inclusion in the portfolio. This global reflection is the last piece of evidence in the portfolio. This is a chance for each student to step back and view the 2 or 4 years of work holistically. It is an opportunity to take some time to review the portfolio from beginning to end rather then as individual components/evidence. Students are instructed to pay attention to their development as a professional through the complete program, recognizing growth from one year to the next and/or progression from a novice to a competent professional.

By default the faculty who have coursework included in the student portfolios serve as mentors through their feedback during the time the assignments, projects, and events are undertaken. As stated above, faculty are trained in portfolio methodology and are able to provide formative feedback as needed. Beyond these faculty, additional faculty are tapped for a summative evaluation that occurs in the students' final year; for dental hygiene this takes place in the Spring of their last semester and for predoctoral students it is their fourth year, first semester. This timing was deliberate so that those students who do not pass the summative evaluation, have time for mentoring and revision as completion of portfolios are required for graduation.

Conclusion

This paper has presented theory and research behind self-assessment in higher education and related this information directly to dental education. Examples of pedagogical strategies for implementing self-assessment in dental education at both a classroom and global level (portfolios) are described. Applied examples from 2 different dental schools using portfolio assessment where students "demonstrate" self-assessment through reflection and reflective writing were described. It is the authors' hope that these examples can be instructive for dental education programs endeavoring to meet the revised accreditation standards that require students possess and demonstrate self-assessment skills.

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Sjögren's Syndrome: Oral Manifestations and Treatment, a Dental Perspective

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Abstract

Purpose: Sjögren's syndrome is a systemic autoimmune disease affecting approximately 3 million Americans, primarily perimenopausal women. The syndrome is characterized by dysfunction and destruction of exocrine glands leading to oral and ocular manifestations, xerostomia and keratitis sicca. Sjögren's syndrome commonly remains either undiagnosed or is diagnosed years after the onset of symptoms. Diagnosis is based on the concurrent presence of various signs and symptoms of the disease as established by 6 diagnostic standards set by the American European Consensus Group standards: oral symptoms, ocular symptoms, evidence of oral signs, evidence of ocular dryness, evidence of salivary gland involvement with positive Anti-Ro/La autoantibodies and a positive gland biopsy. Currently no definitive test or cure exists; treatment is predominately palliative and supportive.

Conclusion: With an aging population and heavier reliance on medications and treatments which cause xerostomia, oral health professionals are likely to encounter a higher incidence of xerostomia and Sjögren's syndrome more than ever before. The dental professional must recognize the signs and symptoms of xerostomia, include Sjögren's syndrome in their differential diagnosis, and communicate those findings and concerns to other health care providers, including the primary care physician, rheumatologist and ophthalmologist for evaluation in a timely fashion. This article discusses the dental professional's role in formulating a preventive oral health plan: meticulous oral hygiene instructions, dietary counseling, a complement of chemotherapeutic agents and more frequent recall care to avoid oral complications and improve quality of life. Dental hygienists can help patients understand the wide range of products available to substitute or stimulate salivary flow, prevent or remineralize early carious lesions and relieve candidal and bacterial infections. Ultimately this collaboration of care by the dental and medical professionals will benefit the Sjögren's syndrome patient and lead to better patient outcomes.

Keywords: Sjögren syndrome, autoimmune, xerostomia, sicca, interprofessional

This study supports the NDHRA priority area, **Clinical Dental Hygiene Care:** Investigate how dental hygienists identify patients who are at-risk for oral/systemic disease.

Introduction

There are currently over 80 types of autoimmune diseases.[1] Autoimmune diseases mistake healthy tissues in an individual as an infection and then attempt to attack and destroy it. Sjögren's syndrome is one such example in which the body attacks the exocrine or secretory glands, most commonly the salivary and lacrimal glands.[2] Sjögren's syndrome is one of the most common autoimmune diseases that affects approximately 3 million Americans, primarily women (9:1 compared to men) over the age of 50.[3] The onset of the disease is insidious; diagnosis is often delayed for 5 or more years. Researchers are not certain why some people develop Sjögren's syndrome. Certain genetic traits may place some individuals at a higher risk of developing the disorder, and it appears that a triggering mechanism, such as infection with a particular virus or strain of bacteria, is also necessary. Stress and hormonal factors may play a role in the pathogenesis of Sjögren's syndrome since the disease predominately manifests in perimenopausal women.[4]

Sjögren's syndrome is subclassified into primary Sjögren's syndrome, consisting of dryness of the mouth (xerostomia) and eyes (keratoconjunctivitis sicca), and secondary Sjögren's syndrome, which is also associated with other systemic autoimmune rheumatic diseases, such as rheumatoid arthritis, lupus or scleroderma.[3] Research suggest that Sjögren's syndrome is manifested in 25 to 35% of rheumatoid arthritis patients.[5,6] Both primary and secondary Sjögren's syndrome share the same cardinal signs and symptoms, xerostomia and keratitis sicca; therefore, they are treated similarly.

Dental professionals are frequently the first practitioners to detect the signs of Sjögren's syndrome. Saliva is essential for the preservation of oropharyngeal health. It aids in swallowing, oral cleansing, speech, digestion and taste. Hyposalivation or chronic xerostomia can impair the patients' quality of life. Early diagnosis and treatment is vital for preventing oral complications. Intervention and treatment are of piv-

otal significance, including referral to other health care professionals, i.e., ophthalmologist and rheumatologist, for diagnosis and systemic intervention. Treatment is predominately palliative and supportive. With an aging population and their heavier reliance on medications and treatments, which may cause xerostomia, oral professionals are likely to encounter a higher incidence of xerostomia and Sjögren's syndrome more than ever before. An understanding of xerostomia and its management is essential to consummate patient care. Subsequent paragraphs will explore manifestations, testing, diagnostic criteria, palliative treatment and methods to monitor and maintain the health of a patient diagnosed with Sjögren's Syndrome. The objective of this literature review is to summarize Sjögren's syndrome research focusing on oral manifestations and management of dental treatment options.

Oral Manifestations

Sjögren's syndrome is characterized by dysfunction and destruction of the exocrine glands associated with lymphocytic infiltration and immunological hyperactivity.[2] Research suggests that 88% of Sjögren's syndrome subjects had a reduced salivary flow rate, followed by complaints of xerostomia in the 75 to 92% range.[2] Patients with Sjögren's syndrome have a range of major salivary gland involvement, mainly parotid enlargement, but also isolated submandibular gland enlargement.[7]

Oral manifestations are encountered with high frequency mainly due to the hypofunction of salivary glands resulting in decreased salivary secretion. Loss of the lubricating, buffering and antimicrobial properties of saliva lends to an amplified incidence of the following conditons:[8]

- Dental erosion
- Dental caries
- Mucosal friability
- Dry cracked or peeling lips
- Angular cheilitis
- Dry plaque laden coarse tongue
- Erythematous tongue
- Mucositis
- Ulcers
- Oral candidiasis
- Halitosis
- Oral/dental infection

Chronic xerostomia impairs taste, chewing, swallowing, speaking and sleeping. The dental professional should document the initial symptoms (Figure 1) and recognize the multiple oral manifestations of Sjögren's syndrome.[8] The dental professional therefore should have a good understanding of oral manifestations as well as viable treatment options for the Sjögren's syndrome patient (Figure 2).[9]

Figure 1: Subjective Symptoms of Xerostomia*

- Tongue sticking to the roof of the mouth
- Putting a glass of water on the bed stand to drink at night (and resulting nocturia)
- Difficulty swallowing
- Inability to eat dry food (e.g., crackers) because it sticks to the roof of the mouth
- Increased liquid intake
- Sensitivity to spicy foods
- Lack of or diminished taste perception
- Altered salty and metallic taste
- Mouth pain or burning sensation
- Malodor
- Difficulty speaking
- Development of hoarseness
- Coughing episodes
- Difficulty wearing dentures
- Painful salivary glands

*Source: Turner MD, Ship JA[8]

Diagnosis and Treatment

Unfortunately, testing and diagnostic criteria for identifying Sjögren's syndrome can be confounding. Diagnosis is difficult and evasive since the clinical signs and symptoms mimic other autoimmune diseases such as lupus and multiple sclerosis.[10] Numerous, commonly used medications cause xerostomia and may also mimic some signs and symptoms of Sjögren's syndrome. Furthermore, there is no single test that will confirm diagnosis. Diagnostic standards used are the American European Consensus Group criteria. The criteria consists of 6 different domains:[4]

1. Oral symptoms
2. Ocular symptoms
3. Evidence of oral signs
4. Evidence of ocular dryness
5. Evidence of salivary gland involvement with a positive anti-ro/la autoantibodies (ana)
6. A positive gland biopsy

Diagnosis of Sjögren's syndrome is based on the concurrent presence of various oral signs and symptoms of the disease. Researchers at the Sjögren's Syndrome Foundation suggest that reaching a diagnosis takes on average 5 years from the onset of symptoms.[11]

Common Oral Complications

The first and foremost complication of Sjögren's syndrome is Xerostomia, and dental caries is the most common clinical manifestation. Specifically, root and incisal caries, which are seldom seen amongst the general population, are of greater concern for those with Sjögren's syndrome.[7] The dental caries process involves dental biofilm and the associated species of bacteria which colonize tooth surfaces. Streptococci

Figure 2: Xerostomia-Associated Problems and Treatment Strategies*

Xerostomia Associated Problem	Treatment Strategy

Carious Lesions	Proactive Prevention & Remineralization Options:
	• Utilizing technology to detect early carious lesions:
	  • Transillumination, i.e., Dexis CariVu, DIFOTI
	  • Laser Fluorescence, i.e., DIAGNOdent
	  • Qualitative Light Fluorescence, i.e., VistaProof
	  • Light Emitting Diode (LED), i.e., Midwest Caries I.D.
	  • Spectroscopy, i.e., CarieScan Pro
	  • Photothermal radiometric modulated luminescence, i.e., Canary System
	  • Optical coherence tomography, i.e., OCT Dental Imaging System
	• Mechanical Toothbrush, i.e., Sonicare or Braun OralB
	• Interdental Options:
	  • Oral Irrigator, i.e., Waterpik
	  • Proxy brushes
	• Remineralizing Dentifrice, i.e., Proenamel
	• Home Fluoride:
	  • Daily use of fluoridated dentifrice (0.05% Sodium fluoride)
	  • Daily use of prescription fluoride gel (1.1% sodium fluoride, 0.4% stannous fluoride)
	• Rinses:
	  • Prescription Remineralizing: i.e., supersaturated calcium phosphate rinse (NeutraSal)
	  • Prescription Antibacterial: i.e., Chlorhexidine (CHX) 0.12% - rinse, swish and spit 10 ml twice daily
	• Professional application of 5% sodium fluoride varnish
	• Increased hydration
	• Salivary stimulation with sugar-free gum, mints, and lozenges
	• Dental examination at least every 3-4 months and bitewing radiographs every 12 months for early diagnosis

Dry Mouth	• Salivary stimulation with sugar-free gum, mints, and lozenges
	• Artificial salivary replacements::
	  • Oxygenated Glycerol Triester, i.e., Aquaoral spray
	  • Biotene rinse, spray and/or gum
	• Prescription sialogogues: pilocarpine (5 mg 3 times daily and at bedtime; cevimeline (30 mg 3 times daily)
	• Lubricants on lips every 2 hours
	• Avoidance of spicy foods
	• Bedside humidifier during sleeping hours

Dysgeusia	• Avoidance of alcohol, caffeine, and products containing sodium lauryl sulfate (SLS) • Drink fluids, especially water, while eating
Dysphagia	• Careful eating, with fluids • Copious use of fluids during meals • Avoidance of dry, hard, sticky and difficult to masticate foods

Oral Candidiasis	• Extraoral:
	  • Antifungal ointments: nystatin ointment applied 4 times daily to commissures
	• Intraoral:
	  • Antifungal rinses: nystatin oral suspension
	  • Antifungal lozenges dissolved in mouth 3-5 times daily, nystatin pastilles (200,000 units), clotrimazole troches (10 mg) for 10 days
	• Denture antifungal treatment options (daily hygiene) -soak prosthesis for 30 minutes in:
	  • benzoic acid
	  • 0.12% chlorhexidine (CHX)
	  • 1% sodium hypochlorite

Bacterial Infections	• Systemic antibiotic therapy for 7 to 10 days: amoxicillin with clavulanate (500 mg each 8 hours); clindamycin (300 mg 3 each 8 hours); cephalexin (500 mg each 6 hours) • Increased hydration • Salivary stimulation with sugar-free gum, mints, and lozenges

*Source: Ship JA,[9] Napenas JJ[19]

bacteria are most deleterious, in terms of dental caries; Sjögren's syndrome sufferers have been reported to have higher numbers of cariogenic and acidophilic micro-organisms in comparison with those found in age matched control individuals.[10] In otherwise healthy people with adequate salivary output, bacteria are dislodged and expelled from tooth surfaces by the mechanical process of chewing, tongue movement and salivary flow; however, for those suffering from Sjögren's syndrome, low salivary flow does not permit the oral self-cleansing which buffers, lubricates and performs essential antimicrobial duties. One study found Sjögren's syndrome individuals with "excellent oral hygiene" who received routine 3 to 4 month recall dental treatment, and used fluoride containing dentifrices, still had elevated levels of dental caries along with premature toothloss.[10]

Another common, painful and often chronic complication of Sjögren's syndrome is oral candidiasis.[2] Signs include Angular Cheilitis, atrophy or loss of filiform papillae on the dorsal tongue or erythema of the tongue and other mucosal surfaces; diagnosis should be verified by positive potassium hydroxide slide and/or positive culture.[2,5] A study investigating the prevalence and quantity of oral yeasts and their association with oral candidiasis in Sjögren's syndrome patients receiving regular dental care demonstrated an increase in oral yeast levels, primarily candida albicans, among participants in southern China with a "satisfactory" level of oral cleanliness.[12] Results also suggest that oral yeasts were present in 84% of primary Sjögren's syndrome and 63% of seconday Sjögren's syndrome versus 7% for control subjects; interestingly, none of subjects presenting with oral candidiasis experienced any symptoms.[12] A positive correlation between yeast colonization and removable dentures was also demonstrated.

Systemic Complications

The magnitude of this syndrome has far-reaching concerns beyond xerostomia, dental caries and oral candidiasis. The development of non-Hodgkin Lymphoma and central and peripheral neurological complications are extremely concerning. Non-Hodgkin Lymphoma is the most serious complication of Sjögren's syndrome.[13] Compared to the general population, the lifetime risk in cohorts of unselected patients in longitudinal studies is estimated to be 5 to 15% or roughly 20-times increased risk.[3,13] A predictor of lymphoma development in Sjögren's syndrome is persistent enlargement of parotid glands.[3] Diffuse large B-cell Lymphoma and mucosa-associated lymphoid tissue Lymphoma make up the most common types.[13] While Sjögren's syndrome manifests primarily in females (9:1), male patients with primary Sjögren's syndrome seem to have a slightly higher risk of Non-Hodgkin Lymphoma compared to female counterparts.[13] A parotid biopsy may be indicated for the Sjögren's syndrome patient whose main complaint is persistent parotid gland swelling and lymphoma is suspected.[3]

Neurologic and systemic manifestations are among the many afflictions to which Sjögren's syndrome sufferers are vulnerable. Clinically significant neurologic manifestations affect approximately 20% of patients and may be an early manifestation.[14] Patients with primary Sjögren's syndrome often present with nonspecific general symptoms including non-inflammatory muscle and joint involvement, severe debilitating fatigue, weakness, neuropathies and fibromyalgia-like indicators.[15,16] Primary Sjögren's syndrome has many clinical parallels with multiple sclerosis. Peripheral neuropathies, especially sensory disturbances, are the most commonly reported. Primary Sjögren's syndrome patients with sensory neuropathy complain of distal, often symmetrical, paresthesia and/or neuropathic pain including burning feet sensations.[16] Cranial nerve involvement is another complication, often impairing the cochlear nerve and causing hearing loss and vestibular symptoms. Sensory trigeminal nerve involvement and facial nerve involvement are also largely described.[14] Treatment of primary Sjögren's syndrome-related neuropathies are currently noncodified. Analgesics are generally the first line of defense for mild forms of sensory neuropathies; however, for more profound sensory-motor neuropathies, prednisone, azathioprine, cyclophosphamide and intravenous immunoglobulins may be prescribed.[14]

Oral Care Treatment and Recommendations

Since Sjögren's syndrome has no cure, treatment is symptomatic and supportive. Without sufficient saliva to restore the oral pH and regulate microbial populations, the mouth can rapidly colonize deleterious bacterial, viral and fungal populations. A personalized treatment plan must be developed for the patient by their health care professionals to treat the various symptoms. A preventive oral health plan should include meticulous oral hygiene instructions to improve quality of life, and avoid complications (Figure 2).

- Mechanical toothbushing 2 to 3 times daily with a prescription fluoride gel containing 1.1% sodium fluoride, or remineralizing dentifrice
- Interdental aids such as a waterpik or proxybrush in addition to flossing
- Dietary counseling
- A complement of chemotherapeutic agents
- More frequent recall care, 3 to 4 month

Chemotherapeutic products generally fall into 2 categories: salivary substitutes (viscous products applied to the oral mucosa in the form of sprays, gels, oils, mouthwashes, mouth rinses, pastilles or viscous liquids) and saliva stimulants (such as lozenges, chewing gum and mints, which may or may not contain medication).[17] Oral health professionals should have

a thorough understanding of the range of products available. Patient preference and acceptability is a significant factor when recommending chemotherapeutic products for home use.

A recent study found that patients suffering from xerostomia were 3-times more likely to have difficulty eating and required water when swallowing.[18] Water is the most commonly used home remedy for the management of discomfort associated with xerostomia by providing some moisture to the oral mucosa and often aiding in speech and swallowing.[3,18] In mild cases, frequent sipping of water, along with dietary avoidance of certain foods and chemicals, such as alcohol, caffeine and sodium lauryl sulfate, commonly found in dental products, may alleviate xerostomia to an acceptable level.[17,18] In addition to hydration, patients with Sjögren's syndrome should be advised to avoid dry, hard, sticky cariogenic foods, and especially limit the frequency of sugar-containing foods and drinks.[19]

Professional application of topical 5% sodium fluoride varnish, and daily home fluorides such as 1.1% sodium fluoride prescription dentifrices are preventive strategies which decrease microbe colonization and strengthen tooth enamel—thus making tooth surfaces more resistant to caries.[8] Supersaturated calcium phosphate rinse (NeutraSal), a prescription mouth rinse, is a relatively new treatment option for patients experiencing Sjögren's syndrome-related xerostomia. NeutraSal contains supersaturated amounts of calcium and phosphate ions which can relieve dryness, reduce acidity (pH), and may help prevent caries through remineralization of the teeth.[20]

The Cochrane Collaboration published in 2011 summarizes 36 randomized controlled trials and compares topical interventions such as lozenges, sprays, mouth rinses, gels, oils, chewing gum or dentifrices for the treatment of xerostomic symptoms.[17] Complex saliva substitutes attempt to mimic the protective properties of saliva through the addition of remineralizing and antimicrobial agents.[18] The Cochrane Collaboration asserts that while there is no strong evidence that any topical treatment is effective for relieving the sensations of xerostomia, Oxygenated Glycerol Triester saliva substitute spray was found to be more effective than water based electrolyte spray.[17] Since no commercial saliva substitute has been developed which accurately replicates all essential qualities of natural saliva, attempts should be made to increase the natural flow of saliva as much as possible.[17]

Sugar-free gum, mints and lozenges are advisable in those with residual capacity to encourage increased salivary production.[17] Products containing cariostatic sugar alcohol, a bacteriostatic agent, such as xylitol or sorbitol, are recommended during waking hours to reduce the sensation of xerostomia and facilitate speech and swallowing.[17] The Spry Dental Defense System hosts a line of products incorporating xylitol, including dentifrice, floss, rinse, spray and gum.[21] GlaxoSmithKline incorporates a combination of glycerol and xylitol into their Biotene product line consisting of a gel, spray, rinse, dentifrice (also includes sodium fluoride) and gum.[19] Manufacturer of Extra Professional Calcium Sugar Free gum, currently available in Australia, suggest that 40 mg of calcium per piece of gum is released within 20 minutes.[22] Another gum with recaldent, currently available in the U.S., claims to remineralize hard tissue through the release of both calcium and phosphate in the form of casein phosphopeptide amorphous calcium phosphate.[23] If Sjögren's syndrome patients can tolerate gum chewing, it should be encouraged as directed.

Medication induced xerostomia, an inescapable side effect of many commonly prescribed drugs, can compound the oral manifestations of Sjögren's syndrome. Drug substitutions may help reduce the adverse side effects of medications that produce xerostomia, if similar drugs are available that have fewer xerostomic side effects.[8] Taking anticholinergic medications during the daytime, opposed to bedtime, can help diminish nocturnal xerostomia when salivary output is diminished during sleep. Lastly, dividing a drug dosage over the course of a day may help avoid the side effects caused by a large single dose.

Systemic saliva stimulants in the form of medication may be considered in cases of severe xerostomia.[19] Two muscarinic acetylcholine receptor agonists (pilocarpine and cevimeline) are licensed for the treatment of sicca symptoms in Sjögren's syndrome.[18] These systemic agents stimulate the muscarinic acetylcholine receptors M1 and M3 present on salivary glands, leading to increased secretory function.[18] Adverse events associated with pilocarpine and cevimeline use include sweating and increased urinary frequency and flushing; however, these drugs are contraindicated in Sjögren's syndrome patients suffering from significant cardiovascular and pulmonary disease.[3,16] These medications should not be prescribed by an oral health care professional, but rather by the physician who is intimately involved in patient care and the multiple prescriptions which the patient may already be taking. A rheumatologist may also treat a patient with Sjögren's syndrome with other therapeutics involving cytokines or immunoregulators (e.g., rituximab or hydroxychloroquine) or systemic steroids.[19]

The decreased buffering capacity, salivary output and the immunocompromised state in persons with Sjögren's syndrome are associated with the increased occurrence of candida infections.[10] Treatment includes topical antifungal treatments and may be followed by systemic antifungal agents for persistent or recurrent episodes. A typical regimen includes antifungal cream and a pastille, troche or oral suspension of an antifungal 3 to 5 times daily for 1 week, followed by systemic

treatment with an azole (Figure 2).[9] For prevention of candidiasis, wearing dentures overnight should be discouraged; dentures should be cleaned and treated daily with benzoic acid, 0.12% Chlorhexidine Gluconate or 1% sodium hypochlorite, as primary Sjögren's syndrome carries a high risk of oral candidiasis and a high frequency of multiple candida infections.[19] Management of these conditions requires a multidisciplinary approach, with close follow-up by a dental practitioner familiar with the complexities of salivary gland dysfunction.[19]

Dry climates, air-conditioned environments and exposure to cigarette smoke may exacerbate symptoms of Sjögren's syndrome.[3] Complementary therapies may include the use of bedside humidifiers, which may help to hydrate the environment and diminish nocturnal xerostomia.[3,8,19] An alternative therapy for Sjögren's syndrome may also include acupuncture. Acupuncture is an increasingly accepted means for controlling pain, chemotherapy-induced nausea and hot flashes; studies suggest that it may also be beneficial in relieving symptoms of xerostomia after head and neck cancer.[24]

Conclusion

The role of dental professionals includes the identification of patients who are at risk for oral/systemic diseases. Sjögren's syndrome patients often present first to their oral health professional because of their predominantly oral symptomatology. Prevention, early diagnosis and treatment are crucial to maintaining oral health. The dental professional must recognize the signs and symptoms of xerostomia, include Sjögren's syndrome in their differential diagnosis, and communicate those findings and concerns to other health care providers for evaluation in a timely fashion.[19] A preventive oral health plan should include meticulous oral hygiene instructions, dietary counseling, a complement of chemotherapeutic agents, and more frequent recall care. The body of evidence does not support a single palliative product but rather a combination of chemotherapeutic products and encourages the action of sugar-free chewing gum during working hours to stimulate host salivary production.[17] Inclusion of commercial saliva substitutes should be tailored to the individual patient's concerns, preferences and oral health needs to help manage the symptom of xerostomia.[18]

Multidisciplinary management of underlying systemic conditions, such as Sjögren's syndrome, is imperative to help reduce oral complications. Management of the Sjögren's syndrome patient may include the primary care physician, rheumatologist, dental professional, ophthalmologist and gynecologist.[16] When health care professionals work together as a team they can improve patient outcomes and quality of life for the patient diagnosed with Sjögren's syndrome.

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The Use of Immersive Visualization for the Control of Dental Anxiety During Oral Debridement

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Abstract

Purpose: The purpose of this study was to evaluate the effects of Immersive Visualization (IV) eyewear on anxious, adult patients during oral debridement.

Methods: Thirty adult volunteers (n=23 females; n=7 males) were enrolled in the study. Participants were required to be 18 years or older, exhibit at least moderate anxiety (score 9 or higher) on the Corah's Dental Anxiety Scale-Revised (DAS-R), and be generally healthy. Individuals were excluded from participation if they presented with severe dental calculus, periodontal disease, or dental caries, were taking psychotropic drugs, had a history of convulsive disorders, vertigo, or equilibrium disorders, or required antibiotic premedication. Subjects received a full mouth oral prophylaxis (supra- and subgingival scaling and selective polishing) by a single experienced dental hygienist. A split mouth design was utilized whereby each subject served as their own control. Subjects were randomly divided into 2 groups: Group A used IV eyewear during the first one-half of the appointment (right side of the mouth) and Group B used IV eyewear during the second one-half of the appointment (left side of the mouth). At screening, medical and dental histories were obtained, full mouth oral examinations were performed, and DAS-R was scored to determine eligibility. At baseline, the DAS-R was re-scored to validate anxiety levels. The Calmness Scale was scored pre- and post-IV treatment on a Likert scale ranging from 1 (very calm) to 7 (less calm). At the end of the study, subjects completed a Post IV Opinion survey. Data were entered into Microsoft Excel for Mac 2011 (Microsoft Corporation Version 14.3.5) and analyzed using SAS® 9.3 statistical software.

Results: Thirty subjects with a mean age of 29.9 years completed the study. Data analysis indicated no statistically significant difference between Group A and B with regard to mean DAS-R anxiety levels at baseline (3.15 and 2.40, respectively), with a p-value of 0.07. Data showed a significant difference when comparing the calmness mean scores within Group A pre- and post-IV treatments (4.66 and 2.93, respectively), with a p-value 0.01. Within Group B the data revealed a statistically significant difference between pre- and post-IV treatments ($p<0.01$, 4.33 and 2.13, respectively). Both treatment groups experienced a decrease in anxiety levels from pre to post IV treatments. Moreover, combined mean calmness scores of the 30 subjects (Group A and B) expressed in mean standard deviation showed there was a decrease from 4.50±1.31 in pre-IV treatment to 2.53±1.17 in post-IV treatment. Further investigation of the data showed that there was a significant correlation between calmness and gender; females reported higher levels of anxiety than men before and after IV treatment.

Conclusion: Results from this study support the use of IV eyewear as an effective technique to reduce anxiety in adults during oral debridement. The use of the IV eyewear was well received by all subjects. The portable, affordable and easy-to-operate IV system makes this technique an appealing approach of reducing dental anxiety.

Keywords: dental anxiety, immersive visualization, virtual reality

This study supports the NDHRA priority area, **Clinical Dental Hygiene Care:** Investigate how dental hygienists use emerging science to reduce risk in susceptible patients (risk reduction strategies).

Introduction

Dental anxiety poses significant challenges for patients and dental care providers.[1-3] Evidence suggests that anxiety inhibits individuals from seeking oral care services, leading to a vicious cycle of inconsistent dental visits that may contribute to the deterioration of oral health.[4-9] Dental anxiety is generally defined as nonspecific lack of ease, apprehension or negative thoughts about what may happen during a dental appointment. The specific cause of dental anxiety is unknown; however, researchers believe it results from a previous traumatic experience or from vicarious learning.[10] People can develop dental anxiety at any stage of their lives, but childhood onset is often associated with a pattern of more severe and negative responses compared to onset during adolescence or adulthood.[10] Non-cognitive triggers, such as fear of the unknown, previous negative experiences and perceptions of family members, friends, and the media, can increase dental anxiety.[11] Cognitive factors such as vulnerability, negative expectations, patient-clini-

cian relationships, perceptions of powerlessness and negative thoughts appear to have greater impacts on dental anxiety than do non-cognitive factors.[11]

Okawa et al concluded that patients reported high dental pain when their anxiety levels were also high.[12] Fear of pain and negative previous experiences are reported as the primary reasons that individuals feel anxious during dental hygiene procedures.[13,14] Consequently, it is important to manage dental anxiety to help reduce pain. Procedures, such as periodontal probing or scaling and root debridement, may elicit some level of pain coupled with anxiety; thus, these procedures represent scenarios that need to be controlled.[8]

The use of adjunctive therapy to reduce dental anxiety is not a new concept. The American Dental Association (ADA) supports the responsible use of pharmacological agents to manage anxious patients.[15] Currently, general classes of drugs used to manage pain and anxiety include nonsteroidal anti-inflammatory drugs, acetaminophen, opioids, benzodiazepines, selective serotonin reuptake inhibitors, tricyclic antidepressants and monoamine oxidase inhibitors.[15,16] Although pharmaceutical medications can help patients with anxiety, the efficacy of these therapies is not guaranteed. Non-pharmacological interventions such as patient-centered communication, bio-feedback, deep breathing exercises and music distraction also have limitations. Therefore, additional non-pharmacological techniques, such as audiovisual immersion therapy, altered reality and music distraction, are being studied to assist anxious patients. The use of ancillary therapies may help individuals have more positive overall experiences. These approaches allow patients to focus on the environment as a distraction from sensory factors such as fear, anxiety and pain.[17-25] Such distraction therapy may not only comfort the patient, but help the clinician provide better care to a more relaxed individual. Although distraction techniques partially interfere with the environment, the patient and the clinician are still able to interact and communicate.

The use of distraction techniques such as immersive visualization (IV), virtual reality (VR) and audiovisual (AV) are novel approaches to managing a wide variety of conditions. Although the exact neurobiological mechanism behind distraction techniques is unclear, these systems have been shown to reduce elements such as stress, general distress, pain, anxiety and fear without interfering with treatment. For example, the use of AV distraction minimized children's discomfort and distress during dental restorative treatments.[22] Similarly, AV distraction reduced adults' anxiety and fear during an oral prophylaxis and was associated with shorter appointment times.[23] Likewise, immersive VR techniques were able to minimize anxiety and pain during scaling and root planning.[24] All of the participants reported they had a positive experience and would use the distraction systems for future dental procedures.[22-24]

The purpose of the present study was to evaluate the effects of a portable immersive visualization eyewear system on adult anxiety during routine oral prophylaxis.

Methods and Materials

The study was conducted at the Dental Hygiene Research Center at Old Dominion University. Institutional review board approval was obtained prior to the beginning of the study. Participants were recruited through flyers and the university's campus wide email system. Informed consent was obtained prior to data collection.

At screening, a full mouth oral examination was performed to assess periodontal status, caries and dental calculus. One experienced dental hygienist performed all procedures in a single 1-hour appointment. Volunteers were enrolled in the study if they were: 18 years or older, scored a 9 or higher on the Corah's Dental Anxiety Scale Revised (DAS-R)[26] and were generally healthy. Subjects were excluded if they presented with severe dental calculus (Class IV or V), severe periodontal disease (American Academy of Periodontology status of 3 or higher), severe dental caries (3 or more open large lesions), required antibiotic pre-medication reported the current use of anxiety medication, psychotropic drugs, or had a history of seizures or convulsive disorders, vertigo, or equilibrium disorder. Subjects were excluded if they were medically treated for anxiety. The researchers were not authorized to provide medical advice and no other mental health tests or guidance was provided. During treatment if participants felt uncomfortable with the IV eyewear or dental procedures, they were free to exit the study. Individuals who did not qualify for the study because of excessive caries, periodontal disease or dental calculus were referred to the dental hygiene care facility at the same institution for evaluation.

A split mouth design was utilized using a left/right side comparison rather than half of the subjects using the IV and the other half not because of the variation in perception of anxiety. By using this method the same individual rated their level of anxiety with and without the use of the IV system. Subjects were randomly assigned into 2 groups: Group A used IV during the first one-half of the appointment and Group B wore IV during the second one-half of the appointment.

Portable Immersive Visualization Vuzix iWear AV 920 video eyewear, which costs approximately $200, was integrated with a common smartphone (iPhone 5) to render videos (Figure 1). A small black disposable

cloth barrier was attached to the top of the IV headset to minimize light and outside distractions. Subjects' peripheral vision was not constricted in an attempt to minimize any anxiety that might result from such "unknowns" as the unfamiliar treatment room and instruments.

Prior to IV treatment, subjects had the opportunity to select one of 3 videos:

1. A documentary about Oregon
2. A set of music videos
3. An episode of Mr. Bean, a popular comic TV series

Subjects could use a Bluetooth switch to display the video with audio, listen to the audio only, or stop the video and audio. Subjects were able to adjust the volume and could turn IV eyewear off at any time. Instructions for using the IV system were provided to all participants prior to starting the treatment.

The DAS-R was identified as a reliable instrument for assessing dental anxiety.[26,27] The DAS-R was scored and recorded at screening to determine eligibility and again at baseline to validate subject's anxiety status. The DAS-R consists of 4 multiple-choice questions that measure anxiety levels related to dental visits. Total possible scores ranged from 4 to 20 points: 15 to 20 (severe anxiety), 13 to 14 (high anxiety), 9 to 12 (moderate anxiety) and 8 or less (low anxiety). The Calmness Scale was a researcher designed question: "How calm do you feel right now?" which was scored and recorded before and after IV treatment, on a 7-point Likert scale. Scores ranged from 1 (very calm) to 7 (less calm).

After the completion of the oral prophylaxis, subjects completed a post-IV opinion survey. Items were scored on a 7-point Likert scale. The survey consisted of following 3 questions:

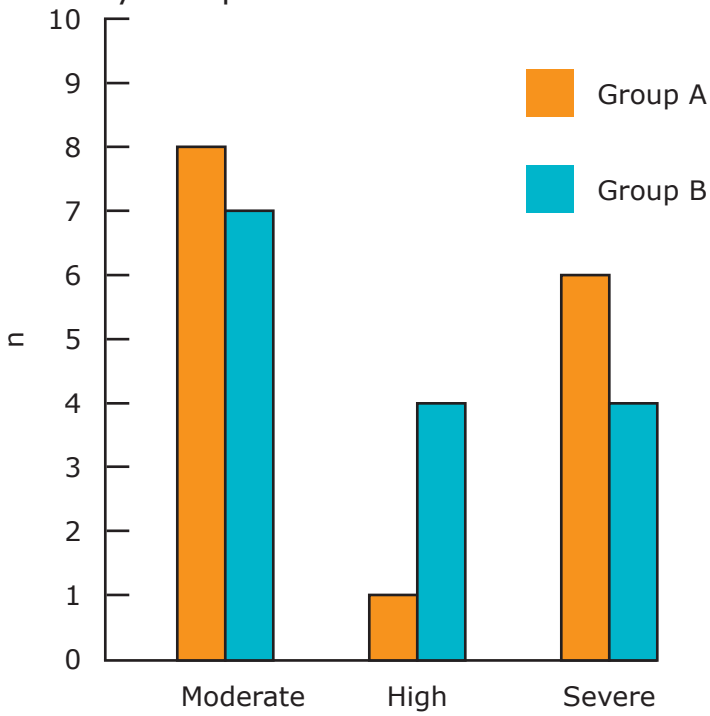
1. How anxious were you during your dental treatment when wearing the Immersive Visualization eyewear(1=not anxious to 7=very anxious)?
2. Did you find wearing the Immersive Visualization eyewear helped to reduce your anxiety during treatment (1=not at all to 7=very much)?
3. Did you enjoy wearing the eyewear during the treatment (1=not enjoyable to 7=very enjoyable)?

Statistical Anaylsis

Data were entered into Microsoft Excel for Mac 2011 (Microsoft Corporation Version 14.3.5) and analyzed with SAS® 9.3 statistical software. Data were reviewed 3-times for validity and quality assurance. Descriptive statistics and analysis of variance (ANOVA for Generalized Linear Regression Model) fits were carried out with a level of significance of 0.05.

Figure 1: Portable IV Eyewear System

Figure 2: Baseline Corah's DAS–R Anxiety Level by Group



Results

Fifty individuals were screened for the study, and 30 subjects qualified. The sample was composed of 23 females (76.7%) and 7 males (23%) with a mean age of 29.96±7.8 (ranging from 18 to 51 years). Fourteen subjects (46.7%) self-identified as Caucasian, 6 (20%) as African American, 5 (16.65%) as Hispanic and 5 (16.65%) as Asian. At baseline, 15 subjects (50%) self-reported moderate anxiety, 5 (16.7%) high anxiety and 10 (33%) severe anxiety on the DAS-R scale (Figure 2). Female subjects reported higher levels of anxiety than men, both before

treatment (female 4.83±0.94 versus male 4.42±0.53) and after (female 2.83±1.70 versus male 2.00±1.15).

The DAS-R was scored at baseline to determine anxiety levels. The results showed no statistically significant differences between groups with regard to the baseline anxiety (Group A=13.33±3.15 and Group B=12.93±2.40, p=0.7).

Comparisons of calmness mean scores are presented in Table I. Group A used the IV system during the right side of treatment while Group B used the IV system during the left side of treatment. Within Group A, the ANOVA fit showed a statistically significant difference in calmness ($p<0.01$) between pre (4.66±1.04) and post (2.93±1.22) in IV use. Likewise, within Group B the fit revealed a statistically significant difference ($p<0.01$) between pre (4.33±1.54) and post (2.13±0.99) in calmness with IV treatment. Results indicate that the use of IV system during oral debridement had a positive effect in lowering anxiety levels in the adult population. Regardless of whether subjects started wearing the IV system at the beginning of the appointment (Group A), or as the clinician switched sides (Group B), anxiety was reduced. Combined calmness mean scores data of Group A and Group B showed a decrease from 4.50±1.31 pre IV treatment to 2.53±1.17 post treatment, which indicates all participants benefitted.

Table I: Comparison of Mean Calmness Scores Pre- and Post-Treatment by Side and Group

Group	Right Side		Left Side	
	Pre	Post	Pre	Post
A	4.66±1.04*	2.93±1.22*	2.93±1.22	3.13±1.96
B	4.8±0.68	4.33±1.54	4.33±1.54*	2.13±0.99*

*Statistically significant, indicates use of IV during treatment

Table II: Comparison of Mean Post–IV Treatment Opinion Scores

Post IV Opinion Survey	Group A	Group B	Total
1. How anxious were you during your dental hygiene treatment when wearing immersive visualization system? Scale: not anxious (1) to very anxious (7)	2.73±1.10	2.73±1.03	2.73±1.05
2. Did you find wearing the immersive visualization system helped reduced your anxiety during treatment? Scale: not at all (1) to very much (7)	6.53±0.64	6.13±0.99	6.33±0.84
3. Did you enjoy wearing the immersive visualization system during the treatment? Scale: not enjoyable (1) to very enjoyable (7)	6.06±1.38	6.26±0.96	6.16±1.18

Prior to oral prophylaxis, subjects had the opportunity to choose the type of video they wanted to watch: 15 (50%) chose the documentary, 10 (33%) subjects opted for the music videos and 5 (17%) chose the comic TV show. None of the participants elected to stop the video or audio while wearing IV system.

Results obtained from the Post IV Opinion survey are displayed in Table II. Subjects responded positively to wearing the IV eyewear system and they felt it helped to reduce their level of anxiety. During post treatment debriefing, all the subjects reported that wearing the IV eyewear was enjoyable and did not interfere with treatment procedures. The clinician also reported that the IV system did not interfere with treatment.

Discussion

Patients with dental anxiety may exhibit behaviors that make rendering treatment difficult and may keep them from seeking oral care, thus contributing to the deterioration of their oral health. The aim of this study was to determine whether a portable IV eyewear system could reduce anxiety in adult patients during oral prophylaxis treatment. Previous investigations have offered patients the use of head mounted AV and music distraction during dental and dental hygiene procedures with similarly positive experiences.[18,19,21-24] IV was determined to be a safe, economical, easy-to-use, non-pharmacological approach to short-term reduction of dental anxiety. The present study is in line with other studies that have shown females are more prevalent to report or experience dental anxiety and fear when compared to the male population.[1-4,8,11,14,28] The authors also postulate that perhaps more women seek out dental treatment than men and are more comfortable in reporting their anxiety and fear.

Results from the Calmness Scale showed Group A to be slightly more anxious compared to Group B. One possible explanation could be that Group A started with higher mean calmness scores compared to group B (4.6 and 4.3 respectively). From the study design, Group A started using the IV eyewear in the beginning of the appointment and was not wearing

the IV on the second half of the study. Both groups showed statistically significant differences in anxiety levels between pre- and post-IV eyewear use. Group B's level of anxiety did not change significantly during the first half of the treatment without the use of IV, but was more than 50% lower after the IV treatment. Several other confounding factors could be the reason for such disparities. One factor may be that Group A enrolled a higher ratio of women (n=13) compared to men (n=2) and included more individuals with severe anxiety (n=6) compared to Group B (n=4).

Nausea has been reported as one of the possible side effects of virtual reality and virtual immersion;[29] however, in the present study, none of the subjects experienced this side effect. Two subjects reported that the IV equipment was "heavy" and "uncomfortable," and 1 subject reported missing the patient-clinician interaction during the procedure, but all subjects reported that they would wear the IV system during dental care if available. In future studies, using a microphone connected to the IV system headset is recommended to provide better communication between the patient and the clinician.

Study Limitations

Although the sample size was relatively small, information gathered in this study can be used to validate previous research and to provide support for future studies. Neither the clinician nor the subjects were blinded to the treatment; due to design study characteristics, this was not feasible. There is some evidence that anxiety may influence blood pressure and heart rate during dental treatment.[23,30] The present study did not include monitoring vital signs although this may be a consideration for other research. Future studies should also consider expanding the questionnaire to include age of anxiety onset since literature suggests that variations occur among age of traumatic dental experience and management techniques.[10] The portable IV system used in this study did not constrict the patient's peripheral vision because we believed that leaving some peripheral vision may provide additional comfort to the subjects. It is also important to note that researchers relied on participants' self-reported levels of anxiety and calmness. The use of additional screening tools to identify patients who are anxious may merit further investigation.

Conclusion

Evidence in the literature indicates that dental anxiety is a very real problem that can complicate oral care or prevent individuals from seeking dental services all together. Because the portable IV system used in this study operates with a common smartphone and an affordable head-mount display, this state-of-the-art technology has the potential to become widely adopted as a distraction technique. Results from this study support the use of IV eyewear as an effective distraction technique to help decrease or manage short-term anxiety in adult patients during routine oral debridement.

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Hearing Difficulties Among Experienced Dental Hygienists: A Survey

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Abstract

Purpose: Assess prevalence of self-reported hearing difficulties among experienced dental hygienists who have been practicing for a minimum of 20 years and explore the relationship between hearing difficulties and occupational noise exposure from ultrasonic scalers.

Methods: A 19-item survey was mailed to a random sample of 1,067 dental hygienists who had obtained their California licenses between 1972 and 1992. To estimate the prevalence of hearing difficulty, binomial proportion and associated 95% confidence interval are presented. Logistic regression model of hearing difficulty was used to assess an association with ultrasonic scaler use.

Results: Response rate was 35% (n=372/1,067). The prevalence of self-reported hearing difficulty was 40% (95% confidence interval, 35 to 44%). Of the 17% (95% confidence interval, 14 to 21%) of respondents that reported hearing difficulty due to ultrasonic scalers, most (91%) reported that their hearing difficulty was confirmed by an audiologist. Respondents with hearing difficulty due to scalers were 2-times (odds ratio: 2.0, 95% confidence interval, 1.1 to 3.6, p=0.03) more likely to report significantly higher scaler use than those who did not have hearing difficulty after adjusting for age and other potential causes of hearing difficulties.

Conclusion: The prevalence of hearing difficulty at 40% among dental hygienists with an average age of 56 years was considerably higher than the reported national average at 17% for adults 70 years or older. Long-term noise exposure to dental equipment, such as ultrasonic scalers, may contribute to hearing difficulties among experienced dental hygienists. Ear protection is suggested as a preventive measure while using noisy dental equipment.

Keywords: dental hygienist, ultrasonic scalers, hearing loss, noise-induced, occupational hazards

This study supports the NDHRA priority area, **Occupational Health and Safety:** Investigate the impact of exposure to environmental stressors on the health of the dental hygienist (aerosols, chemicals, latex, nitrous oxide, handpiece/instrument noise).

Introduction

Dental personnel are in an occupational field that exposes them to hazardous noises on a daily basis.[1] The decibel, which is measured on a logarithmic sale using an A-weighted sound levels (dBA), is used to express the sound level associated with noise measurements. A small change in the number of decibels results in a large change in the amount of noise and the potential damage to a person's hearing. Both Occupational Safety and Health Administration (OSHA) and National Institute for Occupational Safety and Health (NIOSH) recommend all worker exposures to noise should be controlled below a level equivalent to 85 dBA for 8 hours to minimize occupational noise induced hearing loss, and 15 minutes for 100 dBA to avoid hearing loss. The ultra-high speed drill, for example, was introduced in the 1970s, and it produced noise levels of 100 dBA or more.[2] At that time, a committee of the American Dental Association (ADA) reported that extended exposure to this new type of equipment could cause auditory damage.[2]

A historical overview of the literature from 1950 to 2001 concluded that further studies were needed to assess occupational noise-induced hearing loss associated with the use of the dental instruments, as the air turbine, due to inconclusive study results.[2] A Finnish study (1981 to 1982), for example, looked at hearing of dentists and dental nurses over age 25 with a high frequency audiometer and found no statistically significant difference between the hearing of controls without any known history of ear-related problems or noise exposure.[3] A longitudinal study of dentists who had practiced for a minimum of 10 years (1973 and 1988) found that the prevalence of hearing impairment was greater in the follow-up period, but the authors attributed this to presbyacusis (age-related hearing loss) and not noises in the dental office.[4] Since the 1970s, technological improvements were made to dental equipment, which reduced the amount of noise to a level thought to be safe (i.e., <85 dBA).

Instruments, such as ultrasonic scalers, have been reported to produce 68 to 75 dBA, and sometimes up to 90 dBA.[1] Even though this noise level is usually below the sound limits of OSHA[5] and NIOSH,[6] recurring use of dental instruments producing these decibel levels may cause hearing impairment.[1,5] Aged instruments produce higher noise levels, often above 85 dBA. Turbines, for example, become louder after 1 year of sterilization cycles if they are not properly maintained.[7-12]

Evidence suggests that hearing impairment remains a problem among dental professionals.[13-19] A pilot study of 40 dental hygienists from the U.S. (Virginia) with high exposure to noise from ultrasonic scalers had poorer hearing, as measured by pure tone audiometry, than those with low exposure.[13] Four separate questionnaire-based surveys from Italy,[16] Belgium,[14] Thailand[17] and United Arab Emirates[18] reported hearing problems: 30%, 19%, 11% and 5%, respectively. A study from Malaysia reported 5% prevalence of hearing loss based on audiometry.[19] To date, a limited number of studies have investigated prevalence of hearing impairment in dental hygienists, especially studies of U.S. dental hygienists. To our knowledge, there are no previous studies that assess prevalence of hearing difficulty among dental hygienists licensed in California. The primary purpose of this study was to address this gap by assessing the prevalence of self-reported hearing difficulties among dental hygienists who obtained their license from California between 1972 and 1992. The secondary aim was to evaluate occupational noise-induced hearing difficulties associated with the use of ultrasonic scalers.

Methods and Materials

This study was approved by the University of California, San Francisco's Institutional Review Board. The study population consisted of dental hygienists who received their licenses from California between 1972 and 1992. An older population was selected to provide the licensee with the opportunity to have practiced 20 years and, thus, be exposed to ultrasonic scalers during this time. The selection of subjects with 20 or more years of experience decreases the external validity of the study since the results cannot be generalized to all dental hygienists, but increases the internal validity because these individuals could be exposed for a longer duration to occupational noise that may have contributed to hearing difficulty. Therefore, licensees that were practicing less than 20 years either part-time or full-time as a clinical dental hygienist were not eligible for this study. Full-time is defined as working 4 or more days per week.

A 3-page 19-item survey with at least 5 questions per page was developed by the authors, incorporating questions from the Dental Hygiene Work History Questionnaire that included information about use of ultrasonic scalers in clinical practice, hearing difficulties and exposure to loud noises.[13] The survey also requested additional self-report information, such as earplug use and barriers to using earplugs while providing direct patient care and demographic information (e.g., sex and year the dental hygienist was first licensed). The survey was pre-tested by 3 California-licensed dental hygienists, who had practiced more than 20 years, and it was revised accordingly.

To assess the primary aim of this study, prevalence of self-reported hearing difficulties, a sample of 1,067 subjects were randomly selected by computer generation performed by the R & D Data Corporation from a population of 5,725 dental hygienists licensed by the state of California between 1972 and 1992. This sample size of 1,067 subjects was based on an expected response rate of 30% or 320 respondents. It was assumed that 30% of the respondents would report hearing difficulty with a margin of error of 10% based on a 95% confidence level. This estimate was based on a previous study that reported 30% prevalence of Italian dentists with hearing impairment with a 10% margin of error.[16] Mailing addresses of the subjects were obtained from the R & D Data Corporation. Identification numbers were used to ensure subject confidentiality, while permitting follow-up of non-respondents. A second mailing was sent 4 weeks later to those not responding to the first mailing. No monetary incentives were provided to the dental hygienists randomly selected to participate in this study.

Descriptive statistics of the survey questions were calculated and are presented as the frequency (percentage) for categorical variables and mean and standard deviation for variables measured on a continuous scale. To estimate the prevalence of hearing difficulty, binomial proportion and associated 95% confidence interval are presented.

The secondary aim of this study was to explore the relationship of hearing difficulties with ultrasonic scaler usage. Separate univariate logistic regression analysis of each outcome: self-reported hearing difficulty status (presence or absence) and hearing difficulty status due to ultrasonic scalers was used to explore an association with scaler usage (independent variable) and these associations are reported as odds ratios with corresponding 95% confidence interval. Ultrasonic scaler usage was calculated for each respondent based on 4 self-reported questions:

1. Average number of years of ultrasonic scaler use
2. Average days per week of ultrasonic scaler use
3. Average minutes of ultrasonic scaler use per patient
4. Average number of patients treated per day

If a respondent did not complete a question, median scaler usage based on all respondents for that question was imputed before total scaler usage for each respondent was calculated. Total ultrasonic scaler usage (reported in days) was dichotomized as high usage (>103 days) and low usage (≤103 days). The cut-off is the median of the distribution of the ultrasonic scaler usage among all respondents.

Multivariable logistic regression analysis was performed if the univariate logistic regression analysis presented a statistically significant effect. This multivariable analysis was used to evaluate potential confounders, age and other possible causes of hearing difficulties due to family history, congenital defect, infectious disease, loud noise exposure, occupational exposure and other causes that may contribute to hearing difficulties. Statistical analyses used SAS version 9.3 (SAS Institute, Cary, NC). All statistical tests provided 2-sided p-values, and p-values ($p<0.05$) were considered statistically significant. The results presented are consistent with the guidelines for reporting surveys.[20]

Results

Of the randomized sample of 1,067 California dental hygienists licensed from 1972 to 1992, 20 surveys did not reach the dental hygienists and were returned. Fifteen (4%) reported that they had been licensed between 1964 and 1971, and 1 (<1%) in 1993. After 2 mailings conducted in 2013, 395 surveys (37%) were returned. Of the 395 respondents, 23 surveys were excluded because the respondents had not practiced 20 years or more as a clinical dental hygienist. Thus, the response rate for those that met the study eligibility criteria was 35% (372/1,067).

The average age of the respondents was 56 years (SD=8) and the median year of the California dental hygiene license was 1981 (range=1964 to 1993). Nearly all respondents were females (n=371/372, 99%). The majority (77%) reported at least 21 years of direct patient care using ultrasonic scalers and working at least 3 days per week (70%), which was considered part-time since they worked less than 4 days per week.

Most respondents (79%) reported using the ultrasonic scalers for 5 to 20 minutes per patient, and a few respondents (1%) reported using the scalers for greater than 50 minutes per patient. The median usage of ultrasonic scalers was 103 days (25^{th} percentile=38 days, 75^{th} percentile=254 days, range=0.007 days to 1,367 days). Nearly all respondents (94%) answered all 4 questions about ultrasonic scaler usage. Of the 24 respondents (7%) that did not, most (n=23/24, 96%) responded to the majority of questions (3 of 4 questions, 12/24, 50%; answered 2 of 4 questions, 11/24, 46%) except for a respondent (4%) that answered a question.

Table I: Percentage of Respondents Reporting Other Possible Causes of Self-Reported Hearing Difficulty, Exposure to Loud Noises and Earplug Use

Variable	Percentage of Respondents (%)
Possible Causes of Hearing Difficulties*	
Family History	9
Congenital Defect	1
Infectious Disease	3
Loud Noise Exposure	15
Occupational Exposure (other than Dental Hygiene)	6
Other	20
Exposure to Loud Noises*	
Listening to loud music through headphones	33
Attending rock concerts	66
Playing a musical instrument in a group	12
Earplug Use	
Currently use earplugs while using ultrasonic scalers**	5
Plan to use earplugs in the future#	57
Identified barriers to using earplugs##	52

*Numbers do not equal 100 because respondents could select more than one response.
**372 respondents
#359 respondents
##347 respondents

Table I provides a list of possible causes of self-reported hearing difficulty. The most frequent response was other (20%) and then loud noise exposure (15%). The most common loud noise was attending rock concerts (66%). Few (5%) reported wearing earplugs while using ultrasonic scalers, and over half (52%) also reported difficulty hearing due to scalers. While the majority (57%) reported that they plan to use earplugs in the future, 23% also reported barriers to earplug use. Of the respondents that indicated barriers to wearing ear plugs while using ultrasonic scalers (52%), many (49%, 95/193) responded to an open-ended question about the barriers of wearing them. The most common barrier was communicating and interacting with patients (74%, 70/95). Other various reasons (26%) were also reported.

Prevalence of Self-Reported Hearing Difficulties Among Dental Hygienists

Over one-third (40%, 95% confidence interval, 35 to 44%) reported that they had been told or had experienced hearing difficulties and 17% (95% confidence interval, 14 to 21%) reported hearing difficulty due to scaler use. Thirteen percent indicated that their hearing difficulty was diagnosed by an audiologist. Of the 17% that reported hearing difficulty due to scalers, 91% had confirmed this hearing difficulty with an audiologist. The average age of those with self-reported hearing difficulties due to ultrasonic scalers was 56 years (SD=8) and those without hearing difficulties average age was 57 (SD=6).

Relationship Between Hearing Difficulty and Use of Ultrasonic Scalers

Hearing difficulty due to any cause, including the use of ultrasonic scalers, was 1.5 times (95% confidence interval, 1.0 to 2.3) more likely to be associated with higher usage of ultrasonic scalers than those with no hearing difficulty, but this finding was not statistically significant (p=0.05). Those with hearing difficulty due to use of ultrasonic scalers were 2.3 times (95% confidence interval, 1.3 to 4.1) more likely to have higher ultrasonic scaler usage than those without hearing difficulty (p=0.003). The multivariable logistic regression results (odds ratios=2.0, 95% confidence interval, 1.1 to 3.6) remained statistically significant after adjusting for potential confounders, age and other potential causes of hearing difficulties (p=0.03).

Discussion

The results from this study indicated that 40% of respondents (average or median age of 56 years, range 42 to 81 years) that were licensed in California reported hearing difficulties. This prevalence was much higher than the 17% prevalence of hearing impairment among Americans aged 70 years and over, but similar to the 45% prevalence of hearing impairment among Americans 80 years and over that was reported between 1999 and 2006 from the National Health and Nutrition Examination Survey.[21] Even if we assume that all of the non-respondents of the survey did not have hearing difficulty (n=672), then the prevalence of hearing difficulty still remains higher at 17% than the national average at 6.1% for women 50 to 59 years old.[22]

Other countries have looked at hearing problems among dental personnel. Four separate questionnaire-based surveys from Italy,[16] Belgium,[14] Thailand[17] and United Arab Emirates[18] reported hearing problems: 30%, 19%, 11% and 5%, respectively. The lowest prevalence of hearing difficulty was reported in United Arab Emirates and Malaysia at 5%.[18,19] The lower prevalence observed in this Malaysian study, of whom 94% used ultrasonic scalers, may also have been due to a younger population (i.e., average age 39 years vs. 56 years in this study) with less occupational exposure (i.e., 68% worked for 10 years vs. all worked at least 20 years in this study) and pure tone audiometry being used as the assessment of hearing impairment, rather than self-report. A recent study conducted in Italy demonstrated a 30% self-reported prevalence of hearing impairment among general dental practitioners, as compared to a prevalence of 15% for general medical practitioners.[16] Both sets of practitioners had been practicing for at least 10 years, a period generally considered sufficient to generate hearing difficulty.

One reason for the higher prevalence of hearing difficulty in this study may be due to longer occupational exposure. As part of the eligibility criteria, dental hygienists had been practicing for a minimum of 20 years and obtained their licenses between 1972 and 1992. However, 15 respondents (4%) indicated that they had received their license between 1964 and 1971, and 1 (<1%) from 1993. It is unclear whether this discrepancy was due to survey recall bias of these 16 respondents or an issue with the records from the R & D Data Corporation. Since these participants had practiced for more than 20 years, they were included in the final analyses. Furthermore, a sensitivity analysis was performed that excluded these 16 respondents from the analyses, and the results were nearly identical.

Hearing status was not measured with audiometry, so data in this study were the respondents' perceptions of their hearing difficulties, and the respondents' use of the ultrasonic scalers may have been over or under reported. Most dental hygienists (91%) that reported hearing difficulty due to scalers also reported that their hearing difficulties were confirmed by an audiologist. Medical records were not obtained from the audiologist to confirm the cause of hearing difficulty, and therefore, hearing difficulty due to ultrasonic scaler usage may have been over-reported.

This study showed that respondents with hearing difficulties due to ultrasonic scalers were 2-times more likely to have higher scaler use than those without hearing difficulties, even after potential confounders were included in the model (p=0.03). These findings are comparable to a previous report in which dental hygienists with high ultrasonic usage had poorer hearing, as measured by pure tone audiometry, than those with low ultrasonic usage.[13] They are also consistent with a study of Italian dentists concluding that frequent use of ultrasonic scalers was significantly associated with self-reported hearing impairment (odds ratios=3.6, 95% confidence interval, 1.1 to 12.2, p=0.03).[16]

Assessment of other possible causes of hearing difficulties was included in the present study, whereas some previous studies have excluded respondents with history of hearing loss due to infection or congenital defects.[13] Another risk factor of hearing impairment is increasing age, which has been associated with higher prevalence of self-reported hearing impairment.[23] Age-related hearing loss is typically gradual and progressive. We were interested in the influence of these risk factors as potential contributors to hearing difficulty. The effect of ultrasonic usage on hearing difficulty remained statistically significant after adjustment for other possible causes of hearing difficulties and age (p=0.03). Age did not seem to be a confounder in the relationship, but other causes of hearing difficulties did appear to contribute to hearing difficulties. This finding suggests that ultrasonic-related hearing difficulty is not simply the result of the respondents' increased age since age was controlled for in the model, but appears to contribute from more frequent use of the ultrasonic scalers.

In the present study, only a few respondents (5%) indicated that they were currently using earplugs to prevent hearing impairment and reduce exposure to occupational noise pollution, but approximately half the respondents indicated that they would consider using them in the future. This preventive attitude is encouraging since many people are unaware of their hearing loss until it is too late.[24] Longitudinal studies are needed to assess whether wearing ear protection while using noisy dental equipment reduces the risk of hearing loss. Once hearing has been damaged, hearing problems are permanent and irreversible. Kilpatrick stated that if hearing loss is suspected from dental sources, some type of ear plug or ear muff should be used.[25]

Conclusion

The prevalence of hearing difficulty at 40% among dental hygienists with an average age of 56 years in this study population was considerably higher than the national average reported by the National Health and Nutrition Examination Survey at 17% for adults 70 years or older. This higher prevalence of hearing difficulties among survey respondents who are considerably younger may be caused by occupational exposures, such as long-term use of ultrasonic scalers, but additional studies are needed to confirm the causes of hearing difficulty in this population. To prevent potential hearing impairment, wearing ear protection, such as earplugs, is suggested while using noisy dental equipment. Longitudinal studies are needed to assess whether wearing ear protection while using noisy dental equipment reduces the risk of hearing loss.

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Acknowledgments

We would like to thank the reviewers for their constructive comments that have served to improve the manuscript.

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A Comparison of Technique Errors using Two Radiographic Intra-oral Receptor-holding Devices

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Abstract

Purpose: Technological advances in intra-oral receptors have resulted in film-holding devices that may or may not be interchangeable with photostimulable phosphor receptors. This study evaluated the number and types of technique errors that occurred when using PSP receptors with a standard film-holding device and a dual PSP/film-designed device.

Methods: The Rinn XCP-ORA® (Standard) and the Rinn Flip-Ray® PA device (Test) were compared using rectangular collimation. DenOptix® imaging plates (sizes 1 and 2) were used as receptors. Fourteen periapical (10-size 2 and 4-size 1) projections were exposed per full mouth series on each Dental X-ray Teaching and Training Replica with both devices. Five Dental X-ray Teaching and Training Replicas were exposed by 3 experienced radiographers. Data were analyzed using a paired t-test to determine differences in the performance scores between the 2 devices. Technique errors (receptor placement, vertical angulation, horizontal angulation and cone centering) were reported using frequencies. An experienced evaluator critiqued each projection.

Results: A total of 15 full mouth series (210 projections) were taken per device. The mean performance scores per device were 88.4 (standard device) and 88.1 (test device) and were not statistically different ($p=0.88$). Cone centering errors were the most common error observed in both the standard (36%) and test (43%) devices. Receptor placement errors occurred when using the standard (12%) and test (9%) devices. Vertical and horizontal errors were <2% for both devices.

Conclusion: Devices designed for use with film may be used interchangeably with photostimulable phosphor receptors. Some difference was noticed between devices regarding error type and occurrence.

Keywords: intraoral radiographic technique errors, intraoral radiographic device, image quality, dentistry

This study supports the NDHRA priority area, **Clinical Dental Hygiene Care:** Assess the use of evidence-based treatment recommendations in dental hygiene practice.

Introduction

The earliest reported use of intraoral film-holding devices was by William H. Rollins in 1896.[1] Improvements have been made throughout the years on intraoral film devices in order to standardize variable factors, such as film position and X-ray focus. In addition, these devices have been designed to produce optimally comparable radiographs (size and accuracy of object).[2] Evolution has included the introduction of bite blocks, film support and backing plates, film-holding and beam-aiming devices.[3-9] These devices were designed to be used with film and many are still on the market today.

The American Dental Association (ADA) recommended the use of a beam alignment device and rectangular collimation when exposing intraoral radiographs.[10] In order to adhere to this recommendation, radiographers have continued to use paralleling devices originally designed for film even though many have transitioned to using digital photostimulable phosphor receptors. Since receptors have varying dimensions, film-holding devices may not be interchangeable with photostimulable phosphor receptors. Anecdotal reports suggest that the photostimulable phosphor receptors are not secured tightly in the film-holding device and thus result in more technique errors. Common technique errors seen with film holders include receptor placement, vertical angulation, horizontal angulation and cone centering.

Technological advances in radiographic intra-oral receptors have promoted the development of new receptor-holding devices. More recently, a receptor-holding device commercially marketed for use with photostimulable phosphor and film receptors has been introduced in dentistry. The dual receptor designed device (Dentsply Rinn Flip-Ray® PA) was developed as a paralleling technique system that does not require changing parts for exposing horizontal and vertical periapical projections.[11] No studies evaluating or comparing technique performance of this

device to others have been reported in the literature. The purpose of this study was to compare the number and types of technique errors that occurred when using photostimulable phosphor receptors with a standard film-holding device and a dual photostimulable phosphor/Film-designed device.

Methods and Materials

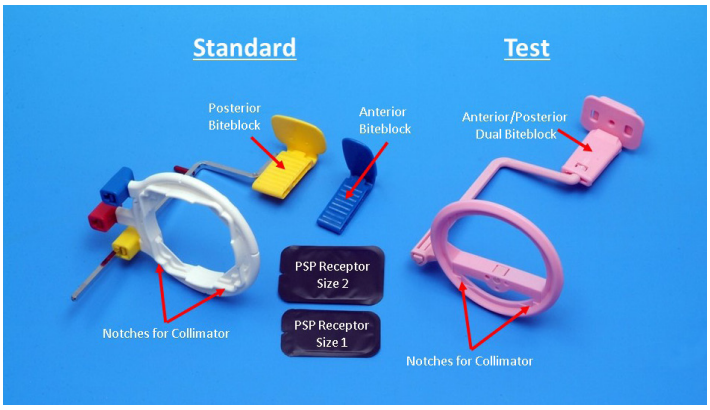
This study was designed to compare the technique quality of 2 intra-oral radiographic receptor-holding devices. Both devices were designed for use with the paralleling technique and rectangular collimation. The Dentsply Rinn XCP-ORA® (Standard) (Model # 550771, Elgin, Ill) and the Dentsply Rinn Flip-Ray® PA (Test) (Model #552600, Elgin, Ill) devices are shown in Figure 1. The Standard device (XCP-ORA) was originally designed to be used with dental film. Two color-coded biteblocks, blue for anterior projections and yellow for posterior projections, are used with the corresponding color-coded knob on the aiming ring. Figure 1 demonstrates the Standard (XCP-ORA) device set up for use with a posterior projection. The Test device (Flip-Ray®) was originally designed for use with photostimulable phosphor receptors, but more recently has been marketed to be compatible with film or photostimulable phosphor receptors (dual-use device). Both the aiming ring and biteblock were adjustable for anterior and posterior projections by rotating them on the bar. Figure 1 shows the test device set up to be used for a posterior projection.

To standardize the receptor type, all projections were exposed using DenOptix® photostimulable phosphor (Gendex, Hatfield, Penn) receptors (displayed in Figure 1). Size 1 receptors were used for the lateral/canine periapical projections (n=4) and Size 2 receptors were used for the central (n=2), premolar (n=4) and molar (n=4) periapical projections. A total of 14 periapical projections constituted a full mouth series for purposes of this project.

Five Dentsply Rinn Dental X-Ray Technique and Training Replica (Model #546002, Elgin, Ill) manikins were used for the radiographic projections. Each manikin was constructed with a human skull and natural teeth which provided unique inherent characteristics. The manikins were designed to allow high reproducibility of projections which allowed for comparison of techniques. For this study, manikins were selected for use based on acceptable functioning of components (i.e. opens easily, locks securely on biteblock), reasonably aligned teeth (i.e. no missing teeth, extremely overlapped teeth) and normal anatomic structures (i.e. no shallow palate).

Each room was equipped with a Planmeca Prostyle Intraoral X-ray unit (Roselle, Ill) with a rectangular collimator insert. The kilovoltage peak (kVp) for each

Figure 1: Examples of Radiographic Devices and Photostimulable Phosphor Receptors



This figure displays an example of each intra-oral radiographic device used in the study. Positioned on the left is the XCP-ORA™ positioning system (standard) with Rinn XCP® anterior and posterior biteblocks. On the right is the XCP Rinn Flip-Ray™ PA positioning system. Centered are size 1 and 2 Photostimulable phosphor (photostimulable phosphor) receptors with barrier covers.

projection was 70. The exposure time for anterior projections was set at 0.20 seconds and a posterior projection was 0.32 seconds.

Each projection was evaluated based on predefined criteria assessing receptor placement, horizontal angulation, vertical angulation and cone centering. Specific criteria are stated in Table I. In addition, each projection was evaluated based on diagnostic acceptability such that the projection displayed the intended radiographic information. For example, the entire lateral and canine teeth were displayed in the lateral/canine projection. Criteria were defined as the presence or absence of technique error. Performance scores were calculated based on diagnostically acceptable and diagnostically unacceptable radiographs. On diagnostically acceptable radiographs, 1 point (-1) was deducted for errors present in each projection and 4 points (-4) were deducted for unacceptable projections for each full mouth series. Four points constituted the maximum number of points deducted per projection with a maximum number of points achievable per full mouth series is 56 (14 projections). Table II describes the application of point values per technique error.

Three qualified radiographers (licensed dental hygienists) exposed two full mouth series per Dentsply Rinn Dental X-Ray Technique and Training Replica. The years of experience of the 3 qualified licensed dental hygienists exposing intraoral radiographs totaling from 10 to 40 years. The radiographers were experienced using the paralleling technique with a beam alignment device. Both the Standard and Test intraoral receptor-holding devices were devices that used the paralleling technique and align the beam to the receptor. The Dentsply Rinn Dental X-Ray Tech-

Table I: Intraoral Radiography Performance Criteria for Periapical Examinations

A. General Consideration - All periapical views should demonstrate:
1. 1/4 inch (5mm) of alveolar bone visible beyond the apex of each tooth. 2. 1/16 - 1/8 inch (1 – 2mm) margin between the crowns of the teeth and edge of the receptor. 3. The occlusal plane should parallel the occlusal edge of the receptor.
B. Specific Views
1. Central Projection (#2 receptor vertically placed) The central/central interspace is centered on the receptor. Demonstrate the central incisors, lateral incisors, and proximal portion of canines, incisive foramen and nasal fosse. Interproximal spaces open with emphasis between central incisors. **2. Lateral Incisor/Canine Projection (#1 receptor vertically placed)** The lateral/canine interproximal space is centered on the receptor. Demonstrate the entire lateral incisor; entire canine; distal portion of central incisor and mesial portion of premolar. Interproximal spaces open with emphasis between the lateral incisor and canine (the canine and the premolar will appear overlapped; this is a result of the transition to a double row of cusps and the normal curvature of the arch). **3. Premolar Projection (#2 receptor Horizontally placed)** Demonstrate no less than the distal third of the canine; the entire first premolar, second premolar and first molar; and the mesial portion of the second molar. Interproximal spaces open with emphasis on the canine/first premolar and first premolar/second premolar. **4. Molar Projection (#2 receptor Horizontally placed)** Demonstrate the first, second and third molars. Interproximal spaces open with emphasis between the first and second molar. This can be achieved by placing the anterior portion of the detector no further forward than the distal portion of the second premolar or by centering the second molar on the receptor.

Table II: Point Values to Determine Performance Scores per Full Mouth Series

Error Type	Error Severity	Point Value
Receptor placement error or Horizontal overlap error or Vertical distortion error or Cone centering error	Error present but image is diagnostically acceptable	-1 out of 4 possible points
Receptor placement error and Horizontal overlap error	Both errors present but image is diagnostically acceptable	-2 out of 4 possible points
Receptor placement error and Horizontal overlap error and Cone centering error	Three errors present but image is diagnostically acceptable	-3 out of 4 possible points
Receptor placement error and Horizontal overlap error and Vertical distortion error and Cone centering error	Four errors present but image is diagnostically acceptable	-4 out of 4 possible points
Receptor placement error or Horizontal overlap error or Vertical distortion error or Cone centering error	Error present but image is not diagnostically acceptable	-4 out of 4 possible points

nique and Training Replica sequence and device used first were randomly assigned. The evaluator was knowledgeable about the performance criteria and has evaluated radiographic technique errors for 35 years. During the image assessment, the evaluator was blinded to the devices used and the radiographers.

The study procedure was composed of the following steps:

- Five DXTTR manikins were assembled in 5 operatories
- Each radiographer was randomly assigned a Dentsply Rinn Dental X-Ray Technique and Training Replica and device

- Upon completion of the full mouth series, the exposed receptors were assigned a unique code number, scanned and stored in the School of Dentistry electronic patient record
- The radiographer progressed to the next assigned Dentsply Rinn Dental X-Ray Technique and Training Replica and device. This procedure continued until each radiographer exposed all 5 Dentsply Rinn Dental X-Ray Technique and Training Replicas using both devices.
- The radiographic images were accessed from the electronic patient record and evaluated on a 22 in. desktop monitor with 1024x768 pixels resolution in a low lit room. No enhancement features were used to alter the display of the image.
- Ten full mouth series (5 exposed with the standard device and 5 exposed using the test device) were randomly selected to be reread by the evaluator in order to determine intra-rater reliability. The rereading occurred approximately 4 hours after the initial evaluation of the images.

The outcome measure for the study was a full mouth series (14 periapicals) performance score. This score was determined by evaluating each image within the full mouth series. Thus, each projection within a FMX was assessed for the presence or absence of a technique error. Once the 14 images within the FMX were evaluated, a performance score was calculated. Fourteen images were worth a maximum of 56 points. The number of points calculated for the presence of an error was subtracted from 56 and then that number was divided by the maximum possible points to derive a percent score. For example, if five points were deducted due to 5 horizontal errors, then 51 would be divided by 56 for a percent score of 91.1 for the full mouth series.

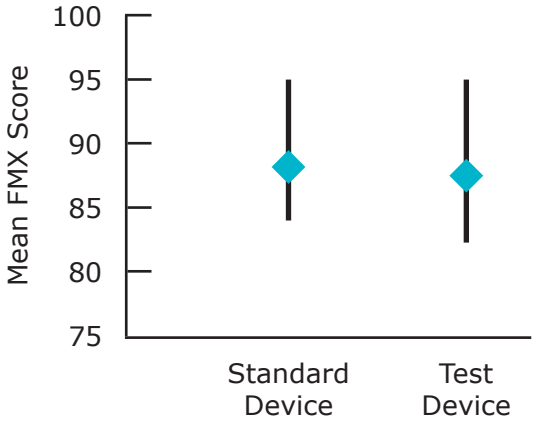
Data were entered into an Excel spreadsheet and analyzed. Technique errors (receptor placement, vertical angulation, horizontal angulation and cone centering) were reported using frequencies. A paired t-test was used to compare full mouth series mean performance scores between devices. Intra-rater reliability was assessed using an intra-class correlation.

Results

A total of 15 full mouth series were taken using both devices (420 total projections) which resulted in 210 paired images that were assessed for technical quality. Intra-rater reliability was 0.87 (intra-class correlation).

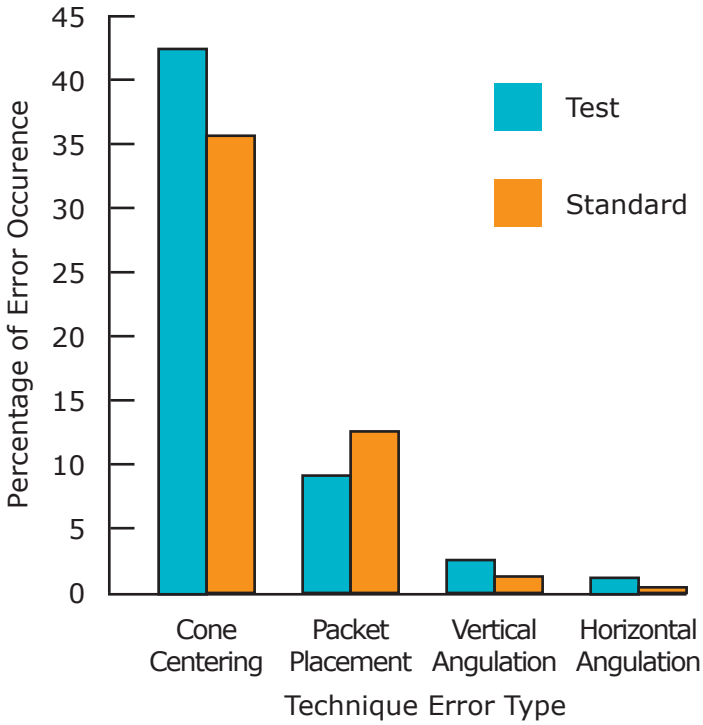
Figure 2 displays the mean performance full mouth series scores by device. The 15 full mouth series exposed by all radiographers using the standard device had an average score of 88.4 (range 84 to 97, standard deviation 5.5). In the same manner, the average performance score for the full mouth series exposed with the test device was 88.1 (range 84 to 95, standard deviation 4.6). The scores were not statistically different with a p-value of 0.88.

Figure 2: Mean Performance Scores by Device



The mean full mouth series performance scores per device were 88.4 (standard device) and 88.1 (test device) and were not statistically different (p=0.88).

Figure 3: Frequency of Technique Errors by Device



Cone centering was the most common error observed in both the standard (36%) and test (43%) devices. Receptor placement errors occurred in projections using the standard (12%) and test (9%) devices. Vertical and horizontal errors were <2% for both devices.

Figure 3 presents the percent of technique errors by device. The percentage of technique errors was determined by dividing the number of times an error occurred by the maximum number of possible times the error could occur for each device. For example,

cone centering errors using the test device occurred in 90 images out of a possible 210 images. Cone centering and receptor placement errors were the most frequently observed errors that occurred. More cone centering errors were seen when using the test device (43%) compared to the standard device (36%). A similar percent of errors between devices were seen for receptor placement with the standard device displaying a slightly higher occurrence (12%) compared to the test device (9%). Vertical and horizontal errors were almost non-existent regardless of the device used. Diagnostically unacceptable images occurred in less than 1% of the projections with both devices.

Discussion

No studies have evaluated the performance of the new device designed for use with film or digital photostimulable phosphor receptors. This study assessed both the number and types of technique errors that occurred with the test device as well as a comparison between the 2 devices. No statistical difference was seen between the 2 devices based on overall performance. A similar finding was reported in a study by Tang et al when comparing different beam alignment aiming rings used with paralleling devices.[12] One explanation for the findings of this study was that both devices were paralleling devices that aligned the beam to the receptor which allowed the projection geometry of the devices to compensate for minor alignment errors. Another reason for no performance difference may be that experienced radiographers were able to identify and problem-solve technical issues prior to making the exposure.

The findings also resulted in cone centering errors occurring at a higher frequency using the test device compared to the standard device. This finding was most likely attributed to the flexible nature of the device and not due to receptor dislodgment. Although the test device firmly secured the receptor in the biteblock portion of the device, the radiographers reported that the flexible design of the aiming ring to the swivel biteblock section allowed the geometry of the beam to the receptor to easily change. Another variable to note was the use of a rectangular collimator. It has been reported that a higher number of cone centering errors occur with the use of a rectangular collimator.[13] Any cone centering errors that resulted due to use of the rectangular collimator would have occurred with both devices. The second most common technique error was receptor placement which occurred at a slightly higher frequency when using the standard device. Receptor placement errors occurred primarily due to the increased flexibility of the photostimulable phosphor receptor or the receptor being dislodged from the biteblock. Since the photostimulable phosphor receptor was used with both devices, the most likely explanation for the slightly higher occurrence of receptor placement errors was a result of the receptor not being secured firmly in the biteblock.

A potential limitation of the study was the use of only 1 evaluator. The reason the authors chose to use one evaluator was to minimize error variance that would occur from the use of multiple evaluators. This was acceptable due to the specific performance criteria requiring the evaluator to identify the presence or absence of a technique error per projection. Intra-rater reliability was assessed to determine the amount of error due to this potential source of variance. Intra-class correlations determined intra-rater reliability to be good at 0.87.

Conclusion

It appears as though either device would be suitable for use with a photostimulable phosphor receptor. When using the photostimulable phosphor receptor with the standard device, extra precautions may be indicated to help secure the receptor in the biteblock and prevent inadvertent receptor placement errors. Radiographers should also take caution when aligning the collimator to the aiming ring of the test device. In addition, consideration should be given to manufacturing the test device with a sturdier material. It is important to remember that this study was conducted in a preclinical setting with a manikin. A clinical environment that involves tongue movement and tissue resistance may result in a different conclusion.

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California Dental Hygiene Educators' Perceptions of an Application of the ADHA Advanced Dental Hygiene Practitioner (ADHP) Model in Medical Settings

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Abstract

Purpose: To assess California dental hygiene educators' perceptions of an application of the American Dental Hygienists' Association's (ADHA) advanced dental hygiene practitioner model (ADHP) in medical settings where the advanced dental hygiene practitioner collaborates in medical settings with other health professionals to meet clients' oral health needs.

Methods: In 2014, 30 directors of California dental hygiene programs were contacted to participate in and distribute an online survey to their faculty. In order to capture non-respondents, 2 follow-up e-mails were sent. Descriptive analysis and cross-tabulations were analyzed using the online survey software program, Qualtrics™.

Results: The educator response rate was 18% (70/387). Nearly 90% of respondents supported the proposed application of the ADHA ADHP model and believed it would increase access to care and reduce oral health disparities. They also agreed with most of the proposed services, target populations and workplace settings. Slightly over half believed a master's degree was the appropriate educational level needed.

Conclusion: Among California dental hygiene educators responding to this survey, there was strong support for the proposed application of the ADHA model in medical settings. More research is needed among a larger sample of dental hygiene educators and clinicians, as well as among other health professionals such as physicians, nurses and dentists.

Keywords: advanced dental hygiene practitioner, dental hygienist, inter-professional collaboration, mid-level provider, mid-level oral health care provider, advanced dental therapist, dental therapist, dental hygiene therapist

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

Introduction

The February 2009 Institute of Medicine Workshop on the Oral Health Workforce in the U.S. highlighted interest in the development of new dental providers.[1] In 2004, the American Dental Hygienists' Association (ADHA) proposed an Advanced Dental Hygiene Practitioner (ADHP) Model, a mid-level oral health provider to help address oral health disparities in the U.S. by increasing access to care for underserved populations.[2-11] This ADHP Model requires a Master's level of education and is an overall model with competencies adopted by the ADHA Board of Trustees in 2008. This Model can be used in any state as a model, however, when it is taken to an institution of graduate education in a particular state then the educational institution defines the degree title and the state licensing boards defines the governing practice, supervision and setting for implementation of the model.[11]

To date, only the Advanced Dental Therapist (ADT) program in Normandale, Minnesota follows the ADHP Model as recommended by the ADHA.[2] Developed in 2005, the ADT graduates earn a master's degree from Metropolitan State University that requires graduate learners to be dental hygienists who are licensed and actively practicing.[11] Minnesota also developed a Dental Therapist (DT) program based on a model set forth by Minnesota dentists, however, the DT graduates are not required to be licensed dental hygienists, or to earn a Masters degree.[12] Moreover, although Alaska, California and Maine have developed mid-level provider programs as alternative workforce models, their programs do not follow the ADHA Model.[11-13] Alaska's dental health aide therapist (DHAT) cannot provide dental hygiene services, and California's Registered Dental Hygienist in Alternative Practice (RDHAP) and Maine's dental hygiene therapist (DHT) are not at the Masters level. Moreover, the DHT in Maine works under direct, not general, supervision of a dentist.[11] Studies report medical practitioners do not feel prepared to provide oral disease prevention education and services,

and have little time to do so due to competing demands.[14-21] These findings suggest the need for an ADHP in medical settings. No studies, however, have been reported on the perceptions of California dental hygiene educators regarding establishing any type of ADHP educational program in California. In light of this gap, the authors posed the following research question: What are the perceptions of California dental hygiene educators regarding a proposed application of the ADHA ADHP Model where the ADHP would work in medical settings, under general supervision of a physician or dentist, to meet clients' oral disease prevention and management needs, and facilitating referral for dental care? To answer this question, California dental hygiene educators' perceptions of the proposed application of the ADHA ADHP Model in medical settings were assessed using a web-based survey.

Methods and Materials

Application of the Model to Medical Settings

The ADHA ADHP Model was applied to medical settings proposing that ADHP services would include conducting oral screenings, prescribing certain medications (i.e, fluorides, antimicrobials, systemic and local antibiotics and anti-fungals) and oral radiographs, providing interim therapeutic restorations, billing insurance directly, consulting with medical personnel regarding oral care for patients with special needs, providing dental hygiene care and referring clients as needed for dental treatment. The ADHP would work in collaboration with the medical team within medical settings under general supervision of a physician or dentist, to meet clients' oral disease prevention and management needs, and to facilitate referral for dental care. Settings proposed included hospitals, federally qualified health centers, medical clinics, public health settings, and long term care facilities. The ADHP would function as a link between medicine and dentistry, focusing on inter-professional collaboration and education to improve client oral health and general health outcomes.

Study Design and Population

This study has a quantitative, cross-sectional survey research design that was approved by the Committee on Human Research at the University of California, San Francisco (UCSF). The study population is California dental hygiene educators employed in the accredited 30 California dental hygiene programs.

Inclusion Criteria

Dental hygiene educator is defined as those individuals who currently teach in the 30 accredited California dental hygiene programs consisting of dental hygienists, dentists, dental assistants and dental laboratory technicians.

Exclusion Criteria

Excluded from the study population were non-dental professional dental hygiene educators in California who teach prerequisite courses needed for entry into the dental hygiene program, or dental hygiene educators who have recently retired.

Survey Pilot Testing

The survey was developed using the Qualtrics system, a system to build, distribute and analyze online surveys, and was pilot tested for acceptability and feasibility among 19 dental hygienists including 7 dental hygiene faculty members, 2 current graduate learners in the UCSF dental hygiene master of science program and 5 past graduates of the same program. The survey was refined based on feedback. The final survey, which took approximately 5 minutes to complete, consisted of 20 items. Seven items addressed socio-demographics (age, gender, race/ethnicity, highest educational level, entry-level dental hygiene credential, year of graduation from dental hygiene entry-level program and highest level of education completed in dental hygiene). In addition, 5 separate items asked about ADHA membership, type of dental profession licensure, years teaching dental hygiene, type of teaching appointment, and state or national involvement in addressing either oral health disparities, access to care, or advancing the profession. Finally, 6 items assessed perceptions of the proposed application of the ADHA ADHP Model in medical settings, and 2 items assessed support of the ADHA's ADHP model in general. The items were measured using a mixture of multiple choice, Yes/No and 5-point Likert scale response options.

Recruitment and Informed Consent

The California dental hygiene program directors or their administrative assistants were contacted by phone or email to determine the total number of dental hygiene educators in each accredited program. Subsequently, all 30 California dental hygiene program directors were e-mailed asking them to forward to their dental hygiene faculty an attached informed consent cover letter that explained the study purpose, risks and benefits, and provided a web link to access the survey online. Clicking on the survey link indicated informed consent to participate in the survey.

Procedures for Survey Administration

Using an e-mail message, with a link to the 20-

item, self-administered confidential online survey, all dental hygiene educators in California who agreed to participate in the study returned the survey. Approximately 2 weeks later, dental hygiene directors again were sent a follow-up e-mail requesting them to forward the link to the survey and attached informed consent in an attempt to capture non-responders. Approximately 2 weeks later, a third and final request was sent to the dental hygiene directors requesting them to forward them survey link and the attached informed consent. As an incentive to participate, the names of all of the respondents were entered into a drawing for a $150 gift card from the chain store Target, if they chose to provide their e-mail addresses.

Statistical Analyses

Frequencies of responses for each item were calculated using the Qualtrics data analysis system. Attitudes and services items were measured on 5-point Likert scales ranging from "Strongly Agree" to "Strongly Disagree." Proposed populations and settings were measured on a 5-point Likert scale ranging from "Extremely Appropriate" to "Extremely Inappropriate."

Results

Of the 30 programs contacted, 29 program directors reported the number of dental hygiene educators who taught in their dental hygiene program. Of the 387 eligible educator-respondents reported by the directors, 70 educators actually completed the survey for an 18% response rate. Most of the respondents were female (95%), between the ages of 45 to 64 years (74%), White, non-Hispanic (83%), had Master or Doctoral degrees (77%), graduated from either a Baccalaureate (46%) or Associate degree (49%) entry-level dental hygiene program, and graduated from their dental hygiene entry-level program between 1970 to 1989 (65%). Most were ADHA members (79%), were either an RDH (80%) or an RDHAP (17%), had taught dental hygiene for at least 11 years (65%), and were full-time educators (53%). About a third (32%) reported involvement in national or state activities to increase access to oral care.

The ADHP Model

Most of the respondents had heard of the ADHA ADHP Model (77%), agreed with the proposed application of the model to medical settings (88%), and believed it would help increase access to care and decrease oral health disparities (88%). Slightly over half of the respondents (51%) believed a dedicated master's degree was the level of education needed, while just over one third (35%) believed the baccalaureate level plus an ADHP certificate was the educational level needed. The majority of respondents also agreed with the proposed services the ADHP would provide in medical settings (Table I). Other services they agreed with, but at a lower level were facilitating Denti-Cal enrollment, prescribing systemic antibiotics, systemic antifungals, and non-narcotic analgesics. Only about a third of the respondents supported the prescription of narcotic analgesics.

Moreover, most respondents also agreed with the proposed ADHP workplace settings of medical clinics (90%), hospitals (90%), Federally Qualified Health Centers (87%), Community medical clinics (97%), and public health settings (94%). Most also agreed with the proposed ADHP's target populations of children (96%), older adults (97%), low income, underserved patients (96%), medically compromised patients (96%), primary care patients (81%), medical specialty patients (84%), and all patients regardless of socio-economic status (84%). A little less than half (49%) agreed that emergency room patients were an appropriate target population for the proposed application of the ADHP Model.

Discussion

The current study assessed California dental hygiene educators' perceptions of an ADHP who would work in medical settings. Among the study population, almost all of the respondents supported the proposed modification of the ADHA ADHP Model to medical settings, and slightly over half agreed the level of education needed for the ADHP Model should be at the master's level. These findings are consistent with educational levels required for the ADHA ADHP, the Nurse Practitioner (NP) and the Clinical Nurse Specialist (CNS) models that require a master's degree.[22,23] The proposed ADHP services to be provided in medical settings were consistent with the NP model that allows explicit authority to diagnose, order tests, prescribe medications and refer patients as needed while working in collaboration with the medical team in a medical setting.[22] The proposed ADHP functionality was also consistent with those of the CNS model and includes major services related to expert clinical practice, education, research, consultation and clinical leadership.[23] Similar to the NP and CNS model, the proposed ADHP application to medical settings envisions an ADHP who would practice in medical settings focusing on inter-professional collaboration to improve oral health outcomes, especially for our most vulnerable populations - children, the elderly, the disabled, and many members of racial and ethnic minority groups.

The fact that most respondents believed that the application of the ADHP would help reduce oral health disparities and access to care issues is consistent with publications related to the need to ex-

Table I: Percentage (number) of California Dental Hygiene Educator Respondents Who Agreed, Had No Opinion or Disagreed with Proposed Services to be Performed by the ADHP in Medical Settings (n=70)

Q #1	Statement	Agree*		No Opinion		Disagree*	
		Percent	(n)**	Percent	(n)**	Percent	(n)**
A	Meets with medical personnel to consult regarding oral care for patients with special needs	96	(65)	3	(2)	1	(1)
B	Provides in-service group education for medical personnel on the oral/systemic health link	97	(66)	3	(2)	0	(0)
C	Conducts oral screenings	99	(67)	0	(0)	1	(1)
D	Refers patients for needed dental evaluation	97	(65)	0	(0)	3	(2)
E	Acts as the patient oral care liaison between medical and dental settings	97	(66)	1	(1)	1	(1)
F	Facilitates Denti-Cal enrollment	66	(45)	26	(18)	7	(5)
G	Prescribes oral radiographs	93	(63)	1	(1)	6	(4)
H	Prescribes fluorides and antimicrobials	96	(65)	1	(1)	3	(2)
I	Prescribes systemic antibiotics	73	(49)	4	(3)	22	(15)
J	Prescribes local antibiotics	88	(59)	1	(1)	10	(7)
K	Provides interim therapeutic restorations	81	(55)	6	(4)	13	(9)
L	Prescribes systemic antifungals	63	(43)	10	(7)	27	(18)
M	Prescribes local antifungals	82	(56)	4	(3)	13	(9)
N	Provides preventive oral healthcare services	97	(66)	1	(1)	1	(1)
O	Prescribes non-narcotic analgesics	70	(48)	9	(6)	21	(14)
P	Prescribes narcotic analgesics	37	(25)	19	(13)	44	(30)
Q	Bills insurers directly	81	(55)	13	(9)	6	(4)
R	Bills patients directly	78	(53)	16	(11)	6	(4)

*Agree includes those that selected "strongly agree" and "somewhat agree" and disagree includes those that selected "strongly disagree" and "somewhat disagree"
**n varies due to missing data

pand the role of dental hygienists and reports of general support among dental hygienists for a mid-level oral health care provider to help meet the oral health needs of the public.[24]

In addition, most of the study respondents agreed with the services the proposed ADHP would provide, except for the prescription of narcotic analgesics. This finding is not surprising considering reports of increased drug-seeking behavior in patients and the rising epidemic of prescription opioid dependency.[25] Two of the proposed services interim therapeutic restorations and prescription of radiographs are currently being studied in the pilot study Health Workforce Pilot Project (HWPP) authorized by the California Office of Statewide Planning and Development (OSHPD). This project is designated as HWPP #172 and is entitled the "Virtual Dental Home" (VDH).[26,27] The VDH allows RDHs, RDHAPs and registered dental assistants (RDA) to place interim therapeutic restorations (ITR) and decide which radiographs to take in order to facilitate an oral evaluation by a dentist under a special exemption under California law. Patient treatment started in January, 2011 and the locations for treatment by the RDHs, RDHAPs and RDAs include Head Start programs, elementary schools and long term care facilities. The dentists in the program are remote and use telehealth technology to communicate between the dentists in private and community clinics with the providers in the different settings. Preliminary findings indicate a high satisfaction rate among patients and site administrators, and cost effectiveness compared to Denti-Cal.[26,27] Moreover, none of the procedures performed have had adverse outcomes.[27]

The VDH is an important model and patients have benefitted from the opportunity to receive many

services. Since it is reasonable to think that patients and medical staff in medical settings would also benefit from the proposed application of the ADHA ADHP Model within medical settings, a pilot project is needed to test its acceptability and feasibility to implement. Studies indicate that many medical staff are not comfortable providing orally-related treatments due to lack of knowledge, training and time, nor are they aware of the bidirectional relationship between oral and systemic health, such as that between diabetes and periodontal diseases.[28]

Moreover, in another study regarding emergency department dental visits, researchers concluded that emergency departments are an important point of care for dental-related complaints and recommended that emergency department staff be trained in triage, diagnosis, basic treatment and the provision of follow-up care for dental concerns.[29,30] Emergency departments could be another site for integration of the ADHP although less than half of the respondents in this study agreed emergency department patients were an appropriate target population for the proposed application of the ADHP within medical settings. Other researchers also have called for dentists or other "oral health experts" to be integrated into hospitals settings.[31] The ADHP could be more cost effective and valuable than dentists because of the ADHP's intense focus on oral disease prevention and health promotion, especially with additional education at the master's level. Our study respondents agreed that the ADHP could directly provide those services listed in this study including dental referral when needed in the medical setting, collaboration with and education of medical staff to increase awareness and knowledge of the oral/systemic health link among medical health care providers. Most of the respondents agreed with the workplace settings for this application of the ADHA ADHP Model as well. Therefore, we recommend that in addition to further research regarding acceptance of this application of the ADHP model in medical settings among dental professionals (educators and clinicians), that perceptions of medical professionals also be assessed.

Most of the study respondents agreed with the patient populations targeted by the proposed ADHP model. The one exception was emergency room patients. This finding was surprising considering the number of studies of emergency room visits that are due to dental concerns,[32-37] and the findings of a recent study by the American Dental Association (ADA). These latter findings indicate that over 4 million emergency department visits occurred in the U.S. from 2008 to 2010 involving the diagnosis of a dental condition which was slightly over 1% of all emergency department visits occurring in the entire U.S. These emergency department visits for dental conditions cost $2.7 billion over a 3-year period.[32] With estimates of approximately one-third of the population not receiving regular dental care,[38,39] the large number of emergency departments visits due to dental concerns supports the need for the ADHP as an oral health mid-level provider. It is reasonable to think that an ADHP could be a major asset to the public and the medical community.

This study has several limitations. First, due to the low response rate, it cannot be assumed that the findings are representative of the population of dental hygiene educators in California or elsewhere. The low response rate may be explained by the timing of the survey distribution (around spring break for some programs), how busy the dental hygiene program directors and faculty were, lack of interest in the topic, or the need to rely on dental hygiene directors to send out the survey as e-mail addresses for faculty were not available.

Another important limitation was the failure to include an item asking respondents about what level of supervision, if any, should be required for the ADHP in medical settings and by whom, with response items listing different levels of supervision and appropriate supervisors from which to choose. This information may have affected the level of support for the proposed model.

Finally, although respondents were asked about a proposed list of services for the ADHP, such as prescribing certain medications and referring patients as needed, no questions were asked about explicit diagnostic authority, a function to be expected of a practitioner with a broad scope of practice while liaising and working in collaboration with medical and dental teams. Darby and Walsh have proposed a human needs conceptual model to define the dental hygiene process of care (assessment of 8 human needs related to dental hygiene, diagnosis of deficits in these needs, planning goals to meet the deficits, implementation, evaluation of goals met, partially met, or unmet and documentation of outcomes) that is based on human need theory related to oral disease prevention, management and health promotion.[40] In this model, they define a dental hygiene diagnosis as a clinical decision made by a dental hygienist that identifies an actual or potential human need deficit that the dental hygienist is educated and licensed to treat and/or refer for care. This diagnostic approach defines the scope of dental hygiene practice broadly and clearly distinguishes a dental hygiene diagnosis from a dental diagnosis.

Conclusion

The majority of California dental hygiene educators who participated in the study supported the concept of an ADHP who would work in medical settings providing oral health disease prevention, management

and professional referrals for a variety of populations, including children, older adults, the medically compromised, and low-income underserved individuals. Additional research on perceptions of this application of the ADHA ADHP in other populations, such as clinical dental hygienists, other dental professionals, and medical health care providers, is needed. Such a role for the ADHP could provide a cost-effective bridge between medicine and dentistry to increase access to care, prevent oral disease, and promote oral and overall health.

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Acknowledgments

The authors wish to thank the California dental hygiene educators who completed the survey.

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Oral Health Care of Vietnamese Adolescents: A Qualitative Study of Perceptions and Practices

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Abstract

Purpose: To explore the oral health perceptions and practices of Vietnamese adolescents 13 to 17 years old in San Jose, Calif.

Methods: A purposeful sample of 10 Vietnamese parents with adolescent children were recruited at a Temple in San Jose, Calif. After gaining parental consent and adolescent assent, Vietnamese adolescents participated in an audio-taped, 20 to 30 minute, individual, semi-structured interview in English to explore their perceptions about oral health. Interview data were transcribed verbatim. All statements related to each question were identified, and similar statements were grouped into categories.

Results: Ten adolescents participated in the study. All reported tooth appearance as the most important reason for oral care, and that oral health, diet and general health were related. All were concerned about dental pain. Of the respondents, 9 believed that having good teeth would give them more confidence, and help them find jobs and romantic partners, while 2 did not follow recommended oral hygiene routines or recognize early signs of disease. Seven participants favored U.S. dentists over Vietnamese dentists. Frequently reported barriers to seeking dental care were fear of dental treatment (n=7) and inability to pay for dental care (n=6).

Conclusion: When educating Vietnamese adolescents, dental hygienists need to highlight availability of pain control, encourage better performance of personal oral hygiene and recommend dental clinics with sliding fee scales to low-income families. This approach to oral health education may enhance dental health and seeking of regular dental visits.

Keywords: adolescents, oral health, qualitative, perception, belief, attitude

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

Introduction

The 1999 National Oral Health Survey of Vietnam reported 70% of children had decayed, missing or filled teeth.[1] In addition, a 2010 survey of the Vietnamese adult population in Vietnam reported a moderate level of caries (decayed, missing and filled teeth score of 4.98) and a low level of oral hygiene.[2]

Over 1.5 million Vietnamese have immigrated to the U.S. since 2010, and nearly 40% (581,946) live in California. The U.S. city with the largest Vietnamese population, with over 125,000 people, is San Jose, Calif.[3]

Vietnamese migrant children in low income families tend to experience disproportionately high rates of dental caries. A 1979 study of 200 Vietnamese refugees of all ages in Germany reported that 43% of primary and 22% of permanent teeth were carious.[4] In addition, a 1981 survey in Bergen, Norway reported that newly immigrant Vietnamese teenagers needed about 4 times the treatment for dental caries as Norwegian schoolchildren 12 to 18 years.[4]

A 1997 study in an urban Canadian population of Vietnamese preschool children reported that 64% of children 18 months of age had dental caries. Contributing behavioral factors were the constant presence of a bottle during the day and at naptime, and the belief that dental decay in primary teeth was not a problem.[5,6]

An Australian study of Vietnamese speaking parents' practices related to their children's oral health care and risk of disease reported 4 traditional patterns: tooth brushing with salt, delayed introduction of tooth brushing, not visiting dental clinics for preventive care and the use of lay remedies rather than dental care to cure oral pain. Language was identified as a major barrier to attending the child dental service, following notification of treatment need.[7] In general, minorities in the U.S., including Vietnamese, suffer from more dental caries and periodontal diseases than Caucasians and non-Hispanics.[8] Several California studies of younger children in other migrant situations have reported significant differences

in dental caries in various ethnic low income minority groups compared to the rest of the population.[6] Moreover, it has been reported that among Asians in general, 14 to 15 year olds have higher periodontal treatment needs than Whites.[9]

Although no clinical studies have been reported, it is reasonable to suspect that migrant adult Vietnamese in San Jose, Calif are susceptible to dental caries due to its high prevalence in Vietnam among adults. This suspected dental caries among Vietnamese adults in San Jose is a concern since a 2004 international study found that parents' perceptions, beliefs and oral health-related behaviors predicted whether their children had dental caries.[10]

No studies of the oral health perceptions of migrant Vietnamese adolescents in the U.S. have been reported. It is important, however, to explore this issue since adolescents are approaching a life stage where they will make health care decision. The purpose of this qualitative exploratory study was to develop an understanding of the oral health perceptions and practices of Vietnamese adolescents in San Jose, Calif. Our research questions were: What are the perceptions of Vietnamese adolescents about oral health? What are the oral health practices of Vietnamese adolescents to prevent dental diseases? What are the primary challenges facing them in getting oral care?

Methods and Materials

A qualitative approach based on phenomenography was used to gain an understanding of Vietnamese adolescents' perceptions surrounding oral health. Phenomenography is a way of looking at the world from the interviewee's point of view.[11]

Study design, Study Population and Pilot Testing

This qualitative, cross-sectional, exploratory study was approved by the University of California San Francisco Institutional Review Board. The study population was a purposeful sample of 10 Vietnamese adolescents, aged 13 to 17 years who attended a Buddhist Temple in San Jose, Calif. None of the study participants were siblings. After developing an interview protocol and guide and gaining parental consent and adolescent assent, the guide was pilot tested for content validity and acceptability of the questions by 6 volunteer Vietnamese adolescents. These adolescents were recruited from the same temple, but had no knowledge of those who were recruited to participate in the study. Based on their feedback, the interview guide was refined.

Exploring a phenomenon to gain insight is a characteristic of qualitative research. Qualitative research requires one to collect data to learn about the views of individuals to generate theories based on participant perspectives. It requires one to obtain detailed information about a few people to learn from the participants in the study and to develop forms, called protocols, for posing general questions so that the participants can provide answers to the questions. Often questions on these forms will change and emerge during data collection. Examples of these forms include an interview protocol or guide that was used in this study.[12]

Subject Recruitment, Parental Informed Consent, and Adolescent Assent

A Buddhist Temple in San Jose, Calif was selected as the study site because the researcher did not have a role within the Temple community that could affect the honesty of participant response; it offered English classes to Vietnamese adolescents, and had a large Vietnamese population attending the Temple. Parents and their adolescent children were approached concurrently by the bilingual researcher in the reception area of the Temple when the parents dropped off or picked up their adolescent children. The researcher verbally explained the study purpose, risks and benefits, and answered any questions about the study, in Vietnamese if necessary. The researcher, who was unknown to the parents and adolescents, passed out consent forms to interested parents and at the same time passed out assent forms to adolescents in English to establish their willingness to participate in the study. After gaining parental consent and adolescent assent, a date and time were scheduled for an in-person 20 to 30 minute interview in English at the Temple for the adolescent. All participants were interviewed on different days to avoid the potential exchange of information about the questions and answers and the interview process. This approach eliminated the possibility of contact among participants while waiting to be interviewed. Consent and assent forms were kept secure in a locked file cabinet.

Data Collection

During 2013, individual, digitally-recorded, confidential, semi-structured interviews were conducted using the interview guide in a private room at the Temple for each subject. All semi-structured interviews were conducted by the same investigator. This investigator was the principal investigator, spoke both English and Vietnamese, and underwent training in the interview protocol by another experienced qualitative researcher. The interview consisted of asking demographic questions (gender, age, length in the U.S, place of birth) and 10 open-ended questions that addressed oral health perceptions and behavior (Figure 1). Open-ended questions were used to guide, rather than to direct, the discussion. As

described in the consent and assent forms, upon interview completion , the investigator gave each participant a $10 gift certificate as a thank you for study participation.

Data Analysis

Audio-recorded interview data were transcribed by the principal investigator verbatim manually without personal identifiers using Microsoft Word®. Data were stored in a secured password- protected computer stored in a locked office. Audio recordings were destroyed upon study completion.

Data analysis consisted of the following: First, the researcher listened to the tape while reading transcripts to become familiar with the data and correct any transcription errors. Next, all of the transcriptions were read carefully, and the researchers grouped all similar statements into 8 coded categories:

1. Attitude toward dental visits
2. Reasons for oral care
3. Dental experiences
4. Importance of oral health
5. Perception of healthy and unhealthy teeth
6. Diet
7. Barriers to oral care
8. Health beliefs and behaviors

Subsequently, the researchers re-read the transcripts to refine the categories. For example, when the responses assigned to the coded categories of "reasons for oral care," "perception of healthy and unhealthy teeth" and " health beliefs and behaviors" were reviewed, it became apparent that there was overlap. As a result, responses in the categories "reasons for oral care" and "perceptions of healthy and unhealthy teeth" were combined with some of the responses in the "health beliefs and behaviors" category into a new category entitled "other oral health beliefs." The remainder of the behavior-related responses in the original category "oral health beliefs and behaviors" were assigned to a new category entitled "oral health behaviors." Thus, oral health beliefs and behaviors were assigned to separate categories.

In a similar manner, the responses in the category "attitudes toward dental visits" were combined with the category "dental experiences" to create a new category entitled "attitudes toward dentists and dental visits" to eliminate overlap and duplication of responses. As a result of this process, thematic categories decreased from the original 8 categories to the final 6:

1. The importance of oral health
2. Attitudes toward dentists and dental visits
3. Other oral health beliefs
4. Oral health behaviors
5. Diet
6. Barriers to oral care

The resultant categories were then compared to check if there were any overlapping and duplicating responses within themes. Upon determining that there was no further overlap or duplication of responses, the 6 categories were accepted as unique themes.12 Typical responses - direct quotations - that depict the full range of responses coded together into each thematic category are used here to illustrate main findings upon study completion.

Figure 1: Interview Guide Questions

Question 1: How often do you think that people should visit the dentist? Can you tell me more about that?
Question 2: How can you tell if someone has decayed teeth and how do you feel when you see people who have problems with their teeth? Can you give me an example of what you are talking about?
Question 3: How often do you think should people brush their teeth? (Probe: How often do you brush your teeth? Why?)
Question 4: What do you feel when you see people who do not brush their teeth? (Probe: how do you feel when you are around people who have bad breath? Do you have any ideas of what might cause that? Do you think bad breath is related to tooth brushing?)
Question 5: What do you think about eating sugary foods and drinking sugary drinks? How do you think that behavior relates to tooth decay? How do you feel about reducing sugary drinks? Why? (Probe: Can you tell me more about that? Or can you give me an example?)
Question 6: Do you think that what people eat affects the health of their teeth? (Probe: Do you think that what you eat affects how healthy your teeth are? Why?)
Question 7: How do you think people your age feel about going to the dentist for a check- up? (Probe: How do you feel about going to the dentist for a check-up? Why? Are there any problems you can think of when it comes to going to the dentist?)
Question 8: How important to people your age is cleaning their teeth at home? (Probe: How important to you is cleaning your teeth at home?)
Question 9: How do you think people your age feel about going to the dentist for dental treatment (filling/ remove teeth)? (Probe: How do you feel? Why? Can you tell me more about that?)
Question 10: Do you think oral health affects your general health and well- being? (Probe: What makes you think that?)

Results

Ten adolescents (50% male, 50% female) were interviewed. The median age was 15 years (range 13 to 17 years) with a median residency length in the U.S. of 6 years (range 4 to 9 years). All participants were born in Vietnam and their native language was Vietnamese.

The 6 major themes discerned in the data are discussed as follows:

Importance of Oral Health

Adolescents considered how their teeth could influence their confidence and perception of others. Most thought oral health was important for social reasons and that appearance of their teeth could affect their careers. Adolescents stated:

"I want to have shiny and white teeth like my friends...I want to have a fresh breath so that I feel comfortable in front of people. I can talk loud and laugh out loud when I have nice teeth. Healthy teeth give you more confidence."

"You can easily get a job with a beautiful smile. Like if you look for a marketing job or customer representative job. They really want to hire a person with nice teeth…. Easy to find a job, easy to get a boyfriend, and easy to get attention from people. I think I have nice teeth. So I feel very confident in front of my friends."

Attitudes toward Dentists and Dental Visits

A little more than half of the participants reported positive attitudes toward dentists and the need for dental visits. Sample comments were:

"Dentist will find out if I have any problems and will fix it. Dentist will give me a good education about oral health care so that I know how to take a good care of my teeth."

"Dental treatment is very important…I would see a dentist right away when I have problems because I don't want to lose my teeth"

"Cleaning helps prevent cavities and remove all the stuffs that you can't do by brushing"

Many reported their dental visits were influenced by families and friends:

"I see my dentist in every six months. My family and most of my friends see the dentist twice a year. This is like our culture and habit … It is up to my parents."

Some adolescents had a negative attitude about visiting the dentist:

"You don't know what is going to happen when you go there. Scare. I hate getting my teeth out."

Most of the participants thought U.S. dentists were more gentle than dentists in Vietnam, as demonstrated in the following quotes:

"I had a bad experience about my dentist in Viet Nam when they did a filling. They did not give me anything when they did the filling. It was horrible … The dentist in Viet Nam hurt you a lot, and they don't really talk to you. They just do whatever they need to do. But the dentist in U.S is so nice. They talk to you more. They are very gentle. And especially they give you anesthesia when they do the filling … I scare of the dentist in Viet Nam. But I don't really scare to see a dentist in U.S."

"I think a dentist in U.S. talk to me more; teach me more about oral care compared to the one in Viet Nam. And dentist in U.S. send me a reminder in every 6 months. And you don't need to get in line to wait for so long like the one in Viet Nam. They give you exactly day and time to come. You don't have to make an appointment when you see the dentist in Vietnam, first come first serve."

"I had a bad experience with my dentist when I was in my country. They were terrible when they pull my teeth. They did not talk to me and did not numb me at all."

Other adolescents, however, felt there was no difference between dentists in the U.S. and Vietnam and some even wanted to see Vietnamese dentists in the U.S. because they can speak their language.

"I think dentists in Vietnam and US are the same. They do everything the same.They treat me the same. I think nothing difference."

"Vietnamese dentist speak my language so it is easier. I can communicate with them more. I can tell them what I want."

Oral Health Beliefs

Several individuals recognized the relationship of oral health to general health. The following are some sample quotes:

"You will have heart attack and stroke if you have a lot of problems with your teeth. Teeth are also damage to your general health. You will get sick if you have tooth pain cuz you cannot eat."

"You will have a lot of medical problem if you

have bad teeth like you may have periodontal disease and stroke. You may have heart attack and infection as well."

All of the participants perceived healthy teeth as teeth that have no signs or symptoms of a problem. Many viewed healthy and unhealthy teeth in terms of pain. Several defined a healthy mouth as:

"No cavities, no tooth pain, no bad breath."

"My teeth are good … I don't have any pain. You can eat whatever you want when you have good teeth. You don't feel sensitive when you eat sweet foods."

Many defined unhealthy teeth as having:

"Pain, bleeding, red gum, smell bad, and you can't eat anything."

Some of the participants did not know what infection was. One participant explained:

"I never heard about it [infection]. But I don't think I have one because my parents and my dentist would tell me if I have it."

Oral Health Behaviors

All adolescents interviewed reported brushing, but not always after breakfast and lunch; some also reported flossing. Sample comments were:

"I brush twice a day and floss once a day … I get up in the morning, brush, and then eat. I brush before I go to bed."

"I don't have time in the morning [because I have] to run after I have breakfast. And I don't have time at lunch because … I always have lunch with my friends and I like to chat so much so no time to brush."

"… it is hard to floss and it takes so much time."

Diet

All of the participants had knowledge about the linkage between diet and oral health. For example, one adolescent explained:

"Whatever we eat will affect the health of the teeth. If you eat unhealthy food, you will have unhealthy teeth … you will have a lot of cavities if you eat too much candies and cookies."

Some of the adolescents mentioned they eat a lot of sugary foods and drinks:

"[I eat candy] Maybe like four to five times per day and I eat one to two candies each time. I love chocolate."

"I love coke … But I only drink one a day so I think it is ok … I just like coke. No, I will not reduce it. I love it."

All of the participants were concerned about their high intake of sugary foods and drinks because they were aware that these substances cause cavities. Some explained:

"… candy caused a lot of cavities."

"Sweet is always bad for your teeth."

Some indicated that they wanted to avoid sugary foods and drinks, others said they could not control themselves. For example:

"I really want to reduce it [sugary foods] because I don't want to have any problems with my teeth."

"I know [candy causes cavities] but I love it. I can't control myself."

"I love coke even though I know it is not too good for my teeth."

Barriers to Dental Care

The adolescents were asked about barriers associated with visiting a dentist. The major barrier reported was fear:

"I'm scared of the filling and pulling teeth out. I think it has a lot of pain."

"I think most of the kids are afraid of teeth removal. I am not an exception."

Another barrier reported by subjects was the expense of dental care as indicated by the following statements:

"[I] … don't want to go [unless I] … have a pain because it is so expensive. We don't have insurance. We pay cash."

"If my parents can't afford it, I may not go."

Another barrier reported by a few was the long waiting time for care:

"Every time we see a dentist, it takes us almost 4 hours. We have to wait for so long. They book so many patients. I hate to wait."

Discussion

All Vietnamese adolescents interviewed thought oral health was important for social reasons and believed that appearance of their teeth affected their confidence and ability to attract friends as well as influenced their ability to gain employment. This finding is consistent with those of other researchers who found that common health concerns reported by adolescents include those related to appearance and dental health.13-20 In a 7-year cohort study of 2,406 sixth graders in 2 communities in the U.S. who were followed annually through the twelfth grade, physical appearance was found to be the most valued characteristic and the only one that grew in importance over time.20 It appears that relating good dental health with an attractive facial appearance would enhance adolescent motivation to perform recommended personal oral hygiene behaviors.

In this study, most adolescents generally described brushing twice a day, but not always after breakfast and lunch. Although they indicated that they knew they should brush after meals, most talked about brushing before breakfast and not afterwards. Moreover, many said they had no time to brush after breakfast and lunch because they had early school and limited lunch time.

Similarly, with regard to dental floss use, participants talked about not necessarily flossing every day though they knew they should. The findings suggest that when providing care to Vietnamese adolescents, dental hygienists need to reinforce the importance of flossing at least once a day and the best time to brush in relation to food intake; specifically, the importance of brushing after meals, rather than before meals, to reduce acid attacks on teeth as a strategy for preventing dental caries needs to be emphasized. In addition, having adolescents demonstrate correct tooth brushing and flossing technique in their own mouth would ensure competency to perform the behaviors. It was discovered that it is not motivation they need so much as encouragement to act on their knowledge and development of skill by actually engaging in the behaviors.

At least half of the adolescents in the study were aware of the relationship of oral health to general physical health, such as heart attacks and stroke. Nevertheless, half of the participants did not know the meaning of the word "infection" as it related to dental caries and periodontal diseases. These infectious and transmissible oral diseases are caused by microorganisms in oral biofilms as a result of poor oral hygiene.21 Dental hygienists need to discuss the concept of infection and its relationship to dental caries and periodontal infections as part of oral health education to encourage Vietnamese adolescents to perform recommended oral hygiene behaviors.

Although many participants talked about poor oral health in terms of having bad breath, bleeding gums and gum disease, most defined the health of their teeth not in these terms but in terms of the presence or absence of pain. This latter finding suggests a lack of understanding of the early signs of cavities and gum disease and that although early dental problems can be painless they should be treated before they become painful. Thus, dental hygienists need to educate their Vietnamese adolescent clients about the early signs of cavities or gum disease, how to recognize them, and how to respond properly to address them. Pointing out in an adolescent's own mouth such things as a white spot lesion as a sign of early dental caries and bleeding gums as a sign of early gum disease to promote understanding of how to detect problems early is recommended. If no problems are seen in the individual's mouth, then use of color pictures of such problems in another's mouth also can enhance awareness of how to recognize signs of problems early. In addition to having regular dental exams, educating adolescents on use of topical fluorides to re-mineralize early carious lesions, and having them demonstrate the proper use of floss in their own mouth, will help promote understanding of how to address problems early.

Most of the participants reported positive attitudes toward dentists and having regular dental visits, but their dental visits were influenced positively by families and friends. Other studies on adolescents have reported similar views about dentists and the importance of family support in accessing care.22,23

In this study, all of the adolescents realized the importance of the benefits of having healthy teeth. These findings are consistent with those found in the 2009 California Health Interview Survey of Adolescents that reported approximately 70% of adolescents in California had their last dental visit less than 6 months previously and only 0.9% had never visited the dentist.24 The 2007 California Health Interview Survey of Adolescents reported that adolescents living below the federal poverty guidelines were more likely to report that the condition of their teeth was fair or poor than were adolescents whose families had higher incomes.25 This finding suggests that the positive attitudes toward oral health among study participants might be due at least in part, by socio-economic status. Although not directly assessed, and based on the fashionable clothes worn by the respondents many of whom owned cell phones, the bilingual field researcher observed that most participants appeared to come from families with a modest but not affluent income, rather than

very low income families. Nevertheless, it would have been helpful to have collected quantitative data on socioeconomic status since that is a known factor in oral health status. Indeed, the cost of dental care was an issue with the participants and there is no evidence that these students were not from a low-income household.

Most of the interviewees thought dentists in the U.S. were gentler and better communicators than dentists in Vietnam. This finding suggests that educational explanations by dental hygienists would be equally well received. It is important to note, however, that some respondents wanted to see Vietnamese dentists in the U.S. because they spoke their language.

While all of the participants were concerned about their high intake of sugary foods and drinks because they were aware that sugar caused cavities, more than half of the participants said they had trouble controlling themselves when it came to consuming sugary foods and drinks. This association between adolescents' diet and knowledge of dental caries has been reported by others.22 The findings also are consistent with those of the 2011 California Health Interview Survey of Adolescents that reported 22% of adolescents between 12 to 17 years of age consumed 2 or more glasses of sugary drinks a day.24 Dental hygienists need to focus on sources of sugar in the diet among Vietnamese adolescents. For example, recommending the use of non-sugar snacks to replace chocolate and candy consumption and discussing the importance of drinking fluoridated water rather than sugary drinks to promote oral health would be consistent with the findings.

Fear of dental treatment and the expense of dental care were the most frequently reported barriers to visiting the dentist. Fear of pain from dental treatment based on past dental experiences, especially in Vietnam, was a universal concern among our study participants. Dental hygienists need to highlight the availability of pain control in dental settings to help address this barrier. Moreover, emphasis should be placed on the point that early detection and treatment of problems could eliminate the need for later treatments that may require more invasive or distressing work by the dentist.

Despite the apparent modest income appearance of these teenagers, the expense of dental care was a frequently reported barrier for seeking dental care. Similar findings have been reported elsewhere.25 Recommending dental clinics with sliding fee scales to low-income Vietnamese parents may help decrease this barrier and increase access to care.

This study has several limitations. First, the findings are limited due to the inability to reach data saturation on all aspects of some questions. However, for many questions more than half the adolescents agreed with each other or gave the same responses, some degree of data saturation was reached for certain aspects of those questions/topics. Second, there could be sample selection bias due to the small sample size and the convenience sampling technique. Participants were recruited from only one particular location - the Buddhist Temple in San Jose, Calif. Study participants may have been more supportive of oral health care than those adolescents who did not participate in Temple activities. Therefore, the study findings cannot be widely generalized. Third, although the interview guided questions were tested for content validity, they were not tested for reliability.

Conclusion

The purpose of this qualitative exploratory study was to develop an understanding of the oral health perceptions and practices of Vietnamese adolescents in San Jose, Calif. Based on the findings conclude that when educating Vietnamese adolescents, dental hygienists need to highlight: the importance of oral health to physical appearance, the availability of pain control in dental settings, and the importance of flossing at least once a day and brushing after meals to prevent dental caries and periodontal disease infections. Recommending dental clinics with sliding fee scales to low-income Vietnamese parents may help increase access to care. The role of parents and friends serving as external factors to promote oral health among adolescents appears to be important but needs to be further studied. Findings from this study offer valuable first insights into migrant Vietnamese youths' understandings about oral health and provide a basis for future larger studies in the U.S.

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Acknowledgments

The authors wish to thank Barbara Heckman for her assistance with the UCSF Committee on Human Research application process. We also wish to thank the Duc Vien Buddhist Temple in San Jose and the Vietnamese parents and adolescents who participated in this study.

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2015 CLL Poster Abstracts

A Study of Nutrition in Entry-Level Dental Hygiene Education

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Problem: Though CODA (2013) requires nutrition be incorporated in dental hygiene education to the extent that students have the ability to provide oral health services that include analyzing and synthesizing interrelationships of whole health systems (CODA, 2013), CODA, the ADEA and the ADHA do not specify competencies, standards or recommendations to ensure adequate knowledge of nutrition and the ability to perform nutrition assessments and counseling. Without specific standards, determining whether dental hygiene students are receiving adequate information to incorporate effective nutrition assessments and counseling is impossible to ascertain. A specific nutrition education model may be useful to address the possible lack of nutrition knowledge and to implement an effective standard. To develop an adequate nutrition model, an analysis of current curriculum content needed to be conducted.

Objective: The purpose of this study was to document the extent of nutritional information included in dental hygiene program curricula, identify perceptions and barriers to expanding nutritional content within the curriculum, and determine the need for a proposed nutrition curriculum model.

Method: This was a mixed method study involving qualitative and quantitative aspects. An invitation letter was emailed to all 335 entry-level dental hygiene program directors in the United States to determine interest in participating in this study. Fourteen nutrition instructors and 10 program directors were interviewed regarding their perceptions and opinions of nutrition education for dental hygiene students, and 55 course syllabi were analyzed.

Results: All aspects of the content analysis results revealed nutrition content in entry-level dental hygiene programs is diverse. Some programs did not include nutrition content, while others provided oral and whole health nutrition intervention subject matter. Some programs offered multiple applied clinical applications and patient contact opportunities while most required none. The interview results disclosed a variety of opinions and perceptions of dental hygienists' role in nutrition. Several interviewees viewed dental hygienists' role in nutrition to be an integral part of patient care, while others indicated the role is minimal to provide caries prevention or none.

Conclusions: Nutrition is an integral component of oral and general health. Recommendations for teaching nutrition in entry-level dental hygiene programs exist. However, nutrition education for entry-level dental hygiene students varies throughout U.S. institutions. Some programs require nutrition as a prerequisite, some teach nutrition content within other courses throughout the curriculum, while others provide a stand-alone course. Opinions and perceptions of the dental hygienists' role in providing nutrition interventions and the essential nutrition content are also diverse. Without a standard of nutrition knowledge for dental hygiene students, clinical dental hygienists are not able to reliably provide an expected standard to patients in need of nutrition interventions. This study implies that dental hygiene students may or may not have the knowledge to provide necessary nutrition counseling to their patients, or the wisdom of when and where to refer. Therefore, a proposed standard nutrition model created for dental hygiene interventions within the dental hygiene care plan is recommended.

Leadership in Degree Completion Programs-A Study Comparing Stand-Alone Leadership Courses versus Leadership-Infused Curricula

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Problem: Equipping future dental hygiene professionals with leadership skills is essential for advancing the dental hygiene profession. Leadership skills are necessary in many facets of the dental hygiene profession including research, education, licensure and regulation, public health, and government; however, leadership in dental hygiene education appears to be lacking. According to a survey of degree completion programs, only 31 percent of the responding programs reported a stand-alone leadership course in the core curriculum. Portillo et al. affirmed that little is known about the subject of leadership in degree completion programs.

Objective: The purpose of this study was to compare the extent to which leadership is taught in degree completion programs by comparing stand-alone

leadership courses/hybrid programs versus leadership-infused curricula.

Method: This study was a mixed method approach using both qualitative and quantitative data. Personal interviews of (16) program directors and faculty members that teach either a stand-alone leadership course, a hybrid program or leadership-infused courses within the dental hygiene degree completion curricula were conducted and a comparison of 19 programs providing course syllabi determined the differences in the extent of leadership content and experiences between a stand-alone leadership course and leadership-infused curriculum. A self-designed matrix was created by utilizing leadership skills found in the text, "Leadership for Health Professionals: Theories, Skills, and Applications" as a framework for which the leadership skills taught in either stand-alone leadership courses or leadership-infused curricula were measured.

Results: Of the 53 dental hygiene programs that offer degree completion programs, 49 met the inclusion criteria. Thirty-nine percent of the responding programs provided course syllabi. Thirty-three percent of the program directors or faculty members that teach either a stand-alone leadership course or leadership-infused curricular courses participated in the interview portion of this study. Competencies related to leadership were not clearly defined or measurable. Overcrowded curriculum, limited qualified faculty availability, and lack of resources were barriers identified with leadership-infused programs incorporating a stand-alone leadership course.

Conclusions: The findings of this study provide a synopsis of leadership content in degree completion programs and information to support the notion of incorporating leadership into the core competencies of degree completion programs. Results of this study identified gaps of leadership education in both leadership-infused curricula and hybrid programs offering a stand-alone leadership course. Suggested changes to degree completion program curricula included the need for leadership competencies and more opportunities for leadership development offered to dental hygiene educators.

Visible Tattoos in Clinical Practice as Perceived by Dental Hygiene Students

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Problem: Increasing numbers of persons in the workforce have tattoos as body art has become more prevalent among varying age groups, ethnicities and professions, despite negative perceptions. Whether one agrees or disagrees, physical appearance influences the professional image of health care providers and tattoos have been reported to diminish professional image and credibility.

Objective: The purpose of this study was to determine perceptions of 39 junior dental hygiene students toward visible tattoos and professionalism in the clinical setting.

Method: The IRB approved survey was completed by thirty-nine junior dental hygiene students via Survey Monkey. The questionnaire consisted of 14 questions in three sections: A) demographics); B) photographs of tattoo conditions displayed by the same individual in short sleeved scrubs: no visible tattoo, small tattoo on wrist, and large sleeve tattoo on the arm. C) number of tattoos participants had and their attitude toward visible tattoos in healthcare. Participants rated each photograph on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree) with regard to how ethical, responsible, hygienic, competent, professional and caring the individual appeared in the photographs.

Results: When comparing mean group scores the photo without a tattoo scored the highest (better) in all categories, whereas the intense sleeve tattoo, consistently scored the lowest. When comparing no tattoo to sleeve tattoo, there was a significant difference with regard to appearing ethical ($p=<.05$, 3.95 and 3.67) and caring ($p=.05$, 4.10 and 3.85) respectively. Both the intensely and mildly tattooed individuals scored significantly lower compared to the individual without tattoos with regard to appearing responsible and professional. There was no statistically significant difference between tattoo conditions with regard to individuals appearing competent or hygienic. Data revealed 46% of the respondents believe tattoos should be covered in the workplace. Thirty-eight percent of the respondents had a tattoo; however, 87% reported that their tattoo was not visible while wearing short-sleeved attire and none were visible on the neck or hairline. Eighty percent self-reported between 1-3 tattoos and 13% had 7-10 tattoos.

Conclusions: Results suggest that dental hygiene students perceive small tattoos as acceptable in the clinical setting; however, larger sleeve tattoos are less accepted. Participants did not believe visible tattoos should be covered in the clinical setting although they indicated a clinician with a visible full sleeve tattoo appeared to be less professional. These finding provide insight for educators as they prepare individuals to enter the workforce and for students and others as they contemplate decisions about obtaining body art.

Enhance Pre-Clinical Lab with Self-Directed Learning Activities

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Problem: As a dental educator, understanding the adult learner is critical for teaching clinical skill development. Each instructor must realize that each student learns in different ways and at a different pace. This concept that adults learn differently has initiated a new form of teaching/learning where learning is self-directed, and the teacher is viewed as a facilitator of learning. Self-directed learning (SDL) allows the student to be a partner in the learning process and emphasize teaching the adult learner "how to learn." It challenges the student to be more engaged in the learning process and become an educational partner.

Objective:

- Employing a self-directed approach to learning.
- Developing clinical skills at one's own pace.
- Experience a positive environment for learning.
- Analyze one's skill development through self and peer evaluation.

Method: Pre-clinic lab has two sections. Section A is instructor guided skill development at a 1:3 instructor/student ratio. Section B is the SDL lab where students are given activities that are self-directed, skill-specific, and goal-oriented. These activities include instructional videos, skill sheet exercises, and self- and peer evaluation of clinical skills being developed in the lab sessions.

Results: SDL activities call for a student to demonstrate self-motivation, determination, and responsibility - the driving factors behind self-directed learning. Through the process of instructor, peer, and self-evaluation, students are provided the opportunity to become aware of their strengths and weaknesses. Students may learn better from their peers because they feel more comfortable. Also, students often want instant gratification; therefore, setting smaller, obtainable goals helps students focus on the task at hand.

Conclusions: Incorporating the SDL activities into pre-clinic has been a huge success thus far. Using the following SDL activities did enhance the pre-clinic lab as well as the learning environment.

Instructional Videos - Students watch instructional videos and completed skill sheet exercises at their own pace. This allowed each student to be self-directed and take responsibility in the learning process.

Peer Teaching and Evaluation - Students completed a detailed skill activity sheet with a student partner while teaching and evaluating the student's performance. This information gave each student immediate feedback and encouragement.

Cell Phone Recordings - Students record and evaluate a specific skill performed by a student partner. This recording is used for both peer and self-evaluation. This provided each student with an opportunity to become more aware of his or her own strengths and weaknesses.

Interprofessional Collaborative Approach to Screening, Brief Intervention, and Referral to Treatment (SBIRT)

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Problem: Teaching dental hygiene students interviewing techniques presents a challenge when the subject area is uncomfortable or unfamiliar, such as screening for alcohol, tobacco and other drug (ATOD) use/misuse.

Objective: The objective of the program was to increase educate dental hygiene students on how to work with patients presenting with ATOD use/misuse. Screening, Brief Intervention and Referral to Treatment Program (SBIRT) was utilized to teach students how to effectively screen, provide education and feedback on ATOD use and associated risks to patients being treated in the dental hygiene clinic.

Methodology and Statistics: The dental hygiene students (n=30) learned SBIRT skills during scheduled interprofessional standardized patient sessions. The simulated cases addressed alcohol ATOD use, with emphasis on oral manifestations and implications. Students completed the AAPPQ and DDPPQ, which are measures of attitudes and perceptions toward working with individuals with alcohol and other drug issues, at pre-training, post-training, and post-simulation. Data were analyzed using within-subjects, repeated-measures ANOVA. Students' SBIRT skills were rated using a Competency Rating Scale. This project was determined as exempt by the University of Pittsburgh Institutional Review Board.

Results: On both the alcohol and drug perception measures, role security scores increased significantly across pre-training baseline, post-training and post-simulation. For AAPPQ role security, $F(2,22)=14.38$, $p<0.01$, and for DDPPQ role security, $F(2,21)=7.0$, $p<0.01$. Overall therapeutic commitment scores did not increase significantly across the three time points on either the AAPPQ or DDPPQ. Increases in alcohol role security were accounted for by pre-training to post-training difference ($F(2,22)=19.1$, $p<0.01$), whereas increases in therapeutic commitment were due to increases from post-training to post-simulation ($F(2,21)=8.22$, $p<0.01$). Contrasts on the DDPPQ were not significant. Simulation competency ratings showed that students learned and applied SBIRT skills with standardized patients.

Conclusions: These results indicated that the SBIRT training and simulation contributed to improvements in role security and therapeutic commitment around working with patients with alcohol issues, respectively. SBIRT simulation was an important component of the overall program that contributed to solidifying skills and attitudes in students. Students demonstrated an increased willingness to interact with and show empathy toward patients who presented with a history of ATOD use. Students can now integrate the SBIRT model during the assessment phase of their dental hygiene care appointments. They also learned how to participate in an interprofessional approach to the delivery of patient care.

Funding for this study was provided by the Health Resources and Services Administration #D09HP25025.

Interdisciplinary "Senior Dental Toolkits" to Enhance Oral Health Education for Nursing and Dental Hygiene Students

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Purpose and Goals: Dental hygiene students learning in collaboration with nursing students has the potential of improving overall health outcomes for seniors/older adults. This project supports the National Dental Hygiene Research Agenda (NDHRA). The goal of this innovative oral health educational practice is to promote interprofessional health education (IPE) for dental hygiene and nursing students at Wichita State University in Wichita, Kansas, utilizing a senior dental toolkit.

Significance: Currently, there is a gap in Interprofessional education regarding preventive treatment, oral care techniques and tools for older adults, especially those who are frail. This project demonstrates two strategies to bridge the gap in education, prepare future health professionals and impact the overall health of older adults. Utilization of the information and tools may benefit older adults and prevent future episodes of pneumonia. Studies show older adults who live in long term care facilities are more likely to die from pneumonia than from any other cause.

Key Features: Utilization of an oral health education toolkit will better equip students in their chosen careers to provide and promote oral health care for older adults. A power point presentation entitled "Senior Smiles 2012-A Survey of the Oral Health of Kansas Seniors Living in Nursing Facilities," was presented to both dental hygiene and nursing students. Following the presentation, dental toolkit contents were described and demonstrated for future use in the dental hygiene clinic and/or at a long term care facility. Toolkit contents included: 1) Surround toothbrush, 2) mouth prop, 3) denture care items, 4) pen light, 5) disposable mirror, and 6) fluoride varnish.

Evaluation Plan: Following the interdisciplinary presentation, nursing students completed a pilot questionnaire. The evaluation plan involved a reflective questionnaire including: 1) information learned, 2) feelings about brushing another's teeth, 3) performing an oral screening, 4) challenges that might occur, 5) recognizing healthy teeth, gingiva and structures, 6) suggestions about additions to the kit and 7) the interdisciplinary learning experience. The reflective questionnaire to evaluate the effectiveness of this IPE presentation will be completed for 36 dental hygiene students together with 28 nursing students in spring 2015.

Funding for this grant was provided by Patterson Dental Supply, Wichita, Kansas.

Valuing Dental Hygiene Students in an Interprofessional Education Event

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Problem: Dental hygienists (DH) are underutilized in interdisciplinary collaboration, and what utilization that does take place is not well studied. In addition, oral health is not seen as part of total general health care by other health care professionals. As interprofessional education (IPE) becomes an important tool in developing a collaborative health care model for patients, the importance of oral health should be recognized as a vital component.

Objective: The primary goal of this study was to evaluate an IPE event at a Midwest university to determine if the concept of oral health was valued by other health care students.

Method: Students (n=180) from seven disciplines participated in an IPE simulated case study. Faculty from each discipline developed standardized patients with appropriate symptomatology to engage each discipline. The case centered on a patient with oral human papilloma virus (HPV). Teams were comprised of students who were in their program's final academic year including dental hygiene (DH), physician assistant (PA), physical therapy (PT), speech language pathology (SLP), health services management & community development (HSMCD), and doctor of nursing practice (DNP). The evaluation tool of this learning activity included both quantitative and qualitative responses. The responses to the open-ended evaluative questions were analyzed by constant comparative analysis. This process entailed using open coding followed by selective coding to conceptualize the data.

Results: The following three themes emerged: (1) Valuing others roles was a common theme as stated by comments such as, "I had a lack of knowledge regarding HPV and no one in my group understood the disease or prognosis except DH students", and "I learned more about how oral health relates to other fields and can apply it to medical situations." (2) Working as a team emerged with statements such as "I learned the importance of healthcare teams to increase patient health is essential." (3) Lacking knowledge was seen as a barrier that was overcome with others expertise; "I know my strengths and weaknesses as a profession and how other professions can contribute, and not hesitate to ask for others help/input."

Conclusions: In this setting, the DH students were viewed as a valuable resource in guiding the IPE team towards oral health care decisions. It is important to include oral health as part of overall health assessment of patients, and the DH students were perceived as an integral part of the healthcare team.

Effect of Yoga on Musculoskeletal Pain in Dental Hygiene Students

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Problem: Musculoskeletal pain has been associated with work stress and a shortened career in the dental hygiene profession. Finding effective strategies for dental hygiene students to incorporate into their daily or weekly routine to prevent and manage musculoskeletal pain is important to support a long and satisfying career.

Objective: The purpose of this study was to determine if participating in two yoga sessions per week would impact the musculoskeletal pain reported by dental hygiene students.

Method: This study used a convenience sample of 83 dental hygiene students divided between a yoga treatment group and a control group. Students in the yoga group participated in bi-weekly, 60-minute yoga sessions for 13 consecutive weeks. Students completed a questionnaire and a Comparative Pain Scale evaluation prior to and immediately following the study to assess their musculoskeletal pain. Additionally, the Omron HBF-514C Full Body Composition Sensing Monitor and Scale was used to measure body mass index (BMI), body fat, and muscle prior to and upon completion of the study. Paired sample t-tests and independent t-tests were used to analyze the quantitative data.

Results: Thirty-seven dental hygiene students participated in the yoga group and 38 were assigned to the control group, with an average age of 23.8 years. Most participants were female (91.5%), with 36.6% non-Caucasian. Students reported experiencing musculoskeletal pain in their lower back (32.9%), hands/fingers (31.8%), and neck (28.3%). An independent sample t-test revealed there was no significant difference on the pre-study Comparative Pain Scale between the yoga group and the control group (p=.393). The treatment group reported a significant decrease in musculoskeletal pain after participating in the yoga sessions (p=0.001), while the control group had no significant decrease (p=0.881). The average pre-study BMI score was 23.7, with 73.6% of participants within the normal BMI range. There was no significant difference between pre- and post-study BMI scores for the yoga treatment group (p=.984) and the control group (p=.901). Additionally, there was no significant difference in reported outside exercise activity between the yoga treatment group and the control group (p=.782).

Conclusions: This research supports that bi-weekly yoga sessions are beneficial in decreasing musculoskeletal pain in dental hygiene students, and statistical analysis supports this change independent of outside exercise activity. This study concludes that yoga is a viable complementary health approach to incorporate into a student's routine to increase the health and longevity of a dental hygiene career.

Disaster Preparedness and Response: A Survey of U.S. Dental Hygienists

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Problem Statement: Disaster preparedness and response is achieved through multidisciplinary efforts; yet, challenges exist with identifying and organizing trained responders. A review of the literature related to this specialty area indicates that dental hygienists' involvement is limited in consideration of the estimated 150,000 hygienists across the U.S.

Objective: The purpose of this study was to determine dental hygienists' interests, formal education, views, comfort levels, and intentions for becoming involved in disaster preparedness and response efforts during mass fatality incidents (MFIs), which is currently unknown.

Methods: A convenience sample (N = 400) was recruited for an online 21-item, researcher-designed survey. IRB approval was obtained to conduct the survey, which was pilot tested by 10 dental hygiene faculty members at Old Dominion University (ODU). The sample included dental hygienists who attended the 2014 ODU continuing education conference and hygienists belonging to four closed groups on the social media website, Facebook.

Results: A response rate of 83.5% (N = 334) was attained. Regardless of years of work experience, 85.6% of respondents were significantly interested in disaster preparedness and response (p=.000), and the majority (91.6%) of those who indicated interest have intentions of becoming involved (p=.000). A significant number of respondents (92.8%) had not received formal education in disaster preparedness and response (p=.000), yet an overwhelming 94.9% shared the view that dental hygienists could have a vital role in this specialty area (p=.000). When dental hygienists were questioned about comfort levels with disaster victim identification (DVI) activities, mean perceived comfort levels with activities that involved no contact with human remains were 9% higher than mean comfort levels related to activities requiring contact. Still, most respondents indicated perceived comfort with DVI activities requiring physical contact such as: taking photographs (76.2%, n=254), taking radiographs (83%, n=273), resecting the mandible (55.1%, n=184), and cleaning skeletonized remains (66.8%, n=221).

Conclusion: Dental hygienists view themselves as professionals who could have a vital role in this specialty area and are comfortable with DVI related tasks. Dental hygienists are interested in disaster preparedness and response. More training opportunities are needed to learn about and to participate in disaster preparedness and response. Competency training should be more readily available to create educational opportunities for dental hygienists who choose to serve their communities.

Bridging the Theory-Practice Gap with Dental Hygiene Instrumentation Videos

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Problem: Dental hygiene educators are challenged to bridge the theory-practice gap with innovative teaching strategies to enhance the educational experience and meet diverse learning needs of students. Instrumentation videos are a relatively new adjunct to teaching dental hygiene skills to students and there is a lack of evidence concerning the use of videos in dental hygiene education.

Objective: The purpose was to explore current student use of and satisfaction regarding instrumentation videos in dental hygiene education to improve student learning in the clinical environment.

Method: A quantitative, descriptive, survey research design was employed using a convenience sample of first year dental hygiene students (n=143). The instrument used contained 26 questions regarding demographics, effectiveness of instructional aids, appeal of instructional aids, general satisfaction with instructional aids, and two open-ended questions about value and benefit to the student. The anonymous survey was administered electronically online. Data was analyzed using descriptive statistics and nonparametric Spearman correlation tests at an alpha threshold of 0.05. Qualitative data from open-ended questions was analyzed using thematic analysis to identify common themes. IRB approval was obtained.

Results: The majority of participants were Caucasian (58%) females (91%) between the ages of 18-24 years (67%), pursuing an accelerated baccalaureate degree in dental hygiene (72%), and reported having access to technology outside of the educational environment (97%). Roughly one-third of participants listed English as their second language (35%). The most prevalent response to all 5-point Likert scale questions regarding the effectiveness, positive appeal, and general positive satisfaction of the instructional aids was "Agree" (range 37% - 55%). The majority of participants used the instructional aids while practic-

ing (83%). Correlation tests showed participants who listed English as a second language were less likely to feel the instructional aids were effective, found the aids less appealing, and were left less satisfied ($p<0.05$). Additionally, participants who practiced while using the aids were more likely to list the aids were effective, had appeal, and were left satisfied than participants who watched the aids but did not practice with them ($p<0.05$). Thematic analysis of the data identified recurring themes in student responses suggesting dental hygiene instrumentation videos are beneficial to student learning. Common themes that emerged were helpfulness in outside practice to clarify, reinforce, and visualize skills learned in the clinical setting.

Conclusions: Instrumentation videos can be a valuable resource to aid in closing the theory-practice gap in dental hygiene education. Further research is warranted.

Root Caries Lesions in Geriatric Patients Reveal a Surprising Collection of Disease-Associated Bacteria

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Problem: The microbiology of root caries has been an ongoing area of study for several decades. As the frequency of elderly patients keeping their natural teeth increases so does the incidence of root caries in this population, in part due to the increased exposure of roots upon gingival recession.

Objective: The aim of this study is to identify the bacteria associated with root caries in geriatric patients and compare them with the bacteria associated with healthy exposed roots in the sample patient pool to determine whether certain bacterial species are more prominent in root caries of geriatric patients.

Method: In this ongoing study four patients, 65 years of age and older, with a total of 11 root caries lesions were enlisted. Dental plaque was obtained using a sterile curette and removing supragingival plaque from root surfaces. Within each patient we obtained a plaque sample from the diseased tooth and the contralateral healthy tooth (22 plaque samples) to compare the microbiota within the same patient. Plaque samples were placed in a sterile tube containing 2 ml PBS buffer with 10% glycerol as a cryoprotective agent and the sample was stored at -80°C. Upon thawing, 0.5 ml of sample was subjected to lysis and chromosomal DNA purification. Purified DNA was quantified and used as a template for PCR analysis with primers designed to detect specific organisms of interest, including: Streptococcus mutans, and Actinomyces species. In addition, plaque samples were diluted in PBS and plated for isolation of single colonies after growth for 3-7 days in an anaerobic chamber in order to assess microbial diversity and observe any caries-specific microbes based on colony morphology. Any such caries-specific microbes will be isolated and sequenced to identify the bacterial species.

Results: Initial results indicate that only one of the diseased teeth had detectable S. mutans colonization, while three were positive for Actinomyces. However, there was no difference in the presence of Actinomyces between carious and healthy teeth (3 carious teeth were positive and 3 healthy teeth were positive). Based on colony morphologies the carious teeth showed at least three unique disease-associated strains. Future analyses will identify these species by DNA analysis.

Conclusions: Our initial analyses show root caries lesions were no more highly associated with S. mutans or Actinomyces species than non-carious plaque samples. Some unique caries-specific bacterial strains were observed by colony morphology and their identity will be determined by DNA analysis.

Oral Health of Elderly Residents in Long-Term Care Facilities: A Qualitative Study Examining Barriers, Solutions, Policies, Rules, and Regulations

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Problem: The population with the poorest oral health is older individuals living in long-term care facilities. It is anticipated the population of those 65 and older will double in the next 40 years due to the aging of the baby boomer generation. The major growth of this population will affect the amount of elderly residents needing long-term care in nursing homes and other facilities. Because many of the residents of long-term care facilities rely on the staff for oral care, it is important for key staff members to know the administrative policies regarding oral care and the state and government regulations that exist regarding the oral health of residents.

Objective: The purpose of this study was to identify barriers, propose solutions, and address the policies, rules, and regulations that influence the conduct of oral health care in long-term care facilities.

Method: This study employed a qualitative design

consisting of semi-structured interviews conducted among key staff members of three long-term care facilities. Participants were selected using a convenience sample and included three administrators, three nursing directors, one registered nurse, and five nursing aids. Interview items were generated based on the literature. Approval was first granted by the Human Subjects Committee (#4076) and consent was obtained by the administrators of the facilities. All participants provided their signed informed consent. Interviews were recorded, transcribed, and analyzed using a general inductive analysis approach.

Results: Five main themes emerged through this research: the oral health of residents, oral care provided to residents, barriers to care, solutions to improving oral care, and knowledge of administrative policies and state and federal rules and regulations. Most staff members, including facility administrators, were not aware of the administrative polices and state and federal rules and regulations concerning the management of oral health care in long-term care settings. This study pointed to the need for greater attention to protocols, rules and regulations for providing oral health care.

Conclusions: Inconsistencies were evident among the knowledge of staff members regarding state, federal, and facility policies, rules, and regulations. Given the lack of knowledge about oral health care for residents in long term settings, a logic model was proposed. This model can provide improved collaboration and support among caregivers. Improvement in the oral health of elderly residents in long-term care facilities requires the efforts of all caregivers, administrators, and oral health professionals.

Silver Diamine Fluoride, Ag $(NH_3)_2F$ on Root Caries: A Review

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Objective: The aim of this study was to systematically review the present literature on the effect of Silver diamine fluoride on root caries.

Materials and Methods: The MEDLINE-PubMed, the ProQuest, and the Japan Medical Abstracts Society (JMAS) Web databases were searched through January 2015 to identify any appropriate studies. Silver diamine fluoride (SDF) and root/dentin caries were selected as search words.

Results: An independent screening of 19 MEDLINE-PubMed, 22 ProQuest, and 6 JMAS Web papers resulted in 8 publications that met the eligibility criteria. We choice JMAS since SDF was developed in 1966 and it has been used in Japan for long periods. Two of six were randomized controlled clinical trials. Data extraction of two clinical trials provided a little evidence that the application of SDF was effective in elderly patients when annual application of SDF together with biannual oral hygiene instruction, and SDF as well as NaF and CHX were more effective in preventing new root caries than giving OHI alone. Three of six were in vitro studies showed the efficacy of SDF as an antibacterial agent and gaining re-mineralization. Three of six were reviews that evidence for the effectiveness of SDF in preventing dentin caries was weak.

Conclusion: Within the limitations of this review, it may be concluded that SDF may provide a beneficial effect on the root surface. We need more and better designed and reported interventions to fully assess the impact of SDF on the root surface and understand the appropriate uses of SDF clinical interventions.

Utilizing the Modified Mallampati Score System to Evaluate Patients for Risk of Airway Complications in a Dental Clinic Setting

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Problem: A life threatening medical emergency occurred with a patient diagnosed with Treacher Collins Syndrome. The non-sedated patient has a severe laryngeal spasm which totally occluded the airway.

Objective: A quality improvement project is proposed to implement the Modified Mallampati Score System for patients with craniofacial anomalies. By identifying individuals at risk for airway obstructions, appropriate precautions are incorporated in the treatment to eliminate potentially life threatening outcomes associated with a difficult airway.

Method: During the initial encounter of a patient with a craniofacial anomaly, a simple visual exam will be performed to identify a patient at risk. To perform the exam the patient will sit upright and be asked to open his/her mouth and protrude the tongue as far as they can. This will allow visualization and assessment of the position of the base of the uvula, faucial pilliars (the arches in front of and behind the tonsils) and the soft palate. The patient will then be scored using the Modified Mallampati Score System as described below.

- Class I: Soft Palate, Uvula, Faucial Pilliars visible.
- Class II: Soft Palate, most of the Uvula visible.
- Class III: Soft Palate, base of Uvula visible
- Class IV: Only Hard Palate visible.

Results: Once the classification is complete and

documented, the clinician will discuss with the patient and family the best and safest treatment option based on the Modified Mallampati Score of the patient. In most clinical settings, Class I and II are associated with the ease of treatment. Class III and IV demonstrate a potential difficulty with maintenance of the airway in a supine position. Precautions and treatment modifications are discussed with the patient and family in order to provide care in the safest manner possible. Since implementation of the program, no adverse outcomes or respiratory emergencies have occurred.

Conclusions: Implementation of the screening tool to identify patients at risk for medical emergencies has proven successful with our patient population. This screening tool can easily be incorporated into clinical practice. It can be performed rapidly by dental personnel after a simple demonstration. We recommend that patients with craniofacial anomalies or individuals with compromised airways undergo this screening prior to any dental care. The results should be incorporated in the dental record and reviewed at the start of every dental appointment.

UAMS Collaborative Care Pilot Program

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Problem: As the lowest tier of states meeting national dental health criteria, Arkansas is in the bottom quartile. Preparing dental hygiene students for collaborative community settings requires much more than didactic education. Students require a basic threshold of clinical skills to work in a collaborative setting. Producing technically competent graduates, who possess good communication skills, cultural competency, cultural sensitivity, and health literacy, is challenging for the traditional dental hygiene school curriculum.

Objective: Develop a collaborative care practice model for dentists and hygienists in Arkansas. Provide training to support oral health providers practicing in advanced dental roles. Additional objectives: improve oral health care for vulnerable under-served populations; increase the number of children receiving oral health education, oral prophylaxis, dental sealants, and fluoride varnish therapy; increase the number of elderly in long term care facilities receiving oral health education, oral prophylaxis, head and neck cancer exams, and fluoride varnish therapy; promote a collaborative care model to the students in the dental hygiene program as well as licensed dentists and dental hygienists in Arkansas; and promote the dental hygiene profession as a career opportunity to a diverse population when providing treatment to elementary school children.

Method: UAMS faculty, three hygienists and one dentist licensed by the Arkansas State Board of Dental Examiners (ASBDE), will enter into a collaborative agreement established with the ASBDE. Upon the development and delivery of the collaborative care curriculum, collaborative care clinical rotations will be incorporated during the fall, spring and summer semesters. Underserved and vulnerable populations will be the target for the clinical rotations.

Results/Measurable Outcome(s): Measurements will consist of: number of patients treated; number and type of services provided; dates and number of Collaborative Care CE courses given; number of attendees for the Collaborative Care CE courses; pretest and post-test scores for students in DHY 3334 and DHY 3245 Community Dentistry I and II; number of graduates from the program each year after the implementation of the curriculum; number and year of Collaborative Care I and II permits issued by the ASBDE.

Conclusions: Benefits from dental hygiene students' participation in collaborative care community-based settings includes evidence-based instructional methods allowing students to become adept in their ability to deliver cross-cultural care in alternative practice settings. Students are likely to enter into a collaborative care practice model if exposed to all aspects of that model as part of the dental hygiene curriculum.

Funding has been requested from a submitted HRSA-15-050 "Focus Area 2" Grant.

Recognition of the Anatomy of Airway Space as a Screening Tool for Obstructive Sleep Apnea

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Problem: Obstructive sleep apnea (OSA) is a common disorder that involves frequent, partial, or complete occurrences of upper airway obstruction affecting 15-24% of the population. However 70-80% of the cases are undiagnosed with the majority of individuals unaware of their condition. Dental professionals have the potential to identify factors in detecting this condition. In 1990, the cost of healthcare in the United States, linked to patients diagnosed with OSA was 275 million dollars.

Objective: Investigate the plausibility of utilizing the Mallampati Airway Classification as a screening tool for OSA to aid in the screening and diagnosis of OSA/OSAS.

Methods: The study was conducted by thirty two dental hygiene students and eight clinical faculty trained for the correct determination of Mallampati Airway Classification. Upon patient consent, a voluntary paper survey requested the following patient information: self-reported weight, age, gender, neck circumference (measured by students or faculty), history of snoring, sleep patterns, daytime sleepiness, xerostomia, previous OSA diagnosis, and previous sleep study conducted. Patients were classed as Mallampati Class I, II, III or IV. Surveys were coded, and entered into the SPSS for statistical analyses. Four questions were yes, no, not sure; three questions were seldom, often, daily; and one question quantified how often the patient awakened during the night; 1 time, 1-2 times, 3-4 times, 5-6 times, or more than 6 times.

Results: N = 270 completed surveys (10 surveys were incomplete). Gender participation was: 17 (64%) female; 98 (36%) male. Average weight was 168.4 (min = 96; max =319 lbs.). Average neck-circumference was 14.9 (min 11.5; max 22).Thirty-four participants (12.6%) were previously diagnosed with OSA and 236 (87.4%) were not. Twenty-seven (79.4%) previously diagnosed patients had a Mallampati Class of III or IV, compared to only 7(20.6%) who had Mallampati Class II and II ($p < .05$). Participants in Mallampati Class III and IV had statistically significant higher neck circumference (M = 15. 37 SD =1.88) and weight (M = 15. 37 SD =1.88) than participants with class I and II ($p < 0.01$). Ninety-seven (36%) participants in class III and IV reported snoring as compared to 39 (14%) who were in class II and II reporting snoring. Chi-square test of independence showed that snoring and class III and IV were dependent on each other, chi-square (2) = 16.78 ($p < .01$).

Conclusion: Mallampati Airway Classification and/or neck circumference may be a simple useful screening tool to identify potential OSA patients.

Determination of the Cleaning Ability, Relative Dentin Abrasion Level and Fluoride Uptake of Hello Fluoride Toothpaste

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Problem: Many products marketed as alternative toothpastes without artificial sweeteners and dyes lack clinical evidence supporting safety and efficacy of the products.

Objective: The purpose of this series of studies was to determine the in vitro stain removal effectiveness, abrasivity and fluoride uptake of an ADA-accepted dentifrice, Hello Fluoride Toothpaste.

Method: Stain removal and cleaning ability were measured using the Pellicle Cleaning Ratio (PCR) method and the Relative Dentin Abrasivity (RDA) method was used to measure abrasivity. The Enamel Fluoride Uptake (EFU) method was used to determine the effect of the test toothpaste on promoting fluoride uptake into incipient enamel lesions. For the PCR method, the ability of the test toothpaste to remove stain from stained human enamel specimens was measured photometrically. In the RDA test, 32P-labeled human dentin specimens were subject to brushing treatments and the loss of dentin was measured as compared to the ADA reference material. In the EFU test, fluoride uptake was measured in incipient enamel lesions after treatment with the test toothpaste.

Results: The PCR test demonstrated that Hello Fluoride Toothpaste was effective at removing extrinsic stain with a value of 95.14 + 3.77. In addition, the RDA for Hello Anticavity Toothpaste at 90.69 + 1.88 is well within the safety limit as suggested by the International Organization for Standardization (RDA < 250). The fluoride uptake for Hello Fluoride Toothpaste was 889.09 and was higher than the ADA standard which had a fluoride uptake of 756.48.

Conclusions: Hello Fluoride Toothpaste demonstrated effective stain removal and was shown to be safe for the enamel in terms of abrasivity. In addition, Hello Fluoride Toothpaste was effective in promoting fluoride uptake. For consumers looking for a fluoride-containing toothpaste free from artificial sweeteners, triclosan, microbeads, preservatives, dyes or animal-testing, Hello would provide a safe and effective alternative.

Student Perceptions of Emotional Intelligence in Clinical Dental Hygiene Faculty

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Problem: The academic performance of students in higher education who are taught by emotionally intelligent faculty is likely to result in improved learning outcomes. A lack of study exists regarding the level of emotional intelligence (EI) present in health professions faculty and its impact on student clinical learning experiences. The few studies available have investigated and measured the presence of EI in health profession students themselves, but did not provide any insight into the level of EI present in their educators.

Objective: The overall aim of this project was to understand student perceptions of EI in dental hygiene clinical faculty and to provide baseline information for further study on the presence of EI in these faculty and its impact on dental hygiene students.

Method: The qualitative study, which examined the student perspective on the presence of EI in dental hygiene faculty, utilized an online voluntary anonymous survey via Survey Monkey© and was comprised of five open-ended questions that queried dental hygiene students' regarding their view of their instructor's EI. A thematic analysis was developed from recurring themes identified from student responses to the survey. Student participation (n=52) was solicited at the end of a fourteen (14) week semester with students participating while in the final year of their program.

Results: Recurring themes identified in the students' responses suggested an educator's emotional skills impacted students' performance during clinical sessions. The transferal of the instructor's emotional state was passed on to students, and was reflected in student comments, i.e., an instructor's stress created an environment that in turn amplified stress in students. A positive transferal of emotions also occurred when instructors who expressed empathy during challenging sessions were perceived by students to have provided help and support that assisted in improving their patient care experiences.

Conclusion: The thematic analysis produced from the survey outcomes suggests the level of EI present in dental hygiene instructors impacts students' learning experiences and clinical performance.

Dental Hygienists Attitudes Toward Chairside Medical Screening in the Dental Setting

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Problem: In previous work we found that dentists, patients, and physicians have a favorable attitude towards point-of-care screening for medical conditions in a dental setting. Dental hygienists are likely to participate in or actually conduct the screening tests.

Objectives: To understand attitudes and perceived barriers among practicing dental hygienists on the implementation of chairside medical screening in the dental setting.

Methods: An eight question survey with a 5-point Likert-scale (1=very important/willing, 5=very unimportant/unwilling) response scale was mailed to practicing dental hygienists in the U.S. The survey asked about attitudes towards chairside screening in a dental setting for specified conditions, willingness to collect the necessary samples/data, willingness to participate in these activities; and concerns around implementation of chairside medical screening. Descriptive statistics are presented.

Results: Of 1687 respondents, 99% were female, 60% were 41-60 years old, and 72% were practicing >10 years. The majority felt it was important for oral health care providers to conduct chairside screening for cardiovascular disease (86%), hypertension (94%), diabetes mellitus (90%), HIV infection (79%), and hepatitis (80%). Respondents were willing to conduct chairside screening that yields immediate results (86%), discuss results immediately with the patient (75%), and refer patients for medical follow up (94%). The majority were willing to collect oral fluids (90%) and blood pressure (95%), but less willing to collect finger stick blood (59%) and height and weight (62%). The overwhelming majority considered all of the following important factors for implementation: time (98%), cost (94%), insurance coverage (88%), patient willingness to participate (98%), liability (95%), support from the dentist, (98%), and training (98%).

Conclusions: Practicing dental hygienists felt it was important to conduct chairside medical screening in a dental setting, were willing to discuss results immediately with the patient, refer patients for medical follow up, and collect the necessary samples. Several considerations regarding implementation were important to almost all respondents. Incorporating dental hygienists into chairside screening strategies will require adequate training along with support from the dentists and an indication of patient willingness to participate.

Supported in part by the UK Research Support Fund. Presented at the 2014 annual meeting of the IADR/AADR.

Students' Knowledge, Attitude, and Perceptions of an International Service Learning Experience in Belize

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Problem: Access to oral health care is a global issue. Integration of international service learning into dental hygiene curricula could potentially improve access to care in diverse cultures, in addition to fostering graduates who have an increased understanding of access to care issues who feel they can make a difference in the oral health of diverse populations.

Objective: The objective of this study was to explore the knowledge, attitude, and perceptions of dental hygiene students who participated in an international service learning experience in Belize, with respect to providing dental care to a culturally diverse population.

Method: The design of this study included qualitative and quantitative research using a cohort, convenience sample of seventeen senior dental hygiene students who provided dental hygiene services in Belize. Prior to leaving, and immediately upon their return, students (n=17) completed a thirteen-question, Likert-type survey that explored their knowledge, attitude, and perceptions of providing care to an underserved population in a diverse culture. Survey data was analyzed using a paired sample t-test at a significance level of $p<0.05$ utilizing SPSS Statistics version 20. Qualitative data was also collected from daily journals written while in Belize and a comprehensive reflection paper upon their return, detailing their thoughts, attitudes, and perceptions of the service learning experience.

Results: Data revealed that by agreeing or strongly agreeing with the survey questions, all students, n=17, (100%) had a positive attitude towards their service learning experience in Belize. There was a statistically significant increase ($p<0.01$) in all thirteen areas, n=13, (100%) surveyed concerning their perceptions, attitude, and knowledge pertaining to this experience. Students indicated that their experiences led to perceptions of growth as a health care professional, and they perceived they were able to apply the knowledge and skills learned in their academic program to the service learning experience in Belize. They also felt they were able to make a difference in the oral health of the people of Belize, and after witnessing the disparities apparent in a diverse culture, had a greater appreciation of their personal standard of living upon their return home.

Conclusions: Dental hygiene students perceived their experience gained in international service learning can foster professional growth as a health care provider, heighten awareness of health care disparities in diverse cultures, and create a desire to engage in future service learning as a health care professional.

A Pilot Dental Teamwork Course Focused on Interprofessional Competencies

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Problem: Interprofessional teamwork skills are essential for all future healthcare professionals. In clinical dental practice, communication and collaboration between dental team members are imperative for safe and effective patient care. The future integration of newly emerging dental team roles, such as advanced practice dental hygienists and dental therapists, will require that all future oral health practitioners to have adequate training in interprofessional competencies.

Objective: The purpose of this study was to introduce intra-professional clinical collaboration and small group learning sessions to dental and dental hygiene students to evaluate teamwork and communication skills based on interprofessional competencies. The goal was to pilot a replicable curriculum to encourage students of both disciplines to learn clinical skills with and from one another, recognize one another's clinical roles and responsibilities, and practice transferrable skills for effective teamwork and communication.

Method: Quantitative and qualitative data was collected utilizing validated pre-test/post-test questionnaires; Readiness for Interprofessional Learning Scale (RIPLS) and Dental Roles and Responsibilities, along with self-assessment evaluation. Third and fourth year dental student participants (n=16) were volunteers; dental hygiene participants (n=7) in their final year were assigned. The control groups (47, n=32 dental, n=15 dental hygiene) were students who did not take the course.

Results: Quantitative data: Participant and control groups were similar; non-significance was found for the following factors using Pearson Chi-Square test at alpha=0.05 and Independent t-test at alpha=0.05: gender, age, education level, prior professional training, future professional plans, and prior exposure to IPE. Study participants' total RIPLS scores at pre-test were higher than controls' (approaching significance at $p < 0.1$). Statistically significant ($p<.05$) results for pre-test to post-test changes were found for the total RIPLS and the team collaboration subscale only.

Qualitative Data: Students self-assessed addressing the value and impact of each session. Overall, both disciplines (84%) valued the interactive, small group format, clinical collaboration and teamwork skills training as additions to professional education.

Conclusions: This study revealed evidence that this pilot course holds promise as an innovative model for teaching dental and dental hygiene students the foundational concepts and skills for collaborative interprofessional practice, both within and beyond the dental team. Additionally, the finding from this study suggest dental and dental hygiene students have divergent opinions about one another's responsibilities. Future studies should explore understanding student's role perceptions as well as research on effective interprofessional teaching methods to assist in developing effective teaching materials and approaches to foster safe and effective teamwork.

Caries Risk Assessment, Management, and Prevention: A Look into US Dental Hygiene Programs Cariologic Curriculum

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Problem: Recent international efforts have developed guidelines and recommendations for what should be taught in cariologic education. However, little is known regarding cariologic education in United States (US) dental hygiene programs (DHP).

Objective: The aim of this study was to explore how DHPs are teaching cariology in their entry-level curriculum. Specifically: (a) have US DHPs adopted specific cariology curriculum, (b) what components of cariology are being addressed, (c) how are caries management strategies taught, (d) what products are being recommended /taught regarding caries management, and (e) in what years do DH students receive caries risk assessment, management, and prevention education.

Method: The quantitative study utilized a convenience sample of 335 US dental hygiene program directors (DHPDs). The electronic survey consisted of four parts: (1) demographics of the DHP, (2) components of the cariology curriculum taught in their DH program, (3) when in the curriculum caries risk assessment, management, and prevention are being taught, and (4) questions regarding preclinical activities. Additionally, an open-ended question asked how cariology knowledge and competency are measured in their programs. Data were collected from 150 US DHPDs.

Results: The study resulted with a response rate of 45% (n=150). Sixty-six percent (n=90) of DHPDs indicated their program had adopted a specific cariology curriculum. In no other semester other than year one, semester two, did more than half of the programs teach any one component of cariology. Of the 66% of DHPDs indicating a specific cariology curriculum was adopted, topics identified included evidence-based caries management (96% n=130), considerations for root caries (95%, n=128), and the histological appearance of carious lesions (95%, n=128). Around 68% of DHPDs indicated that cariology is taught as part of multiple courses instead of through a stand-alone cariology course. Fifty-three percent of DHPs teach cariology using case-based or evidence-based education strategies and 63% teach cariology through clinical education. With regard to non-surgical caries management strategies DHPs identified their programs are still addressing the importance of professional and self-care plaque removal (97%, and 98%), while many are also focusing on diet modification (98%), fluoride treatments (99%), and sealant placement (97%).

Additional research is warranted comparing DHP data with dental school curriculum to assess alignment of educational standards in the teaching of cariology in US dental/dental hygiene schools.

Conclusions: International efforts have developed guidelines and recommendations for which components of cariology should be taught in dental education. Results indicated that cariology is an important element in the DH curriculum. This information will allow educators to compare DHP data with dental school curriculum data allowing a more cohesive alignment of educational standards in the teaching of cariology in US dental/dental hygiene schools.

Work-related Musculoskeletal Disorder (MSKD) and Complementary and Alternative Medicine (CAM) Utilization: The Beliefs, Attitudes, and Most Sought after Therapies by Registered Dental Hygienists (RDH)

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Problem: Dental Hygienists have higher risk factors for the development of work-related musculoskeletal disorders that are associated with the profession. It is imperative for the dental hygienist to gain an understanding of Complementary and Alternative Medicine and therapy's as it is the initial choice for maintenance of work-related musculoskeletal disorders.[1]

Objective: The purpose of this study was to determine the most utilized and sought after therapies. Another aspect was to establish a baseline of the beliefs and attitudes towards the preferred therapy.

Method: This single-blind study utilized a sample of 520 Illinois Dental Hygiene Association members to complete a survey about Complementary and Alternative Medicine (CAM) utilization with a focus on the beliefs, attitudes, and therapies utilized for work-related musculoskeletal discomfort management. The instrument utilized in the study included 31 open and closed ended questions. Prior to dispersement of the survey five peer reviewers tested the instrument for reliability and validity. The research instrument was obtained through the use of an electronic online mailing, establishing confidentiality for both researcher and sample population. Descriptive statistics were then employed to analyze the data. IRB approval was obtained from the UB Fones School of Dental Hygiene.

Results: The returned sample collected was 79 (15.2%) prior to the inclusion criteria yielding a total generated sample size of 57 (11%). Anatomical areas most affected by sample population included the neck at 61.4% then the lower back at 49.1%. The most common utilized Complementary and Alternative Medicine (CAM) therapy was massage at 73.7%. The distributed response of 75.4%

indicated that massage produced a more positive attitude and belief in that it helped with the management of musculoskeletal discomfort over chiropractic care at 42.1%. Another 36.8% strongly agreed that Complementary and Alternative Medicine (CAM) therapies were effective in the management of work-related musculoskeletal discomfort.

Conclusion: The majority of the respondents agreed that massage and chiropractic care were the preferred therapies for the treatment of both upper and lower extremity work-related musculoskeletal discomfort. And in turn, produced positive beliefs and attitudes towards Complementary and Alternative Medicine (CAM) utilization for management of work-related musculoskeletal discomfort.

New Teaching Tool Aims to Improve Student's Clinical Diagnosis of Oral Lesions

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Problem: Dental hygiene students are challenged with formulating a clinical diagnosis when presented with a case study in the oral pathology class. The research project was initiated to assist dental hygiene students organize the information in a way that will facilitate self-efficacy, critical thinking and recall of information. A search of the literature revealed medical students processed information by forming mental scripts of many details that eventually led to an accurate diagnosis. Beginner clinicians when faced with a diagnosis take more time going over their mental scripts to arrive at the diagnosis. Experienced clinicians use the same process but arrive at an accurate diagnosis in much less time.

Objective: The research project is to provide a learner-centered tool that will help students to methodically identify and document visual findings and research information that will begin the process of establishing scripts that they can draw upon when faced with identifying and documenting oral lesions. It is expected that the CSAT will improve the accuracy by which dental hygiene students identify oral lesions.

Method: A Case Study Assessment Tool (CSAT) was created containing a step by step process purposefully organized to guide the student to describe and identify lesions which will assist with the formation of mental scripts. A mixed methods study design was employed to address the research question. A convenient sample question survey was developed to assess the efficacy of the CSAT. Ninety current and past oral pathology dental hygiene students were recruited for the study. Twenty students volunteered to participate. Nine participants completed the project. There were two phases to the project. In the first phase students were asked to solve a case study describing and identifying an oral lesion without the CSAT. In the second phase the students were asked to solve the same case study with the CSAT. After both phases were completed, each student kept their initial response. A qualitative survey was also prepared. Nine students were interviewed and responses were recorded and transcribed to determine themes and codes.

Results: Four students had the correct descriptions and identification of the lesion. Nine students agreed the CSAT guided them in their ability to describe and identify a lesion and researching the topic assisted to expand their learning about the lesion. Eight of the nine students answered yes when asked if the CSAT helped them retain information. Four students felt there were sufficient questions on the tool to guide the process and four felt there were not enough. Seven students indicated that they would continue to use the CSAT in their clinical practice.

Conclusions: Themes are yet to be determined and codes assigned. The initial sample size was very small and a definitive conclusion cannot be made at this time.

Musculoskeletal Disorders – Does Operator Positioning or Use of Ergonomic Devices Matter?

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Problem: Problem Statement: Results of worldwide studies indicate that musculoskeletal disorders (MSDs) are highly prevalent and remain a potential occupational health hazard to practicing dental hygienists. It is unknown how current recommendations for operator positioning and use of ergonomic devices impact development of MSDs and workforce issues among dental hygiene practitioners.

Objective: The purpose of this study was threefold: to determine if self-reported operator positioning was correlated with development of MSDs; to assess whether use of ergonomic devices helped reduce risk for occupational injury; and to measure the impact of MSDs dental hygiene workforce issues in Mississippi.

Method: Methodology and Statistics: A 47 item questionnaire was developed and pilot-tested for face and content validity. The online survey was sent to all licensed Mississippi dental hygienists (N=1553). This IRB-approved study utilized a correlational design examining relationships between operator positioning and development and time to onset of MSDs, and impact of MSDs on practice behaviors and workforce retention. Data analysis consisted of Pearson chi-square correlation and Kaplan Meier survival analysis.

Results: Three hundred thirty-eight (22%) practitioners responded to the survey. There was no significant difference in prevalence of MSDs between those sitting in front of or behind the patient (χ^2 (1) = 1.67, p=0.196), although those who sat behind the patient developed MSDs sooner (χ^2 (1) = 3.92, p=0.048). Regardless of operator position, by 16+ years in practice, n=271 (80%) of dental hygienists developed MSDs. Having MSDs did not impact ability to work, need to take time off from work, reduce work hours or reduce patient load. Ergonomic devices were used by only n=73 (21.6%) of study participants.

Conclusions: The majority of practicing dental hygienists develop MSDs regardless of operator position. Sitting behind the patient resulted in earlier development of MSDs. Few practitioners use ergonomic devices. Dental hygiene workforce issues were not negatively impacted by MSDs.

Dental Hygiene at the Crossroads of Change: An African American Perspective

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Problem Statement: Dental Hygiene is at a crossroads of change. Numerous studies have reported lack of access to oral health care in the United States within the last decade. One of the major challenges is how to effectively address dental health access and disparities among various ethnic and racial groups and within the underserved communities. Various work force models have been proposed to answer this need. In several of these models dental hygienists have been suggested as the health care provider. Scientific literature reports limited data on perceptions of African American registered dental hygienists to these challenges.

Purpose: The purpose of this study was to assess the perceptions of African American dental hygienists on their willingness to perform limited restorative procedures and if the current scope of dental hygiene practice is expanded, do they think it will improve access to care.

Methods: A twenty question survey was sent to members of the National Dental Hygienists' Association (n=364). The survey was conducted to investigate the perceptions of African American dental hygienist regarding their interest in gaining restorative, limited extractions and advanced preventative capabilities. Survey information was obtained through the use of an electronic online tool, and all responses remained confidential. Descriptive statistics were used to analyze the data.

Results: Seventy-one (71) surveys were completed for a response rate of 20%. Data indicated 94% of African American dental hygienists believe that increasing the scope of practice of dental hygienists will have a positive impact on access to care. Over 50% of respondents felt the following procedures should be included in the dental hygiene scope of practice: placing retraction cord, taking a final impression, placing bases and liners, placing composites and resins and placing and carving amalgams. A minimum of thirty percent reported they would like hygienist to be able to prep the tooth prior to placement of the composite, resin or amalgam and the ability to perform simple extractions. Results showed 32% believe if the scope of practice was changed to include these procedures that additional continuing education either during or after completing the dental hygiene curriculum should be the minimal educational requirement while 36% felt it should be a Bachelor's degree.

Conclusion: Respondents see the need for access to care; however, they did not want to be limited to underserved populations only. Results indicated regardless of age or previous dental assisting experience, the majority of the participants surveyed were interested in performing additional duties and were willing to take further education to allow them to do so. The majority of the African American dental hygienist in this survey perceive themselves as one the health care providers who could address dental health care disparities if current scope of dental hygiene practice is expanded.

The Effectiveness of Prophylactic Application of Mouthwashes on Microflora of the Oral Cavity

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Problem: The majority of gingivitis is caused by bacteria, which attaches to the tooth surface and forms the basis of bacterial plaque. One of methods to remove bacterial plaque and to prevent it's formation is use of antibacterial agents.

Objective: The aim of this study was to learn the effectiveness of antiseptic mouthwashes on the microflora of the oral cavity when used prophylactically.

Method: Fifty eight (58) patients with intact gingiva were randomized into 3 groups. Group 1 (20 people) used 0.2% chlorhexidine mouthrinse, group 2 (20 people) used 0.2% triclosan mouthrinse and group 3 (control group) did not use a mouthrinse. All subjects used a manual toothbrush during the study. Rinsing was carried out for 4 weeks, 2 times a day according to instruction. Microbiological investigation of the plaque was performed before and after 4 weeks of rinse application and long-term results were studied after 3 months. Count of microflora was provided by percentage distribution among participants.

Results: After 4 weeks of application Staphylococcus sp. decreased in group 1 by 10% and in group 2 by 30% from baseline. Streptococcus sp. in group 1 was less by 20% than the original detection, in group 2 - by 30%. Candida albicans were reduced by 5-10% compared to baseline in both groups. Also normal flora was inhibited - Corynebacterium, Lactobacillus were not detected, what can be considered as dysbacteriosis. The reductions in pathogenic microorganisms persisted up to 3 months.

Conclusions: This study demonstrated the potential to reduce normal oral flora along with pathogenic bacterial organisms when subjects used 0,2% chlorhexidine and triclosan twice daily for 4 weeks and persisted up to 3 months. The development of a dysbacteriosis may occur when recommending these agents used prophylactically.

Exploration of Critical Thinking in Dental Hygiene Education

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Problem: While it is generally agreed that instruction in dental hygiene programs must incorporate critical thinking and decision making skills, there is an absence of research on the cognitive components of clinical decision making, which includes concepts of critical thinking. As a result, it is difficult to chart a course for such change in dental hygiene programs without examining the current status of faculty regarding their understanding and practice of teaching critical thinking skills in their discipline.

Objective: The goal of this research was to examine dental hygiene faculty perceptions and thinking surrounding critical thinking issues within their accredited associate degree dental hygiene programs. The focus was on faculty who teach or have taught first and/or second year clinical theory courses within their dental hygiene program. For the purposes of this study, critical thinking is defined as an art of analyzing and evaluating thinking by self-discipline, self-correction and self-monitoring within a framework to improve one's thinking.

Method: Twenty faculty participated in the study, as drawn from 11 accredited associate degree dental hygiene programs in one Mid-west state. As a qualitative study, multiple sources of data were collected, including email questionnaires, individual follow-up phone interviews and artifacts. Interpretive analysis was conducted.

Results: Data analysis revealed that 15 of the 20 faculty generally understood critical thinking, but interpretations varied. Most do not use varied teaching strategies to promote critical thinking skills, and focus on one particular strategy – that of case studies. 18 of the 20 participants learned of critical thinking through faculty development workshops and identified the need for allied health-focused faculty development opportunities, and noted that calibration of instruction was needed. Despite challenges, all 20 faculty felt responsible for teaching critical thinking skills, and identified the need for time to build critical thinking skills into the curriculum.

Conclusions: Findings revealed a strong desire among the dental hygiene faculty in this study to incorporate critical thinking into their work. They want to do what they believe is the right thing, but their actual knowledge of the definition and application theories about critical thinking is still in the early stages of development. Regular and targeted faculty development opportunities are needed.

Main Tasks of Clinical Dental Hygienists in South Korea

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Problem: Due to varying reasons and circumstances, main tasks of clinical dental hygienists in different countries tend to be slightly distinctive. Clinical dental hygienists in South Korea often engage in various dental services and office management tasks on top of their inherent dental hygiene tasks. This study aimed at clearly recognizing such distinctive characteristics of tasks performed by clinical dental hygienists in South Korea and how they differ from tasks typically done by dental hygienists in other countries.

Objective: Ultimately, this study focused on identifying main tasks performed by dental hygienists working at dental clinics in South Korea. Main tasks of Korean dental hygienists were divided into 8 categories and participation rates of each task were investigated.

Method: Dental hygienists working at dental clinics all over South Korea were sampled randomly and then 1200 copies of a questionnaire were mailed to dental clinics all over South Korea or handed out at academic conferences from January 12th to 30th, 2015. In order to identify main tasks of dental hygienists with respect to their working experience and working condition, frequency analysis and chi-square test were performed.

Results: Out of the 1200 questionnaire copies sent out, a total of 610 copies were returned for further analysis which demonstrated an overall response rate of 50.8%. Results showed that the participated dental hygienists' 8 main tasks consisted of chair-side assistance (93.2%), oral health education (92.9%), appointment schedul-

ing(84.6%), scaling (83.9%), quality insurance activity (82.9%), safety management (60.6%), hospital administration (44.5%), , and hospital management (20.6%), and these categories all showed statistically significant differences regarding the dental hygienists' work experience and the sizes of their dental clinics ($p<0.05$).

Conclusions: Regardless of differences in terms of Korean dental hygienists' working experience or the sizes of dental clinics they work at, most dental hygienists in South Korea are actively participating in various tasks required to maintain effective management of their dental clinics and to enhance the quality of dental services. This situation is quite distinctive compared to the fact that main tasks performed by most dental hygienists in the states are highly professionalized and are focused on tasks related to the dental hygiene care process.

This study was approved by the Public Institutional Bioethics Committee designated by the MOHW (Approval No. : P01-201412-SB-05).

Effects of Aromatase Inhibitors on the Periodontium Among Postmenopausal Women with Breast Cancer

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Problem: Aromatase inhibitors (AIs) are the standard of treatment for women with estrogen receptor positive breast cancer due to their ability to lower the risk of tumor recurrence. AI use results in estrogen depletion increasing the risk of osteoporosis and low skeletal bone mineral density and may impact alveolar bone and periodontium.

Objective: The objective of this investigation was to determine the impact of AI use on the periodontium through the use of clinical parameters, salivary bone biomarkers, and the supplemental use of bisphosphonates, vitamin D, and calcium in postmenopausal women on AIs.

Method: An 18 month prospective cohort pilot study of periodontal health in postmenopausal women (29 receiving AI therapy; 29 controls) was conducted between August 2009 and September 2013 at University of Michigan. Periodontal examinations including clinical attachment loss (CAL), periodontal probing depths (PD), and bleeding on probing were conducted. Linear measurements between the CEJ/restoration margin, and the alveolar crest of first molars were taken on baseline, 12, and 18 month radiographs. Bisphosphonate, vitamin D and calcium supplementation was collected via chart review. The study was approved by the UM IRB.

Results: AI users had significantly more bleeding sites, deeper PD, and greater CAL loss as compared to those not on AIs at the 6, 12, and18 month study visit. A linear mixed model was constructed to investigate bone height as a function of time, AI, calcium, vitamin D and bisphosphonate status, along with an interaction between AI and calcium status. A significant effect of time was found along with a significant AI status by calcium use interaction. Those on AI and calcium had a significantly lower bone height value (Mean=2.509, SE=.137) than those not on calcium (Mean=3.325, SE=.231) ($p=.005$).

Conclusions: AI therapy has an impact on the oral health of postmenopausal women. Data suggests a positive relationship between alveolar bone loss and the use of calcium supplementation among postmenopausal women. The knowledge about the prolonged use of AI will lead to an improved risk assessment of oral and overall health care of these patients and ultimately may lead to a better standard of care for future patients.

The Multiple Mini Interview as Admission Criteria into a Dental Hygiene Program

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Problem: One of the challenges of admissions committees for health science education is to develop and implement admissions tools with the goal of predicting academic and clinical success. Cognitive considerations such as Grade Point Averages and admissions tests have been shown to be predictive of future performance. Personal interviews, however, may be a poor indicator of future performance in health care professions. In Medical Education, the interview has been identified as one of the most subjective aspects of the admissions process. The Multiple Mini Interview (MMI) is an interview format that uses multiple, timed interview stations designed to obtain an aggregate score of each candidate's non-cognitive skills such as communication, ethical decision making, critical thinking and empathy. The MMI has consistently shown to have a positive correlation with future performance.

Objective: The University of Texas School of Dentistry at Houston Dental Hygiene Program began using the MMI as a part of the admissions process in 2010 in an effort to accept students that possessed qualities that would help them to be successful in the rigorous program. The purpose of this small focus group study is to determine participants' perceptions of the MMI as a part of a comprehensive admissions process.

Method: The focus of the MMI's was to evaluate an applicant's ability to reason through scenarios. Approval was obtained from the institutional review board at The University of Texas School of Dentistry. First year dental hygiene students were invited to participate in one focus

group interview session for one 60 minute visit. During the recruitment process, students were asked to contact study personnel or return participation slips to indicate their interest in participating. The interviewees were assigned a speaker number to indicate which person (unidentified) was speaking. Audio recording was used and were transcribed using the constant comparative method for data analysis. The audio recordings were destroyed and the transcripts are locked in file cabinet in a locked office.

Results: The analysis identified three major themes pertaining to the participants' experiences of the MMI. The first theme found was format of the one-to-one interview. Candidates perceived that the MMI format enhanced the building of rapport and created an environment in which the 'interviewers made them feel comfortable.' 'They were friendly and explained everything'. 'I liked being one-to-one since I could converse and express myself'. The second theme was the candidates having the opportunity to have multiple assessment opportunities. 'The process gave me the chance on how I would react to different situations'. I appreciate the process since sometimes you connect with a person, sometimes not.' 'As a collective, it shows a better glance of the overall person'. The third theme was the candidates' comments on the use of standardized scenario-based interviews. Overall, most of them felt that scenarios were fair and it gave insight into the genuine ability of the candidate to synthesize the scenario. 'I liked that you didn't have to know specific information'. 'Glad it was not just dental topics'. 'There were a broad range of questions and real-life scenarios'. 'The process allows for more movement between questions…good conversational setting as opposed to a panel interview.'

Conclusions: Students were satisfied with the MMI as a fair and accurate interview method. They felt that the MMI was preferable to a traditional interview in that it provided the interviewers a multidimensional view of the applicants.

Trends in Academic Preparation Regarding Workplace-related Musculoskeletal Disorders – Training, Equipment and Adoption in Clinical Practice

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Problem: Neck, shoulder and back disorders among dental hygienists are well documented. Little is known about the academic curriculum regarding workplace-related musculoskeletal disorders (WRMSDs) or how students implement training concepts into the workplace.

Objective: To examine academic trends in training and post-graduation practices.

- Determine WRMSD risks discussed in school
- Identify specific devices or accommodations introduced during training
- Investigate relationships between training and post-graduation work practices
- Explore correlations between self-reported WRMSDs and academic training

Method: Hygienists were invited, via multiple social media sites, to participate in the voluntary, convenience poll. Data was collected using an online, internet-based convenience sample over a three-week period in November 2012. The survey instrument contained 22 close-ended, pilot-tested questions including: basic demographics, academic training about WRMSD and ergonomic strategies, self-reported injuries and post-graduation injury-minimizing strategies. Responses were confidential. Data was analyzed using descriptive statistics.

Results: A total of 1,217 licensed dental hygienists representing 47 states and 6 Canadian provinces responded. 64% with 11+ years of practice reported WRMSDs risk training while in school in contrast to >85% who had practiced less than ten years. Academic training varied significantly between practice cohorts ($p<0.01$). Over the past ten years students received more WRMSD risk training than earlier graduates ($p<0.00$).

Dental hygiene educators were the WRMSDs information sources for 63% of survey respondents. Other sources included course research/required activity/table clinic (23%) and continuing education courses (19%).

Clinicians in practice for 11+ years reported no specific equipment training (37%). Nine out of ten respondents perceived magnification, headlight and stools options were not available during academic training.

Over 70% of clinicians in practice for more than 1-5 years reported learning about magnification loupes and purchasing personal equipment, while around one third learned about alternative stools and headlights.

Following academic exposure, 71% adopted magnification loupes and one third adopted headlights and alternative seating. Post-graduation use of magnification, headlights and alternative stools is significantly higher for clinicians exposed to concepts in school ($p<0.01$).

Hygienists with no academic training about equipment report a higher incidence of neck injuries ($p<0.05$).

Hygienists practicing ten years or less, who received seating information, report fewer neck injuries ($p<0.05$).

Hygienists practicing ten years or less, with a history

of mid/upper back injuries, more likely to use magnification to possibly avoid further injuries. ($p<0.01$).

Conclusions: While there was significant variation in training, those with greater knowledge of practice ergonomics reported fewer injuries.

Further research focusing on academic training and strategies to reduce WRMDs is needed to empower hygienists to seek solutions.

Dental Hygiene Workforce and Education Programs in Iowa

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Problem: In 2012, a workgroup of Iowa stakeholders convened to investigate factors related to the labor market environment for dental hygienists. Participants noted a paucity of information about hygienist workforce in the state, as well as anecdotal evidence of a workforce surplus affecting employment.

Objective: To examine the current dental hygiene workforce in Iowa, including temporal and geographic trends related to dental hygiene education programs.

Method: We compiled several cross-sectional data sources to examine Iowa's dental hygiene workforce and education programs. These included: Iowa DHA 2012 survey of all licensed Iowa dental hygienists, 2013 Iowa Dental Board relicensure data, and American Dental Association Survey of Allied Dental Education Annual Reports from 1999-2011. Our study included descriptive and bivariate analyses including cross-tabulation using SPSS and descriptive geographic mapping using ArcGIS.

Results: In 2013, 87% of Iowa's 2074 licensed hygienists were actively practicing in Iowa; that is, they reported working more than zero hours/week. Of those not actively practicing in the state, 7% worked outside of Iowa and 6% reported zero hours per week and considered inactive. Analyses include only those actively practicing in Iowa.

Iowa's practicing hygienists work a mean of 27 hours (SD=11) per week, and 51% work full time (≥32 hours/week). One quarter of Iowa's 99 counties have two or fewer practicing hygienists. Regarding educational attainment, a significantly lower proportion of younger dental hygienists had baccalaureate or higher degrees compared to older dental hygienists.

Dental hygienists tended to work in close proximity to their education institution; almost half of hygienists who graduated from an Iowa program work within 30 miles of their alma mater. Temporal changes in market share of dental hygiene education programs show an increase in the proportion of Iowa hygienists from out-of-state programs.

Conclusions: This study identified several important factors to consider as part of future dental hygiene workforce and education program planning in Iowa: full- vs. part-time status, trends in educational attainment, location of dental hygiene shortage areas, and geographic clustering near education programs.

The trend for fewer younger dental hygienists to attain baccalaureate degrees has implications for Iowa's future dental hygiene educator workforce. Dental hygiene workforce and education programs in Iowa revealed that only 6% of licensed dental hygienists are not actively practicing, and a majority work full time. In this study we were not able to determine whether hygienists who worked part-time desired additional hours.

Assessing the Validity and Utility of the ADHA's Hyposalivation with Xerostomia Screening Tool (HXST)

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Problem: The ADHA HXST was designed to assist with assessment of patient factors that increase risk for hyposalivation with xerostomia and resultant complications. Although endorsed by ADHA and available publically for use, the tool has not been validated nor has its usefulness in guiding dental hygienists' practice behaviors been evaluated.

Objective: First, to test validity of the ADHA HXST to detect hyposalivation as compared to standard salivary flow rate measures. Second, to test utility of the ADHA HXST in dental hygiene practice. Third, to determine how use of the tool influenced dental hygienists' practice behaviors.

Method: This IRB-approved study was divided into two phases. (Phase I) Phase I was a correlational study that involved a clinical trial. A convenience sample of ten volunteers, ages 21 to 59, provided both unstimulated and stimulated saliva samples according to standard guidelines. Volunteers received a clinical examination and findings were used to calcu-

late a risk assessment score using the ADHA HXST. Correlation analysis was used to compare subjects' flow rates with risk assessment scores. Phase II was a descriptive study. Thirty recruited, volunteer dental hygienists were given the tool to use on one workday in their practice settings. Afterwards, they completed a validated online survey to rate the utility of the tool, and to determine how use of the tool influenced their practice behaviors. Descriptive statistics were used to report utility measures and practice behaviors.

Results: For Phase I, there was no significant correlation between unstimulated salivary flow rate and total risk score (Spearman's rho = 0.0, $p > 0.05$) or between stimulated flow rate and total risk score (Spearman's rho = 0.32, $p=0.36$). For Phase II, 20 hygienists reported using the screening tool with their patients. Time was noted as the biggest barrier for use (n=9, 45%). Nineteen (90%) felt that patients benefitted from use; however, only 12 (60%) felt that results matched patient self-awareness of dry mouth. Fifteen (71%) felt that it should be shorter. Most felt that the tool was well-organized, easy to understand and score, and added new insight to assessing dry mouth. Thirteen participants (65%) would consider future use of the screening tool. Findings are limited by sample size, and by the large variance in what is considered normal saliva flow.

Conclusions: The ADHA HXST was not a valid tool for detecting hyposalivation with xerostomia as compared to salivary collection. Additional testing of the validity and utility of the tool is needed using larger sample sizes and with different patient populations.

Evaluation of a New Dental Hygiene Elective Course

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Problem: Following a 2014 study a course was developed at the University of New England to address suggestions made by independent practice dental hygienists for inclusions in dental hygiene education. The course was designed to create greater awareness of viable career paths available to the hygienist and provide skills to be successful in an alternative career path.

Objective: The purpose of this study was to evaluate the new elective course and determine the teaching tools most effective at meeting the courses objectives. Teaching tools utilized in this course included: Dental Hygiene Outreach Program rotations (extramural clinical experience in an interdisciplinary, patient-centered medical home), guest speakers, professional interviews, a case study, reflective writing, and creation of a business plan as a final project.

Method: A pilot of the course ran in the Spring 2014 semester and the students who participated in that course were surveyed. Response rate to the survey was 100%. The survey included questions regarding the effectiveness of specific teaching tools as well as opened ended questions seeking suggestions for course improvement. IRB exemption was provided by the University of New England Institution Review Board.

Results: The study showed that all teaching tools were perceived as valuable with an average level of agreement of 3 or greater on a 4-point Likert Scale where 1=strongly disagree, 2=disagree, 3=agree, 4=strongly agree. Participation in the Dental Hygiene Outreach Program was by far seen as the most valuable teaching tool with an average level of agreement of 4. 100% of respondents expressed a feeling of greater preparation for their career as a result of this course and felt the course had a "great impact" on their career outlook. Suggestions for course improvement included: less reflective writing, offering the course in the fall rather than the spring and increasing the involvement with the Outreach Program.

Conclusions: As the profession of dental hygiene education evolves, we as educators have a duty to keep pace with the changing paradigm. With the rapid expansion of career opportunities available to the dental hygienist brought forth by the advent of things such as public health supervision and independent practice, curriculum must adjust to prepare students for ALL opportunities in their profession. This course is aimed at meeting that goal and this study identifies a successful approach.

Building the Evidence to Inform Dental Public Health Policy in Mississippi

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Problem: Mississippi suffers from population health problems with poor oral health being one of the worst. Policy changes to allow increased public health interventions such as primary preventive measures could prevent oral disease. However, policy change is multifaceted, difficult, and requires many components to converge simultaneously. Policy change begins with awareness.

Objective: The aim of this project is to communicate the status of oral health in Mississippi in order to inform Mississippi policy makers of the need for changes to or the creation of dental public health policy. The purpose of the project is to utilize available oral health data to create an insightful, high-impact infographic for dissemination to lay audiences in Mississippi.

Methods: Data was requested or collected from the following surveillance systems: The National Health & Nutrition Examination Survey; the National Survey of Children's Health; the Surveillance, Epidemiology and End Results Program; the National Health Interview Survey; the Pregnancy Risk and Monitoring Survey; the Medical Expenditure Panel Survey; the National Oral Health Surveillance System; the Behavioral Risk Factor Surveillance System; the Mississippi Board of Dental Examiners; and the Mississippi Department of Health. Geographic information systems (GIS) software by ESRI© and data visualization software by Tableau© were utilized to create an easy to understand infographic demonstrating important oral health indicators across Mississippi. The OPT-In framework of factors to consider when selecting and presenting data to lay audiences was used to guide the implementation and evaluation of the infographic.

Results: An infographic was created using Tableau© software that displayed a map of Mississippi overlaid with results from available oral health surveillance. Some data was not accessible and there were inadequate sample sizes for small area estimation across the state of Mississippi. This forced researchers to present data across the state as a whole rather than by small area. Using the OPT-In framework, researchers developed an implementation and evaluation plan to disseminate the infographic across traditional and digital manners. Stakeholders were identified and asked to present the infographic on websites and in their digital communications. An additional evaluation is scheduled after dissemination to ascertain if policy changes result.

Conclusions: Change in public oral health policy will not occur without relevant targeted information communicated to a wide array of stakeholders. Creating an easy to understand infographic which highlights the need for change to improve dental public health of Mississippians could help to prompt policy change.

Undergraduate Support for Socializing Dental Hygiene Students to Conduct Research

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Purpose & Goals: Typically, research is thought to occur during the educational experience at the graduate level in education, specifically in Master's or PhD level programs. For over a decade, various agencies have recommended higher education provide greater opportunities for authentic learning, including faculty mentored, hands-on research for undergraduates. Our knowledge of how undergraduate research might be integrated in the dental hygiene curriculum and its benefits is limited. This presentation is designed to outline some of the essential features and outcomes of research activities, including the completion of small research projects, in one undergraduate Dental Hygiene Program. Given the need for well-prepared faculty with graduate degrees and research experiences.

Key Features: This presentation describes one institution's efforts in integrating undergraduate research projects in the dental hygiene curriculum. More than a course description about research, this presentation is intended to describe how faculty and students work collaboratively to implement and complete research projects, including successes and fiascoes. Highlights include essential features of undergraduate research such as helping students learn to conduct a literature search and prepare meaningful research questions. Institutional support and outcomes of these undergraduate research efforts will also be described including student grant writing for research support and dissemination of results beyond the university.

Evaluation Plan: Short-term evaluation of these undergraduate research efforts includes; data on project completion, examples of research topics, successful student undergraduate research presentations, funding received for undergraduate research projects and travel grant support. Long-term evaluation plans include alumni surveys to evaluate the impact on graduate school attendance as well as the potential impact of undergraduate research experiences on students' personal and professional practices.

Differences in Social, Teaching, and Cognitive Presence: A Comparison of Two Discussion Formats in an Online Dental Hygiene Course

*Amy Molnar, BSDH, RDH

Online education, and its development as an "anytime, anywhere" option for obtaining higher education, has become an attractive alternative to traditional face-to-face learning. Professional academic programs, such as dental hygiene, are not immune to growing utilization of online education. According to the American Dental Hygienists' Association, 34 (62%) of dental hygiene degree completion programs and 14 (64%) of dental hygiene master's programs offer most or all of their courses online. Online discussion is considered the central place for constructing knowledge in an online course, and it can occur utilizing synchronous and asynchronous tools. The purpose of this study was to observe and compare the development of social, teaching, and cognitive presence while utilizing two different tools of online discussion, asynchronous discussion boards and synchronous video web-conferencing. Students in an online dental hygiene course were instructed to discuss topics using either asynchronous discussion boards or in a synchronous video web-conference. Content analysis was completed on transcripts of 8 discussions that occurred during the 16-week course. The synchronous discussions indicated the highest level of cognitive presence more frequently than the asynchronous discussion. Social and teaching presences were indicated more often in the synchronous groups as well. This study suggests that synchronous communication in online discussions may create higher levels of presence in an online course. Research to explore casual relationships between the presences is indicated for future studies.

Critical Thinking in Dental Hygiene and Practitioners Based on Education and Experience

*Anna Rose Benner, RDH, BS, RF, MDH

Introduction: The complexity of the dental hygiene field, including advancements, disease prevention, and patients individual needs demand dental hygienists who have competent critical thinking skills. Expanding roles in dental hygiene are crucial to the development of critical thinking skills.

Purpose: The purpose of this study was two-fold. First, to investigate if critical thinking changes during a dental hygienist's education and career. Second, to determine if critical thinking abilities of dental hygienists are related to level of education, bachelors of science (BS) and associate of applied science (AAS).

Methods: A cross sectional sample of dental hygiene students and dental hygiene professionals who graduated from AAS and BS (N= 54) programs was utilized. Critical thinking abilities of dental hygiene students were compared to practicing dental hygienists using the California Critical Thinking Skills Test (CCTST). The relationship between critical thinking skills and level of education was also investigated.

Results: Practicing dental hygienists had higher critical thinking scores than students, but not at a statistically significant level. When comparing level of education, BS degree dental hygienists had a statistically significant difference in evaluation and explanation categories, but not in overall critical thinking scores.

Professional Caregivers' Oral Care Practices and Beliefs for Elderly Clients Aging in Place

*Ashley Delgado, RDH

Purpose: As of the 1990's long term care facilities (LTCFs) were the main housing option for semi or fully dependent elders. Today, 90% of those 65 and older want to "age in place." The growth of the elderly population that want to "age in place" will require increasing numbers of professional caregivers to assist in oral health practices. The purpose of this study was to address the gap in the knowledge about the oral health practices and beliefs of professional caregivers who work for non-medical in-home care companies (NMHCs) charged in the care of "aging in place" elders.

Methods: The nursing Dental Coping Belief Scale was used in a descriptive cross-sectional study. N=67 professional caregivers employed by 3 NMHCs in South Texas completed the survey. The survey gathered demographic information, oral care practice questions and oral health belief questions.

Results: NMHCs are not mandated by law to provide training. Yet, professional caregivers wanted more training in oral health. A majority (60%) reported being trained. Most (85%) looked inside their client's mouth yet nearly 18% did not floss their client's teeth and only 31% new if their clients wore dentures.

Conclusion: While this was a small study, it provides preliminary information that professional caregivers, serving those aging in place, want more oral health training.

Professional caregivers would be better served if

there were more thorough and frequent training provided with managerial oversight. This oversight could be provided by the addition of an Oral Health Care Director (OHCD).

The Perception and Employability of Dental Hygienist with Visible Tattoos

*Christina L. Cox, RDH, BSDH, MSDH(c)

Purpose: The aim of this study was to determine if the presence of visible tattoos hinders employment opportunities of dental hygienists.

Methods: 1,800 electronic surveys were distributed to licensed dentists in the state of Virginia. Surveys were randomized according to respondent's birth month. Participants viewed one of three photographs, a dental hygienist with: 1) no tattoo, 2) small tattoo, or 3) large "sleeve" tattoo. Subjects were asked to score the image based on following categories: ethical, responsible, competent, hygienic and professional on a 5-point Likert scale. Subjects also responded to three questions related to how well the image shown "fit" with their practice.

Results: A response rate of 14% (n=226) was attained after two email distributions and 183 (11%) completed the survey. Eighty percent (n=147) of the respondents indicated that tattoos should be covered in the workplace; 18% were indifferent; and 2% indicated that tattoos should not be covered. Results revealed that the dental hygienist with the large visible sleeve tattoo ranked the lowest in all categories. There was no statistically significant difference among the three tattoo conditions with regard to the model appearing ethical, responsible or competent. However, the models with the large and small tattoos scored significantly lower than the model with no visible tattoos in appearing hygienic and professional.

Conclusion: Visible tattoos may have a negative effect on perception and employability of dental hygienists in the state of Virginia.

Visualization of the Oropharynx During Head and Neck Cancer Examinations

*Courtney Perrachione, RDH, MS(c), CHES

Purpose: The purposes of this study were twofold: 1) to determine differences in visibility of the oropharynx during OPC screenings using five methods of tissue retraction; and 2) to identify clinician perceptions of visibility levels and preferences when using those visualization techniques.

Methods: A nonprobability convenience sample of senior dental hygiene students (N=25) was asked to participate. Clinicians visualized the oropharynx of two patients using each of five conventional methods. Patients who were anesthetized or could not be supine/semi-supine were excluded. Following visualization, participants completed a survey related to their perceptions of the best visibility and preference of method. Visibility using each of the five methods was documented with an intraoral photograph and scored using an anatomical checklist. Data were analyzed using descriptive statistics, Chi-square goodness of fit test and Analysis of Variance (ANOVA).

Results: The combination of mirror/"ahh" was perceived as providing the best visibility (52.5%), followed by the combination of tongue depressor/"ahh" (37.5%). The combination of mirror/"ahh" was most preferred (55%) followed by the combination of tongue depressor/"ahh" (32.5%). Forty-two intraoral photographs for each of the five visualization methods were evaluated based on the visibility of nine anatomical structures. Mean visibility scores were best for the combined methods and had significantly lower visibility for single-step methods.

Conclusions: Dental hygienists should request their patients say "ahh" in conjunction with a dental mirror or tongue depressor for adequate tissue retraction and visualization. For high-risk individuals, mirror laryngoscopy should be considered. Consistent guidelines for OPC screenings should be developed and implemented across disciplines.

Cultural Competency in Dental Hygiene Curricula

*Danette Ocegueda, RDH, MS

Purpose: The purpose of this study was to determine the degree to which U.S. dental hygiene programs are incorporating cultural competency education into the dental hygiene curriculum and to identify associated program characteristics.

Methods: A nineteen item survey was electronically administered to all 334 U.S. dental hygiene program directors. The questionnaire solicited information on teaching and evaluation methodologies relative to cultural competency education (CCE), as well as the director's perceptions and program demographic information.

Results: The majority (92%) of participating programs reported incorporating CCE into the curriculum in some form. Most responding directors indicated that CCE has been effectively integrated into the curriculum utilizing a variety of curricular methods. Results of this study suggest that an overwhelming number of responding programs (98%) participate in community outreach/service learning projects. However, nearly half (42%) indicated that their students are not evaluated for culture competency knowledge, skills, and attitudes.

Conclusions: These findings imply that responding programs are incorporating CCE into the curriculum using a variety of teaching methodologies with an emphasis on community outreach/service learning projects. It is important to consider whether or not community outreach/service learning projects improve dental hygiene students' cultural competency skills, attitudes, and knowledge. Future research efforts should aim to describe the value and effectiveness of such programs at achieving cultural competence.

The Effectiveness of a Self-Instructional Radiographic Anatomy Module on the Improvement of Test Performance for Dental Hygiene Faculty

*Demah AlGheithy, BSDH, MS(c)

Problem: Research evaluating the effectiveness of instructional methods to calibrate dental hygiene (DH) faculty in radiographic anatomy is limited.

Hypothesis: Use of a self-instructional radiographic anatomy module (SIRA) will improve DH faculty test performance in identification of normal radiographic anatomy. DH educators with more years of teaching experience will perform better than those with less experience.

Methods: This pilot study used a repeated measures design that was exempt from IRB review. A convenience sample of DH clinical faculty (N=23) were invited to participate. Participants completed a pre-test, SIRA module, an immediate post-test, and a four-month follow-up post-test. All components were online. Descriptive analyses, the Friedman's ANOVA, and the exact form of the Wilcoxon-Signed-Rank test were used to analyze the data.

Results: Pre-test response rate was 73.9% (N=17); 88.2% (N=15) of initial participants completed the immediate and follow-up post-tests. Participants included: 5 full-time faculty, 5 part-time faculty, and 5 graduate teaching assistants. The Friedman's ANOVA indicated no statistically significant difference (P=0.179) in the percentage of correct responses between the three tests (pre, immediate post and follow-up post). The exact form of the Wilcoxon-Signed-Rank test indicated marginal significance when comparing percent of correct responses at pre-test and immediate post-test (P=0.054), and no statistically significant difference when comparing percent of correct responses at pre-test and follow-up post-test (P=0.665).

Conclusions: Use of a SIRA module did not significantly affect DH faculty test performance. Future research should include a larger sample size when evaluating the effectiveness of possible calibration methods.

Knowledge, Attitudes and Practices among Healthcare Professionals Regarding Oral Health Assessments and Early Childhood Caries Prevention for Infants and Toddlers

*Diana Apresov, RDH, MS

Current research indicates that while most non-dental healthcare professionals believe pediatric oral assessments are important, most lack education and training. This study investigated San Diego's healthcare professionals' knowledge in pediatric oral health, opinions on anticipatory guidance, and oral assessments. Results indicate a high incidence of incorrect dental knowledge. Common barriers were lack of knowledge and time. Early intervention and timely dental referrals among non-dental healthcare providers can play a significant role in promoting oral health.

Attitudes, Behaviors and Needs of Team Dentists

*Lesley McGovern, RDH, MS

Problem: Elite athletes strive to attain superior levels of health and fitness; however, many have high levels of oral disease. Dental pain and dysfunction could alter level of performance during practice and competition. Many dentists work with sports organizations, but knowledge about their scope of practice and needs were unknown.

Research Questions:

1. What are the services currently provided by team dentists to athletes across leagues?
2. What are the barriers that prevent team dentists from performing screenings?
3. Are there barriers to providing oral health education and disease prevention measures?

Methods: An online survey was developed and pilot-tested, and IRB approval obtained. Dentist members of the Academy for Sports Dentistry (n=491) were invited to participate. Data collected included league affiliation, services provided, and type of oral screenings performed. Dentists' attitudes regarding athletes' treatment and preventive needs, practice behaviors, and self-identified needs were assessed. Descriptive statistics were used to analyze data.

Results: Results revealed 79.5% (n=116) of respondents had a league affiliation. The most frequently provided services were emergency treatment and mouthguards (95.5%), restorative treatment (78.5%), oral hygiene instruction (63%), and prophylaxis (61%). Of the 80% (n=90) of dentists who perform some sort of oral screenings, 41% (n=36) screen all athletes prior to the season with individualized follow-up examinations.

The most commonly cited barrier to screenings was lack of awareness of the importance of oral health.

Conclusions: Although the majority of team dentists do perform oral screenings, a lack of awareness about oral health importance supports the need for improved educational strategies.

The Role of Dental Hygienists: Sleep Disorder Identification

*Rachel Hamilton, BS, RDH

The purpose of this study is twofold:

1. To determine if a convenience sample of undergraduate B.S. DH students (N=56) are adequately educated in sleep medicine in order to identify patients with potential sleep disorders.
2. A systematic review of the related literature towards evidence base.

Methods: A pre/post-test design will be used to determine if a one hour face-to-face lecture will increase knowledge as measured by comparing pre and posttest scores by use of t-tests. Qualtrix will be used for data collection and statistical analysis of the outcome.

Findings of the systematic literature review revealed that no relevant previously published studies exist focusing on this specific topic. The study will determine the knowledge and attitudes of dental hygiene students related to screening and providing patient education related to sleep disorders. Testing of N=56 BSDH students is in progress and will be concluded by April 30, 2015.

Conclusion: Based on the limited amount of published studies, further study findings will indicate if a one hour lecture added to the DH curriculum is warranted in order to increase knowledge of this new topic in dental hygiene practice and education.

Using a Virtual Community of Practice for Knowledge Sharing Among Dental Hygienists with Community Practices: A Case Study

*Robin R. Roderick, RDH, MSDH

Purpose: As more direct access dental hygienists expand oral hygiene services into diverse settings, often geographically dispersed, opportunity to network and knowledge share can be limited. Communities of Practice (CoP) have been widely used in the medical healthcare sector as a social learning platform for sharing knowledge. Internet access has brought Virtual Communities of Practice (VCoP).

Methods: A 3-phase single in-depth ethnographic case study used mixed methods to gather group characteristics, explore a VCoP and an online Discussion Board (DB) as a tool for knowledge sharing, and assess perceived value of VCoP membership.

Results: In sum, 13 members participated. The typical direct access provider was an English-speaking female, approximately 55 years old, American Dental Hygienists' Association member having an Associate of Science in Dental Hygiene with approximately 23 years of experience. Content analysis found the three most common activities were Information Sharing, Appreciation, Information Seeking. Most common topics of discussion were Events, Professional Development, and Resources. Top five reasons for participation in the DB were: (a) access to information, (b) social, (c) self-improvement, (d) providing mentorship, and (e) professional development. Member benefits were ranked as: (a) privacy, (b) networking, (c) problem solving, (d) information, and (e) sense of community. Overall, the VCOP and online DB met member expectations.

Conclusion: Findings suggest value in an online DB as a tool for communication and knowledge sharing in dental hygiene practice. The results provide direction for design of a VCoP, which may reduce isolation of geographically dispersed dental hygienists practicing in other states.

Hand Function Evaluation for Dental Hygiene Students

*Sara Taft, RDH, MSAH

Dental hygiene students may struggle in dental hygiene curricula with hand function performance. Currently, there is not a universal aspect of dental hygiene programs that screen for hand function issues or protocol in place to help students who lack needed hand function skills.

The research in the study was completed in 2013 at WCTC and 1) examined whether hand function could improve with hand function exercises and 2) whether any improvement would be evident in higher instrumentation scores as a result of hand function exercises.

The study population consisted of 20 students accepted a Dental Hygiene program for the fall of 2013. The response rate was 85 percent, (n= 17).

Across a 6-week pilot study, an occupational therapist tested hand function of the cohort of the students using four occupational therapy evaluations. The evaluations tested students' dexterity, motor skills, and pinch and grip strength. The results were recorded, and the students began a focused, 6-week hand function exercise regimen. After 6 weeks the same four evaluations were performed and the pre- and post-test data were compared.

Statistical tests using a t-Test for dependent samples and simple ANOVA showed significant improvement in assessed hand function following exercises. Scores measuring periodontal probe and 11/12 explorer use of the cohort were then compared to students in the previous 5 cohorts. No significant difference was apparent.

The research concluded that six weeks of hand function exercises improves students' hand function. However, this raised level of hand function did carry over to increased instrumentation proficiency.

Gingival Bleeding and Oral Hygiene in Women with Von Willebrand Disease

*Stefanie Marx, RDH, MSDH

Problem: Von Willebrand disease (VWD) is the most common hereditary coagulation abnormality, presenting in roughly 1% of the population. Individuals with VWD experience mucosal bleeding as well as gingival bleeding. Some evidence suggests gingival bleeding is due to poor oral hygiene. No studies have shown a correlation between VWD and gingival bleeding when adjusting for possible confounding factors such as plaque, dental care utilization, and oral hygiene habits.

Hypothesis:

1. The amount of gingival bleeding will not be dependent on the severity of VWD, and possible confounding variables will have a greater effect on gingival bleeding.
2. Dental care utilization and oral hygiene habits will significantly influence the amount of supragingival plaque and gingival bleeding.

Methods: This multi-site study included 44 women with VWD who completed a questionnaire to evaluate demographics, oral hygiene habits, and dental care utilization. Clinical dental examinations were conducted to determine the presence of plaque and gingival bleeding on the 6 Ramfjord teeth. VWD type and severity was determined through a medical chart review. IRB approval was obtained prior to data collection.

Results: Paired samples t-tests revealed that severity of VWD did not significantly affect the amount of gingival bleeding noted ($p>0.05$). Multiple linear regression models revealed that other factors such as age and last dental visit ($p=0.044$) had a larger effect on the amount of gingival bleeding.

Conclusion: In women with VWD, when gingival bleeding is noted, it is more related to the presence of plaque or dental care utilization than the severity of VWD.

The Conceptualization of the Connecticut Dental Hygienists' Experiences with Care Trends for the Medicaid Patient

*Susan Miklos, EFDA, RDH, BSDH, MSDH

Problem: Obtaining oral health is often a challenge for the Medicaid population. Published research studies confirm access challenges for dental care to this population. Research examined Connecticut dental hygienists' observations and experiences with dental treatment trends for the adult Medicaid population. Investigation explored the association between form of payment and dental services offered. Inquiring if the form of payment dictates the dental services offered to the adult Medicaid patient, identifying limitations to oral health care.

Null Hypothesis 1: Dental payment type is unrelated to care options presented to the adult patient in Connecticut.

Null Hypothesis 2: Dental payment type is unrelated to access to care for the adult Medicaid patient in Connecticut.

Methods: A survey was electronically mailed to 1,300 dental hygienists in Connecticut. Data collected was analyzed using chi-square testing.

Results: Statistical analysis demonstrated a significant difference ($p=0.0002 < 0.05$) in services accepted and treatment options provided to adult Medicaid patients versus privately insured dental patients and demonstrated a significant difference ($p=0.0002<0.05$) with the association between services offered to patients with Medicaid insurance versus. patients with insurance other than Medicaid. Hygienists' report the implementation of a midlevel provider can improve access to oral care for the adult Medicaid population.

Conclusion: Reject the null hypotheses, Dental hygienists in Connecticut report dental payment type is related to care options presented and related to access to care challenges for the adult Medicaid patient.

Perceptions of Dental Hygiene Master's Degree Students about Dental Hygiene Doctoral Education

*Ursula Tumath, MS, RDH

Problem: Although other health professions (e.g., physical therapy and audiology) have doctoral programs to promote discipline-specific research and practice, there are no U.S. dental hygiene (DH) doctoral programs. DH master's degree students' perceptions about the need for, and interest in, a doctoral degree in DH are unknown.

Hypothesis: More students in DH master's degree programs would be interested in pursuing a doctoral degree in DH than those interested in pursuing a doctoral degree in another discipline.

Methods: In this 2014 cross-sectional national study, all DH Master Degree Program Directors were e-mailed a request to forward a consent form and online-survey-link to their graduate students. The 29-item survey assessed perceptions about proposed DH doctoral degree programs. A second request was sent 1 month later. Frequencies and cross-tabulations were analyzed using QualtricsTM software.

Results: Of the eligible 255 graduate students, 159 completed the survey (62% response rate). Most respondents (77%) indicated that DH doctoral education is needed for the advancement of the DH discipline; is important to the DH profession (89%) to increase to enhance interprofessional research opportunities (89%);, and supported both the PhD in DH and the Doctor of DH Practice (DDHP) degrees. Fifty-two percent (n=79) preferred a doctoral degree in DH compared to 22% (n=32) who preferred a doctoral degree in another discipline; 43% wished to enroll in a doctoral program in the next 1-5 years. Reasons were to: become a better teacher, expand clinical practice opportunities, become a researcher, and increase salary.

Conclusion: Most respondents believed doctoral DH education is needed and were interested in applying to such programs to enhance interprofessional research and clinical collaboration.