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- Dental Hygiene Students' Views on a Service-Learning Residential Aged Care Placement Program
- Marketing Strategies and Warning Labels on Children's Toothpaste

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STATEMENT OF PURPOSE

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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Rebecca S. Wilder, RDH, BS, MS



Becoming a Reviewer for a Peer-Reviewed Journal

Many times I am asked how someone can become a reviewer for a peer-reviewed journal. The challenges of peer review are many and it takes time and effort to become an effective reviewer that will not only elevate the status of the journal to which you are reviewing but also mentor the author to become a better writer and ultimately publish a more profound paper. The need for thorough, highly capable peer reviewers is essential to the growth of any journal. In addition, with new science evolving in areas outside of the “normal” scope of dental hygiene practice, it is becoming increasingly important to have a broad range of expertise represented on the review board.

A professional who wishes to hone their skills as a peer reviewer or to begin the process of being considered for this role with a respected scientific publication needs to do several things. First, it is essential that a potential peer reviewer is familiar with research methodology and statistical methods. This does not mean that every reviewer needs to be a statistician, but having a basic course in statistics is beneficial. In addition, reviewers should have knowledge regarding how to conduct an original research project. There is no better teacher about research than doing it yourself. Taking the steps to actually plan, implement and publish the results of a project is the best way to learn about the scientific method. It also helps a reviewer know what an author has or has not done to produce a project and paper worth publishing.

Second, it is important that reviewers are active readers and authors themselves. Reading scientific publications should be commonplace for reviewers. They should stay up to date in the latest science in their field. Being active in professional organizations such as the American Dental Hygienists’ Association, American Dental Education Association, American/International Association for Dental Research and other professional groups that host poster and oral presentations of the latest research is important in building skills and knowledge for peer review.

Once a professional is a reviewer or on a formal editorial review board, several things are important to note:

- 1. Respond to review requests in a timely manner.** When asked to review a paper, respond to editorial staff as soon as possible. This does not mean that you have to accept every request - just respond.
- 2. Meet the deadlines.** We ask reviewers to return the review in three weeks. This helps us respond in a timely manner to authors.
- 3. Write reviews as you would want to receive them.** Blunt, offensive comments have no place in a professional review process. It will leave the author with a negative impression of the journal and it also places the editor and editorial staff in an awkward position.
- 4. Provide feedback to authors, both positive and negative.** Feedback is essential, as is prioritizing comments. There may be many changes that you would like to see but make it clear which ones are the most important.
- 5. Start from a positive place.** A good reviewer should be a critical reader but not necessarily to only find fault. The reviewer should be knowledgeable enough in the subject area to look for important aspects, such as whether the author has included the most important references, structured the study appropriately, used the correct statistical methods or utilized the discussion section to “bring it all together,” and make important suggestions for future studies.

Becoming a peer reviewer is important to the advancement of the profession and also to the career development of the professional. Being a reviewer for a professional journal can be very rewarding and stimulating. It is a vital part of mentoring the future leaders of the profession and it elevates personal growth as well.

Sincerely,

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

Linking Research to Clinical Practice

Interventions for Alleviation of Dentin Hypersensitivity

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.

Da Rosa WL, Lund RG, Piva E, da Silva AF. The effectiveness of current dentin desensitizing agents used to treat dentin hypersensitivity: a systematic review. *Quintessence Int.* 2013;44(7):535-546.

Objective: Dentin desensitizing agents are used in the treatment of dentin hypersensitivity, which is defined as a painful response in the exposed dentin to stimuli that are thermal, evaporative, tactile, osmotic, or chemical. A systematic review was conducted to analyze the clinical effectiveness of current desensitizers with at least 3 months of follow-up.

Methods: Eight electronic databases were searched: Medline (PubMed), Embase, Lilacs, Ibecs, Web of Science, Scopus, Scielo and The Cochrane Library. Only those clinical trials published from 2000 to 2012 were included.

Results: A total of 3,029 relevant records were identified. After title and abstract examination, 2,645 articles were excluded. A data extraction form was designed and completed by reviewers from the selected studies for a retrospective comparison. From the 99 studies retrieved for detailed review, only 17 had an evaluation time of at least 3 months follow-up and fulfilled the selection criteria.

Conclusion: Cervitec Plus, SE Bond & Protect Liner F, laser, and iontophoresis have shown satisfactory posttreatment results between 3 and 6 months. However, additional clinical trials are warranted to better compare the different types of treatments and their effectiveness in the longer term.

Commentary

Dentin hypersensitivity, clinically depicted as an exaggerated response to stimulation to exposed dentin, is a common concern encountered by dental hygienists. Prevalence estimates vary widely; however, a recent general dental practice-based study of 787 patients attending 37 offices in the northwest U.S. concluded that 1 in 8 patients had dentin hypersensitivity.¹ The condition was more prevalent in younger individuals, age 18 to 44, females and those who had recession or used tooth whitening agents. Perhaps surprisingly, tooth sensitivity was not related to obvious signs of occlusal trauma, noncarious cervical lesions or aggressive toothbrushing. About half of these patients had tried at-home treatments, with 72% reporting short-term relief (less than 6 weeks) or no relief from pain. Only about 1 of 5 patients reported having in-office treatment for dentin hypersensitivity, with 38% of those reporting no pain for 6 months or more. The most common in-office treatments participants had received were fluoride (47.6%), dentin adhesives (9.5%), glutaraldehyde-containing varnish (9.5%) and restorative treatments (9.5%).

Dental hygienists have the responsibility to determine potential sources of tooth sensitivity or pain and to provide treatment or recommend interventions that address the patient's concern about tooth sensitivity or pain. Assessment should include an evaluation of the patient's history, the response to stimulation using tactile, cold, and air, how the hypersensitivity affects the individual's oral health-related quality of life, and the exclusion of other dental and periodontal conditions that might be causing the patient's discomfort.¹ An

awareness of research findings indicating the most effective treatments is essential to assisting the many patients who are seeking relief of the discomfort caused by dentin hypersensitivity.

This study assessed the effects of selected in-office desensitizing treatments with 3 and 6 month follow-up to determine whether long-term relief was achieved. Patients often report an immediate, yet temporary, relief of symptoms that return quickly after treatment and require multiple applications of a desensitizing agent or device. The study was a well-designed systematic review, one of the highest levels of evidence, performed by established standards for such reviews.² A systematic review is a study designed to answer a research question by comprehensively collecting and evaluating published studies. All of the studies that meet pre-established criteria for the highest level of evidence are systematically identified, appraised and summarized according to a precise methodology. For research questions about therapies or preventive strategies, a systematic review or meta-analysis of randomized clinical trials is considered the highest level of evidence. This study included clinical trials without the requirement that randomization was used in the study design; therefore, the investigators did not select only the highest quality of research study. This decision may have been made due to the low number of studies available for inclusion in the review. The study included only in vivo studies (studies of dentin sensitivity in human beings) and excluded in vitro (laboratory) studies. Thus, the methodology was strong, and the focus on long-term effectiveness was desirable.

Of 3,029 studies identified in the initial literature review and screening, only 99 published studies potentially met the criteria for quality required for inclusion. Of those, only 17 evaluated the results of the dentin hypersensitivity treatment at least three months posttreatment. Practitioners should be aware that studies or articles that represent lower levels of evidence are frequently published and seek the highest level of evidence available when making decisions about patient care. This systematic review included studies of the most commonly used in-office treatments for dentin hypersensitivity. Of the 17 studies included, 9 evaluated lasers (NdYag, GaAlAs or Er,Cr:YSGG), 6 assessed a glutaraldehyde-containing varnish (Gluma, Heraeus Dental), 3 evaluated a chlorhexidine and thymol-containing varnish (Cervitec Plus, Ivoclar Vivadent), a 3% potassium oxalate gel (Oxa-Gel, Art-Dent) and/or an adhesive bonding agent (SE Bond and Protect Liner F) and 2 assessed the efficacy of 2% sodium fluoride (NaF) iontophoresis therapy.

Although fluoride varnishes are commonly used for desensitization, the best evidence supports their use for caries prevention in children and adolescents rather than as desensitizing agents. Fluoride varnishes are approved, however, by the FDA for use as a tooth desensitizer.

Findings of this systematic review indicated that there is a need for additional long-term clinical trials to evaluate the effectiveness of in-office desensitizing agents, particularly because these studies used a variety of protocols, making comparison difficult. Some evidence was found to support the efficacy of Cervitec Plus, SE Bond & Protect Liner F, lasers and 2% NaF iontophoresis treatments with effects lasting between 3 months and 6 months.

Talioti E, Hill R, Gillam DG. The Efficacy of Selected Desensitizing OTC Products: A Systematic Review. *ISRN Dent.* 2014;2014:865761.

Objectives: The aim of the present study was to review the published literature in order to identify relevant studies for inclusion and to determine whether there was any evidence on the clinical effectiveness of selected desensitizing toothpastes, calcium sodium phosphosilicate, amorphous calcium phosphate, nanohydroxyapatite and casein phosphopeptide-amorphous calcium phosphate (tooth mousse) on reducing dentine hypersensitivity.

Methods: Following a review of 593 papers identified from searching both electronic databases (PubMed) and hand searching of relevant written journals, only 5 papers were accepted for inclusion.

Results: Analysis of the included studies (3 calcium sodium phosphosilicate and 2 amorphous calcium phosphate) would suggest that there may be some benefit for patients using these products for reducing dentine hypersensitivity. No direct comparative studies were available to assess all these products under the same conditions neither were there any comparative randomised controlled studies that compared at least 2 of these products in determining their effectiveness in treating dentine hypersensitivity.

Conclusions: Due to the small number of included studies, there are limited clinical data to support any claims of clinical efficacy of these OTC products. Further studies are therefore required to determine the efficacy of these products in well-controlled randomized clinical trial studies with a larger sample size.

Commentary

This systematic review was well-designed to meet the criteria established to ensure the transparent and complete reporting of systematic reviews and meta-analyses.² The focus of this review was the effectiveness of over-the-counter (OTC) desensitizing products rather than in-office treatments for dentin hypersensitivity. These authors cited references that previously identified the prevalence of dentin hypersensitivity as high as 74% and indicated that earlier estimates may have underestimated the prevalence or reflected under diagnosis of the condition. A large scale, practice-based study discussed earlier in this article identified the prevalence of dentin hypersensitivity as 12.8%.¹ Although 40% of all subjects in that study reported pain or sensitivity upon presentation, the prevalence of dentin hypersensitivity was found to be lower after clinical examination and diagnosis. Diagnosis is often based on elimination of other potential causes, rather than by the patient's self-report. Difficulties in successfully treating dentin hypersensitivity may be related to inadequate assessment of other causes such as cracked tooth syndrome, incorrect placement of dentin adhesives, fractured restorations, pulpal response to caries/restorations, chipped teeth causing exposed dentin. Differences in reported prevalence underscores the importance of a comprehensive assessment of each patient's reported pain or sensitivity and identification of the etiology prior to selecting an in-office or at-home intervention for dentin hypersensitivity.

This systematic review, designed to assess the efficacy of selected OTC desensitizing products for at-home use, included only double-blinded, randomized clinical trials with placebo controls, the highest quality of clinical studies available. The duration of studies included was at least 6 weeks; therefore, it was not designed to assess long-term effects. Studies included followed the Holland et al. guidelines established in 1997 to enable investigators to compare studies with similar methodologies for evaluating a desensitizing agent. Only studies evaluating the effect of toothpastes containing calcium sodium phosphosilicate (Novamin®), amorphous calcium phosphate, nanohydroxyapatite and casein phosphopeptide-amorphous calcium phosphate (tooth mousse) were included. Despite the fact that some stannous fluoride (SnF₂) dentifrices have the American Dental Association (ADA) Seal of Acceptance for safety and efficacy as desensitizing products, SnF₂ toothpastes were not evaluated in this systematic review. Another systematic review recently found some evidence to support the effectiveness of arginine-containing desensitizing toothpastes; however, of 18 studies included, 16 assessed short-term relief (immediate to 8 weeks).³ Additional studies are needed to determine long-term effectiveness

and arginine-containing toothpastes are not readily available in the U.S.

A literature search and screening resulted in 593 studies that were potentially relevant to this review. Of those, 57 were determined to be relevant and appraised for inclusion based on the eligibility criteria. After careful review by 2 investigators, only 5 randomized clinical trials could be included: 3 calcium sodium phosphosilicate, 2 amorphous calcium phosphate, 0 nanohydroxyapatite and 0 casein phosphopeptide-amorphous calcium phosphate/tooth mousse papers. The requirement for placebo controls was restrictive; however, it did ensure inclusion of the highest quality of studies available.

The small number of studies eligible for this systematic review limited the ability to draw definitive conclusions. CSPS and ACP desensitizing toothpastes may have some effect on alleviating dentin hypersensitivity, although further study is required. No conclusions can be drawn about HAP or CPP-ACP desensitizing products because none of the related clinical trials met criteria for inclusion. There is a lack of high-quality evidence comparing various OTC desensitizing agents and a need for additional RCTs meeting the Holland et al. guidelines to determine effectiveness of these products. This lack of evidence or inadequate assessment prior to diagnosis might explain the finding indicating that nearly 3 of 4 patients who had tried at-home desensitizing interventions reported only short-term or no relief of pain.¹

The Bottom Line

These studies addressed the effectiveness of OTC and in-office interventions for dentin hypersensitivity, a common condition. The findings and conclusions of both studies indicate a need for additional well-designed randomized clinical trials evaluating the effectiveness of these products and therapies. Studies comparing different products also would strengthen the evidence available for clinician's to make the best decisions for their patients. Based on the findings of one or both of these studies, the following conclusions are drawn:

- Before selecting any in-office treatment or recommending an OTC product for patients who report tooth pain, a comprehensive assessment, including an interview to determine the patient's history, a careful clinical examination, identification of etiological factors, and elimination of other possible causes, is indicated.
- 72% of patients report only short-term relief or no relief from pain following use of OTC desensitizing products, and 38% of patients who have had in-office treatments report being pain free

for 6 months or more. While in-office treatments appear to have better outcomes than OTC toothpastes, neither intervention has long-term benefits for the majority of patients. Poor outcomes may be related to inadequate examination and diagnosis.

- The in-office treatments with the best evidence supporting satisfactory posttreatment results between 3 and 6 months include Cervitec Plus, SE Bond & Protect Liner F, laser, and NaF iontophoresis; however, further study of these interventions and others is indicated.
- Although commonly used, fluoride varnishes were not included in this review. Evidence supports fluoride varnishes for prevention of caries in high risk children and adolescents rather than as a desensitizing treatment, although the FDA approves use of fluoride varnish for desensitization.
- When recommending products for at-home use, dental hygienists should review the active ingredients and be aware that there is a paucity of evidence supporting long-term effectiveness of most OTC desensitizing toothpastes. Although some SnF₂ dentifrices have the ADA Seal of Acceptance as safe and effective desensitizing products, they were not evaluated in this systematic review. Of the selected OTC products reviewed, desensitizing toothpastes containing calcium sodium phosphosilicate and amorphous calcium phosphate may have some effect on alleviating dentin hypersensitivity. Further study is required.
- There is a lack of strong evidence, based on this systematic review, to support recommendations for nanohydroxyapatite or casein phosphopeptide-amorphous calcium phosphate desensitizing products because none of the related clinical trials met criteria for inclusion.
- Dental hygienists need to continue to monitor research results related to desensitizing interventions giving particular attention to results of randomized clinical trials with placebo controls, sound measures of tooth sensitivity, and results lasting at least 3 months posttreatment.

Summary

Dental hygienists have the opportunity to provide a comprehensive assessment of dentin hypersensitivity, a common concern of patients. Once other potential causes are eliminated, an

intervention may be considered. In-office treatments that have some evidence supporting their long-term effectiveness include Cervitec Plus, SE Bond & Protect Liner F, laser, and NaF iontophoresis; however, no treatments work for all individuals experiencing pain. OTC desensitizing products lack strong evidence to support their use, although some stannous fluoride dentifrices have the ADA Seal of Acceptance for safety and efficacy. Other toothpastes that may alleviate symptoms are those with CSPA and ACP, although further study is needed. Dental hygienists need to be aware of active ingredients in the desensitizing interventions they use and recommend and continue to read related research regarding these interventions in order to make evidence-based recommendations for their patients.

Denise M. Bowen, RDH, MS, is Professor Emeritus at Idaho State University. She has served as a consultant to dental industry, as well as government, university and private organizations and is a member of the National Advisory Panel for the National Center for Dental Hygiene Research in the U.S. Professor Bowen has received national awards for excellence in dental hygiene and is widely known through her numerous published articles, 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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Critical Issues in Dental Hygiene

Fifteen Years of Portfolio Assessment of Dental Hygiene Student Competency: Lessons Learned

Cynthia C. Gadbury-Amyot, MSDH, EdD; Kimberly Krust Bray, RDH, MS; Kylie J. Austin, RDH, MS, ECP-II

Introduction

Assessment is a critical component of the educational experience. Assessment verifies students are acquiring the necessary knowledge, skills, problem solving and critical thinking abilities.¹ Research shows students view assessment as something that is done to them. Beyond the percentages and letter grades, many students have little knowledge about what is involved in evaluating their coursework.² Because of this disconnect, there is a growing trend among accrediting bodies to incorporate student self-assessment into the curriculum.³ In addition, accrediting agencies and other stakeholders such as state governments are calling for actual evidence to support students' learning outcomes.³ The implementation of portfolio assessment provides an opportunity for institutions to encourage self-assessment and challenge students to identify sources of evidence to demonstrate and document their personal and professional growth as they progress through the curriculum and on into their professional careers.

Drivers for Portfolio Assessment

What is often referred to as the assessment movement in U.S. higher education began in the early 1980s in part because of the call for curriculum reform, including greater curricular coherence, the use of powerful pedagogies associated with high learning gains and knowledge about student outcomes and experiences.^{4,5} But an even stronger impetus for assessment was the growing interests of state governments in using assessment to demonstrate return on investment - in other words, make higher education more accountable. In the fall of 1988, then Secretary of

Abstract

Purpose: Adoption of portfolio assessment in the educational environment is gaining attention as a means to incorporate self-assessment into the curriculum and to use evidence to support learning outcomes and to demonstrate competency. Portfolios provide a medium for students to demonstrate and document their personal and professional growth across the curriculum. The purpose of this literature review is to discuss the drivers for portfolio education, the benefits to both students and program faculty/administrators, the barriers associated with portfolio use, and suggested solutions that have been determined through several years of "lessons learned." The University of Missouri Kansas City School of Dentistry, Division of Dental Hygiene department has been utilizing portfolio assessment for over 15 years and has collected data related to portfolio performance since 2001. Results from correlational statistics calculated on the 312 dental hygiene students that graduated from 2001 to 2013 demonstrate a positive and significant relationship between portfolio performance and overall GPA as well as portfolio performance and NBDHE scores.

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

This study supports the NDHRA priority area, **Professional Education and Development:** Evaluate the extent to which current dental hygiene curricula prepare dental hygienists to meet the increasingly complex oral health needs of the public.

Education William Bennett issued an executive order requiring all federally approved accreditation organizations to include in their criteria for accreditation evidence of institutional outcomes. Bennett's executive order specifically held higher education institutions accountable to accrediting bodies for producing and documenting outcomes.⁶ By the mid-1990s, higher education began to see a shift in state focus and formula funding from input (number of students, library holdings, credentials of faculty, etc.) to output (number of graduates, average time to graduation, etc.). One measure of outcome or output which received considerable attention was student competence. The Commission on Dental Accreditation (CODA), as a federally approved accrediting body, adopted standards for

a competency-based curriculum for dentistry in 1998 followed by dental hygiene education in 2000. As a result, dental education has been at the forefront of competency-based (or standards-based) education at higher education institutions across the country. Competency is defined as the skills, knowledge and professional values of an individual ready for beginning independent practice.⁷

In response to the assessment and accountability mandates, institutions of higher education sought out instruments designed specifically to assess the effectiveness of their educational program. Most institutions used a mixture of surveys and a collection of cognitive examinations like the American College Testing or Graduate Record Examination. However, there was a push by faculty for authentic assessment strategies, where actual student work products from assignments in regular courses, or well-established surveys like the National Survey of Student Engagement, as measures of assessment of student learning. It was within this environment that the University of Missouri-Kansas City (UMKC) School of Dentistry, Division of Dental Hygiene, embarked on a portfolio assessment strategy beginning in 1998. At the time, CODA had not yet adopted competency-based curriculum for dental hygiene, so initial portfolios were based on program goals. However, in 2000 when CODA adopted a competency-based education model for dental hygiene, the division was able to redirect their portfolio assessment strategy to program competencies. Fast forward to 2013 where accreditation standards specifically require student competency in such things as critical thinking, self-assessment and ethical reasoning, and it is not difficult to see how portfolios can provide a mechanism for capturing students' knowledge, skills and values (i.e., competency) while demonstrating growth over time in a way that traditional one-shot testing and assessment cannot do. Many institutions are turning to portfolios as a strategy for demonstrating student competency along with tangible evidence for programs going through accreditation review.

On July 1, 2013, revisions to the Pre-Doctoral Dental Education Standard 2-23 went into effect to include assessment of overall competency, not simply individual competencies, in order to measure the graduate's readiness to enter the practice of general dentistry.⁸ In preparation for the revised standards, recent national accreditation workshops sponsored by CODA and the American Dental Education Association were conducted for dental educators.⁹ An emphasis area at the workshops has been the need for evidence for each student (in addition to overall program data) to support decisions about competency. Although at one time it was sufficient to state as a program that all students are meeting the standards, it will now be

necessary to demonstrate competence on a student-by student basis. This shift in focus has led to more widespread use of portfolio assessment in dental education programs.¹⁰

Another change in dental education that could potentially serve as a driver for portfolio assessment is the recent change in reporting of the National Board Dental Hygiene Examination (NBDHE) scores. Where previously a numeric score was provided to the student and licensure bodies, as of January 1, 2012, the NBDHE results are reported as pass/fail. For dental hygienists who desire to go into graduate programs, portfolios have been shown to provide an advantage for the applicant. Likewise, the authors believe this scenario will be similar for dental students desiring to continue into advanced education programs.

Outcomes

Since the UMKC School of Dentistry was the first dental hygiene program in the nation to implement portfolios in 1998, longitudinal data was available for review and analysis. Faculty have documented and tracked dental hygiene student performance on portfolios, cumulative GPA, NBDHE and clinical licensure exams to create a database that includes all graduates of the program from 2001 to 2013. The following results represent the population of students for 12 years and thus provide a strong measure of confidence in the data analysis. Ongoing collection and analysis of this data is approved by the UMKC SSIRB #13-414.

Subjects

The population for the analysis consists of 312 full-time dental hygiene students that graduated from the UMKC School of Dentistry Dental Hygiene program between 2001 and 2013. The mean age at graduation for the students is 25.78 years (SD=5.49); however, ages range from 19 to 48. There are 306 females and 6 males in the sample. The ethnic breakdown of the group consists of 86.2% Caucasian, 4.5% Asian/Pacific Islander, 3.5% Hispanic, 1.9% African American and 1.0% Native American (Table I).

Correlational Analyses

According to Messick, a method for determining the external validity of an assessment is to determine if students who score high on the test also score high on other presumed indicators of the construct being measured.^{11,12} To help support the external validity of portfolio assessment, correlational analyses were conducted between student portfolios and traditional assessment measures of dental hygiene student competency including the NBDHE, GPA and the regional clinical examination scores (Table II). Results demon-

strate a positive, moderate and significant relationship between portfolios and GPA ($r=0.433$; $p<0.01$) and portfolios and the NBDHE ($r=0.339$, $p<0.01$) as defined by Cohen's conventions to interpret effect size.¹³ A positive but smaller correlation was found between portfolios and regional clinical licensure examination scores ($r=0.252$; $p<0.01$). These relationships appear to be good evidence for validity of portfolio assessment.

Fifteen years of experience with a portfolio assessment strategy has illuminated various benefits and certain challenges that accompany the use of portfolio assessment. Many of the benefits and challenges experienced by the UMKC School of Dentistry faculty members and dental hygiene students parallel those that are discussed in the literature.

Benefits of Portfolio Assessment

One of the most acknowledged advantages of using portfolios in the curriculum are student-centered tools requiring the student to self-evaluate and assess their performance. The ability to accurately self-assess is considered a hallmark of competence and is therefore necessary for the development of competent graduates.^{14,15} Unfortunately, many students enter dental hygiene programs with little experience or awareness of self-assessment. In a study conducted by Mould et al, students openly described their unfamiliarity with self-assessment. When asked about using self-assessment as measurement to follow one's progression of skill development, responses indicated many students did not feel adequately prepared to self-assess upon entering the program. No formal orientation to self-assessment was provided to students in the study; however, when it became evident that a lack of knowledge about the purpose and process of self-assessment was a common theme throughout the analysis, it was determined that there is a need for a specific orientation at the beginning of the dental hygiene.¹⁴ Gwozdek et al confirm the benefit of portfolios in developing self-assessment as a professional skill, providing opportunities to self-assess how the course material they complete benefits them personally and professionally, and supporting the development of increased self-perception of competence and confidence over time.³

The benefits of portfolio assessment to the program itself cannot be overstated. Evaluating student reflections in a portfolio provides a method for faculty to assess critical thinking, professionalism and health promotion skills.¹ Through the process of reviewing portfolios, faculty members are able to perform a 360 degree assessment of the curriculum in a holistic way, offering opportunities to determine both strengths and weaknesses of the program. Academic programs

Table I: Demographic Characteristics of Participants (n=312)

Characteristic	n	Percent
Gender		
Male	6	1.9%
Female	306	98.1%
Age Range		
18 to 22	81	25.96%
23 to 27	152	48.72%
28 to 32	48	15.38%
33 to 37	15	4.81%
38 to 42	8	2.56%
43 to 47	5	1.60%
48+	3	0.96%
Ethnicity		
Asian/Pacific Islander	14	4.5%
African American	6	1.9%
Hispanic	11	3.5%
Caucasian	269	86.2%
Native American	3	1.0%
Not Reported	9	2.9%

Table II: Correlations among Traditional and Nontraditional Measures of Dental Hygiene Student Competency as Evidence of External Validity

	Portfolio	GPA	NBDHE	Clinical Exam
Portfolio	1.0	-	-	-
GPA	0.433*	1.0	-	-
NBDHE	0.339*	0.629*	1.0	-
Clinical Exam	0.252*	0.179*	0.200*	1.0

* $p<0.01$

adopting portfolio assessment found it provides an opportunity to support formative assessment with qualitative data in the form of reflection, identify gaps in student understanding and concepts to clarify in the curriculum, quantify students' perceptions of achieving competency-based learning outcomes, provide summative program evaluation through reflection data, and offer valuable insight into areas for program improvement.³

Challenges Associated with Portfolio Assessment

Time: One of the most commonly identified challenges to implementing and sustaining a portfolio assessment strategy is time. Portfolios require a significant time commitment from both students and faculty. Utilizing pre-existing structures within the curriculum

is critical for combating this issue. For example, most programs have some type of mentor-mentee system in place with faculty and students. At the UMKC School of Dentistry, the authors tapped into that system to include portfolios, assigning the faculty mentor as the person responsible for keeping students on track with their portfolios through the curriculum.

At the end of the day, portfolio assessment cannot stand apart from the curriculum or it will be perceived as additional busy work by both students and faculty. Using existing assignments that are already part of the curriculum as evidence of competency for student portfolios or modifying existing assignments to better capture competency for inclusion in portfolios assists in less faculty resistance. If portfolio assignments are well-developed and strategically embedded across the curriculum, then the students can receive formative feedback from faculty through the courses in which assignments are required (embedded), and summative feedback toward the end of the academic program as portfolios are evaluated holistically.¹⁰ With over 15 years of experience with portfolio assessment, the authors can report with confidence that it typically takes faculty approximately 30 minutes per portfolio to provide a summative review of portfolios as the students near graduation.

Control: Control in the educational environment has also been identified as a challenge as educators have been reluctant to share control of evaluation and assessment with students. An even greater struggle has been getting students to assume responsibility for their own evaluation and assessment.¹⁶ In 2006, the American Dental Education Association's Commission on Change and Innovation in Dental Education issued a paper outlining 8 core principles that should characterize dental education and guide curriculum development.¹⁷ One of the core principles, Lifelong and Self-Directed Learning, supports this shift from teacher-focused and teacher-directed learning to student-focused and student-directed learning. The goal of this shift is for the students to become self-directed, self-disciplined, self-aware and self-corrective learners. Portfolios support this strategy by capturing the student's own appraisal, self-assessment and reflection on their performance including areas of improvement, lessons learned and insights about the learning process.¹⁰ Clearly, educators are being challenged to facilitate this shift and portfolios are an excellent vehicle for this transition in pedagogy.

Validity and Reliability: Finally, concerns related to validity and reliability of portfolio assessment have been a challenge as educators continue to question whether portfolio assessment is psychometrically sound and defensible. Variability among portfolios has been identified as a potential weakness as it can make

consistent evaluation difficult for evaluators, thereby compromising reliability.¹ Research has emphasized that in performance assessment, carefully constructed scoring rubrics and intensive training sessions and calibration exercises for raters are essential elements for producing ratings that are reliable.^{10,16,18}

In 2003, Amyot et al investigated the validity and reliability of portfolio assessment in a dental hygiene program. A generalizability study followed by a decision study found that faculty accounted for very little variability or error (1.28%) in portfolio measurement, and that a generalizability coefficient (analogous to reliability coefficient) of 0.69 could be achieved. This coefficient represents the agreement between 2 different evaluators for each portfolio that was reviewed. Based on the findings from the study, the authors concluded that portfolios can serve as a valid and reliable measure for assessing student competency.¹⁶ A caveat of these findings was that 0.69 would be unacceptable if the interpretation and use of portfolio scores were high stakes, e.g., determining licensure. In the UMKC School of Dentistry program, portfolios are used in the final semester as a capstone project and account for 60% of the students total grade in that course. Therefore, we are able to validate this interpretation and use with a reliability of 0.69. In the event that portfolios were to be used as high stakes, it would be necessary to calibrate faculty further and increase reliability.

Discussion

Since the UMKC School of Dentistry has been utilizing portfolio assessment in the dental hygiene program for 15 years, several opportunities for "lessons learned" have occurred along the way. The learning issues encountered and strategies utilized to address them are discussed below.

Student-Selected Evidence

Research in performance assessment has shown that when there is standardization in portfolio entries, reliability is improved.^{10,18,19} In accordance with the literature, faculty have determined which assignments are to be included in the portfolio. However, students at the UMKC School of Dentistry requested the ability to self-select pieces of evidence that they felt demonstrated their competence. Therefore, an additional section was added that allowed the students to include any additional assignments or items that they felt further supported their competence with the understanding that faculty would evaluate the required items and that the self-selected pieces of evidence needed to be kept at a minimum.

Portfolios as Evidence of Curricular Quality

In 2003, following a site visit from CODA, the UMKC School of Dentistry, Division of Dental Hygiene, received a commendation on self-evaluation because of the students' performance on their portfolios. The report states, "The visiting committee noted that the dental hygiene curriculum includes multiple opportunities for students to produce scientific writings and conduct self-assessments. The students complete an evidence-based paper in the majority of dental hygiene courses. The self-assessment is best exemplified by the portfolio exercise. The dental hygiene faculty is commended for implementing a curriculum that facilitates the students' competence in scientific writing and self-assessment."²⁰

As stated previously, faculty members can utilize student portfolios to better see their curriculum in a holistic way and contribute to the program quality enhancement. Gwozdek et al discuss the benefits of portfolios on program and administrative assessment.³ It can serve as a tool for faculty to prepare for upcoming projects, make modifications to existing assignments, identify gaps in student understanding, and clarify any lingering misinformation.

Student Perceptions of Portfolio Assessment as Evidence of Curricular Quality

Although the benefit of portfolios in providing evidence of curricular quality is evident to faculty members and external reviewers, it is not always perceived as beneficial by the students. Prior to graduation, UMKC School of Dentistry senior dental hygiene students are given a survey to evaluate various components of the dental hygiene curriculum. Responses are provided using a 5-point Likert-scale: 1 - strongly disagree, 2 - disagree, 3 - neutral, 4 - agree, 5 - strongly agree. One statement related to portfolio assessment reads, "Development of programmatic portfolios helped me to reflect upon my educational experience and growth and feel more confident in my ability to communicate my competence as a dental hygienist." Results from the past 5 years indicate the students often disagreed with the statement. In 2010 and 2012 the mode was 1 (IQR=2 and 3), in 2011 the mode was 2 (IQR=3), in 2009 the mode was 5 (IQR=2) and in 2008 the mode was 3 (IQR=1.25). The faculty has determined that it is important to continually remind the students why they are developing portfolios and what the portfolio represents so that they can better see the value of the exercise. If the students do not grasp the concept of the assignment, they often view it as busy work. It was also

determined that in the future, the statement should be re-written to ask students if preparing a portfolio helped them to obtain skills in self-assessing, reflecting on program competencies, and capturing their personal and professional growth throughout the program.

Portfolios as a Visible Response to Domains of Legitimate External Concern

One of the current measures for determining clinical competency and subsequent licensure is clinical licensure exams. A problem related to this method of one-shot testing is the inconsistency between student performance at accredited schools and performance on clinical licensure exams.²¹⁻²⁷ Other issues include the ethical treatment of humans when using live patients for the exam, the expense associated with traveling great distances to test and the increased stress and expenses that accompany repeating the exam upon failure.²⁷

To address these problems associated with current clinical licensure examinations, the California Dental Board implemented a new pathway for dental students to obtain licensure upon graduating from a California dental school using portfolio assessment. The law took effect January 1, 2011 and allows students at the 6 California dental schools to complete the licensure process over the course of their final year in dental school instead of waiting until after graduation. The students that choose this option will be required to complete specific clinical experience benchmarks in seven categories and pass a final assessment in each area. Once all benchmarks and assessments have been completed successfully, the students will submit their finished portfolio to the dental board for approval and subsequent licensure.²⁸

Gadbury-Amyot et al suggests portfolio assessment such as this is an appropriate model of assessment to use in determining qualifications for licensure to practice within the competency-based educational framework that is currently taught. The use of portfolios allows students to present multiple representations of their work evaluated by multiple faculty members.^{27,29} Using both theoretical and empirical evidence, a strong case for validity in portfolio assessment has been determined and could serve as a valuable tool in measuring clinical competency.

Electronic Portfolios (ePortfolios)

With the increased use of technology in dental and dental hygiene curriculums, the transition from traditional paper-based portfolios to ePortfolios is

becoming more prevalent. Helen Barrett describes ePortfolios as using electronic technologies as a container to collect and organize evidence in many media types (audio, video, photos, etc.) while connecting it to appropriate outcomes, goals or standards.³⁰ Barrett identifies enhancements such as archiving, linking, storytelling, collaborating and publishing that are possible when technology is added to traditional portfolio processes.

By requiring students to prepare a portfolio electronically, they gain important digital literacy skills. According to Jones-Kavalier et al, digital literacy is a person's ability to perform tasks effectively in a digital environment.³¹ Literacy includes the ability to read and interpret media, to reproduce data and images through digital manipulation, and to evaluate and apply new knowledge gained from digital environments. Digital literacy is vital for students to develop because of the increased use of technology in all aspects of dentistry.

Additional advantages of ePortfolios include the ease of access for both the students and the faculty members. If an internet connection is available, they can have 24 hour accessibility to the portfolio contents. It also allows multiple people to review the portfolio at any point in time, rather than having to share 1 paper-based traditional portfolio. Having the information available electronically also allows it to be easily organized, searchable and transferrable.³²

When choosing to transition to ePortfolios, the program must choose an electronic portfolio system to manage the portfolios. Several companies provide ePortfolio systems with various technologies. Helen C. Barrett developed and maintains a website that provides an overview of ePortfolio technologies available based on the level of interactivity and the level of personal expression and creativity for the portfolio developer.³² In 2009, when the UMKC School of Dentistry switched from traditional paper-based to portfolios, they chose Foliotek as their ePortfolio system for multiple reasons, including Foliotek's willingness to customize their system towards the program's individual needs. The system also facilitated interactivity and contained a data management system that allowed for collection of evaluation data for producing reports and quantitative data.¹⁰

HIPAA and FERPA Guidelines

Over time, guidelines associated with the Health Insurance Portability and Accountability Act (HIPAA) have become stricter due to the increased use of electronic health records. On January 17, 2013, the

U.S. Department of Health and Human Services modified the Privacy Rule to strengthen the standards for protecting individuals' health information. This rule modifies HIPAA by including information about electronic health care transactions. It defines and limits the circumstances for which an individual's protected health information may be used or disclosed by health groups and health care providers. Specific changes to the rule are discussed in the document titled, "Modifications to the HIPAA Privacy, Security, Enforcement, and Breach Notification Rules Under the Health Information Technology for Economic and Clinical Health Act and the Genetic Information Nondiscrimination Act; Other Modifications to the HIPAA Rules."³³

Since portfolios highlight the student's clinical experiences, there have been concerns raised related to the opportunity for potential HIPAA violations by including protected health information in case study reports, competency forms, grade sheets, etc. in student portfolios. In response to these concerns and the modifications to the privacy rule, the UMKC School of Dentistry obtained legal advice regarding the impact on portfolio assessment. Recommendations include de-identifying patient data (a requirement since the inception of portfolio assessment at the UMKC School of Dentistry) and establishing criteria for evaluating the students' compliance with HIPAA guidelines and incorporating it into the scoring rubric. The dental hygiene faculty members have since modified the rubric to include a section stating that the portfolio has been evaluated for any HIPAA or privacy concerns. Since some patients may have conditions/situations that are so unique, there is a chance the patient could be identified, even if no protected health information was disclosed. For example, if a patient with a rare genetic condition that affects the oral cavity was treated in the clinic, it is possible that others would be able to identify that patient based on those conditions. Therefore, it was suggested that a panel of reviewers be established to review situations in which the uniqueness of the case in the portfolio is in question.

In addition to the HIPAA regulations, the portfolio reviews must also comply with the Family Educational Rights and Privacy Act (FERPA). The guidelines of FERPA state that schools must have written permission from the parent or eligible student in order to release any information from a student's education record.³⁴ Therefore, if students will have access to each other's portfolios as part of a peer-review process, documented consent must be obtained from the student prior to disclosing that information.

Academic Integrity Violations

Another area of concern is violations of academic integrity. When evaluating a portfolio recently, a dental hygiene faculty member recognized the written self-reflections were similar to a portfolio she had previously evaluated. Upon further review, it was determined that the student had “copied and pasted” from a portfolio that was submitted the previous year. Upon meeting with the faculty, the student was informed she would receive a “0” for the portfolio and would be asked to report to the UMKC School of Dentistry Honors Council. To prevent this issue from occurring again in the future, all reflections that are included in the portfolio will have to be submitted using the Turnitin software, a program designed to ensure original work by checking all submitted documents against other papers, databases and publications.³⁵

Conclusion

In response to the assessment and accountability mandates proposed by CODA and incorporated into recent changes to accreditation standards, institutions will need to utilize assessment instruments designed to demonstrate student self-assessment and show competence in program outcomes on a student-by-student basis. Portfolios can serve as that instrument as they allow faculty members to evaluate a student’s abilities in critical thinking, problem

solving, self-assessment, professionalism and health promotion. Although the challenges associated with portfolio assessment are widely discussed in the existing literature, 15 years of experience in utilizing portfolios at the UMKC School of Dentistry, Division of Dental Hygiene program has provided insight into methods that can be used to combat those issues, while highlighting the benefits that accompany this instrument for assessment. With even more changes in assessment strategies for dental hygiene education programs on the horizon, portfolios are a promising option as a valid and reliable method for measuring student competency.

Cynthia C. Gadbury-Amyot, MSDH, EdD, is an Associate Dean and Professor, Instructional Technology and Faculty Development, University of Missouri-Kansas City School of Dentistry. Kimberly Krust Bray, RDH, MS, is the Director of Dental Hygiene, University of Missouri-Kansas City School of Dentistry. Kylie J. Austin, RDH, MS, ECP-II, is a Consultant, University of Missouri-Kansas City School of Dentistry.

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North Carolina Cardiologists' Knowledge, Opinions and Practice Behaviors Regarding the Relationship between Periodontal Disease and Cardiovascular Disease

Megan Mosley, BSDH, MS; Steven Offenbacher, DDS, MS, PhD; Ceib Phillips, MPH, PhD; Christopher Granger, MD; Rebecca S. Wilder, BSDH, MS

Introduction

Oral systemic health has been a topic that is gaining more attention in the U.S. The Institute of Medicine (IOM) 2011 report on Advancing Oral Health in America concluded that in order to enhance the delivery of oral health care across the U.S., a collaborative effort across multidisciplinary health related fields is necessary.¹

The U.S. Surgeon General's report noted that there is an association between chronic oral infection and diseases such as diabetes, heart disease and pre-term low birth weight babies.² The IOM report along with the report from the U.S. Surgeon General regarding oral health in America discusses the association between oral health and other systemic conditions. The report also states that there is a lack of knowledge or training of non-dental health care providers in the area of oral health care. The IOM committee concluded that non-dental health care providers could have an increased role in oral health care. It also stated that interprofessional, team-based care could provide the best care to patients.¹

Periodontal disease is a common oral disease that affects approximately 47.2% of the adult population in the U.S. In adults aged 65 and older the prevalence increases to 70%.³ Periodontitis is a bacterial induced, chronic inflammatory disease that destroys the supporting tissues surrounding teeth. A general dentist or periodontist clinically diagnoses

Abstract

Purpose: There has been an increase in awareness of the link between oral health and systemic health in recent years. While questions exist about the relationship of oral disease to cardiovascular conditions, no published study to date has addressed cardiologists' knowledge and opinions about this area of science. This study examined North Carolina cardiologists' knowledge, opinions and practice behaviors regarding periodontal disease and cardiovascular disease.

Methods: A survey was developed, revised, pilot tested and mailed to 625 licensed, practicing cardiologists' in North Carolina. A total of 3 mailings were conducted. Data were analyzed using descriptive statistics.

Results: The response rate was 19% (n=119). Respondents were mostly males (86%) and working in private group practice (48%) or academia (32%). Sixty three percent correctly identified the first sign of periodontal disease; however, only 18% choose the correct etiology of periodontal disease. Sixty percent of respondents stated that medical students and dental students should be trained to work collaboratively. Half of cardiologists' surveyed were unsure that treatment of periodontal disease can decrease a patient's risk for cardiovascular disease. The majority were interested in learning more about the relationship between cardiovascular disease and periodontitis.

Conclusion: The majority of cardiologists surveyed were unclear about the etiology of periodontal disease and would like to have more information about the potential oral-systemic link regarding cardiovascular disease. It is important for educators and administrators in higher education to examine the need for interprofessional education and collaboration between medicine and dentistry. This study may provide valuable information about ways to implement more effective interprofessional education and collaboration between dental and dental hygiene professionals and cardiologists to improve oral health.

Keywords: cardiovascular disease, dental education, interdisciplinary education, oral-systemic health, periodontitis

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

periodontal disease using variables such as tooth loss, recession, clinical attachment loss, periodontal pocket probing, tooth mobility and radiographic bone loss.⁴⁻¹⁰ Factors such as smoking, type 1 and 2 diabetes mellitus, cardiovascular disease, and obesity have also been linked to the risk associated with developing periodontal disease.^{6,10-17}

Cardiovascular disease is the leading cause of mortality in the U.S., with approximately 11.5 % of Americans having been diagnosed. High blood pressure, low-density lipoproteins and smoking are all risk factors associated with cardiovascular disease.¹⁸ The Center for Disease Control and Prevention (CDC) estimates that coronary heart disease costs the U.S. \$108.9 billion dollars each year.¹⁹ Several studies have reported that periodontal disease pathogens and inflammatory markers are common between cardiovascular disease and periodontal disease.^{6-9,20,21}

Cardiovascular Disease and Periodontal Disease

Cardiovascular disease and periodontal disease have many of the same contributing risk factors such as smoking, diabetes and age. It has been suggested that periodontal disease is a direct pathway by which the 2 diseases could be associated. Mucci et al hypothesized that inflammatory mediators that react in response to periodontal pathogens could have a possible effect on the systemic inflammatory response to the development of atherosclerotic plaque.¹⁶ Periodontal infections could be a casual pathway to cardiovascular disease through bacteremia or inflammatory mediators provoked in response to the pathogen. Therefore, this systemic inflammatory response may induce the development of atherosclerotic plaque.¹⁶

Blaizot et al conducted a meta-analysis of observational studies using a methodological process of reviewing 215 epidemiological studies.⁵ The meta-analysis examined the association between exposure to periodontitis and cardiovascular disease. Of the 215 studies, 22 case-control and cross sectional studies along with 7 cohort studies were selected to use in the analysis. The results supported an association between persons with periodontal disease and cardiovascular disease. This analysis provided evidence that many of the risk factors associated with cardiovascular disease and periodontal disease are independent of each other. It concluded that further research is needed to examine the pathophysiological process between the two.

Poor oral hygiene is the major cause of periodontal disease. This chronic oral infection is related to

a systemic inflammatory response. Periodontal disease has been reported to cause an increase in the C-reactive protein levels in patients. Systemic inflammation could signify the mechanism that links periodontal disease and cardiovascular disease. de Oliveira et al conducted a survey to measure if self-reported tooth brushing and oral hygiene was associated with an increase in cardiovascular disease.²¹ The results indicated that persons with reported poor oral hygiene had a higher risk of cardiovascular disease and low-grade inflammation but the causal nature was yet to be determined.

Another meta-analysis focused on prospective cohort studies conducted among the general population. The purpose of this meta-analysis was to determine the relationship between periodontal disease and coronary heart disease. This analysis also reported that biological markers such as C-reactive protein serve as an indicator for additional coronary heart disease. It reported that periodontal disease results in approximately a 24 to 35% increased risk for coronary heart disease.⁸

With the potential effect for periodontal disease to increase risk for cardiovascular disease, it is important for the dental and medical professions to work together to help reduce the risk for adverse outcomes for patients. In 2009, a set of clinical recommendations for patients with periodontal disease and/or cardiovascular disease was published.²² These recommendations were established to provide guidance to both cardiologists and periodontists regarding the link between cardiovascular disease and periodontitis and a potential approach to reducing the risk for cardiovascular disease in patients who have periodontitis. The recommendations were important because they represented the first of its kind between cardiologists and periodontists.

In 2012, the American Heart Association (AHA) issued a scientific statement regarding the association between cardiovascular disease and periodontal disease. Health care professionals from dentistry, infectious diseases, cardiology and epidemiology formed a group to assess and measure the scope of evidence for an association or causality between the 2 diseases. A total of 282 peer-reviewed publications were selected for a literature review.²³ The AHA statement suggests that there are significant gaps in the scientific understanding of the interaction of oral health and cardiovascular disease. Therefore, it is stated that while there is an association between cardiovascular disease and periodontal disease, there is not a causal relationship.²³

Health Care Practitioners' Knowledge and Practices Regarding Oral Systemic Diseases

The area of oral systemic health is continuing to grow in the U.S. It is important to assess the current knowledge and practices of health care practitioners' regarding oral systemic diseases. It is also imperative to examine the roles of both medical providers and oral health care providers in assessing the practice behaviors regarding patient care.

Lewis et al assessed pediatricians' knowledge, attitudes and professional experience regarding oral health and to determine pediatricians willingness to incorporate fluoride varnish into their practices.²⁴ They conducted a survey of 1,600 randomly selected pediatricians using the American Medical Association list of pediatricians. The survey assessed the knowledge, current practice and opinions on their role as a pediatrician to promote oral health. The response rate was 62% with 1,386 eligible survey recipients. Two-thirds of respondents observed caries in their school-aged patients. While the majority of respondents referred patients to a dental office or clinic, 55% reported difficulty in achieving referral for uninsured patients, and 90% agreed that they played an important role in promoting and educating patients on the importance of oral health.

Owens et al surveyed 1,000 internists and 115 endocrinologists to determine their knowledge, opinions and practice behaviors regarding periodontitis and diabetes.²⁵ The survey received a 34% response rate. Knowledge about periodontal disease was high and the respondents agreed that physicians should be taught about periodontal disease and be trained to do screenings for periodontal disease. The majority of respondents indicated that there is a link between periodontal disease and diabetes; however, the majority were not familiar with studies regarding the relationship between the 2 diseases.

Wooten et al surveyed 404 nurse practitioners' and certified nurse midwives' to determine their knowledge, opinions and practice behaviors regarding periodontal disease and adverse pregnancy outcomes.²⁶ The results indicated that nurse practitioners and certified nurse midwives had limited knowledge about oral health. Both the Owens and Wooten surveys concluded that collaborative efforts between healthcare providers and oral health care providers would benefit patients in various areas of health care.^{25,26}

Oral Health Care Practitioners' Knowledge and Practices Regarding Oral Systemic Diseases

Collaborative efforts made by the dental team and cardiologists could help to identify and reduce oral/systemic diseases. The dental hygienist is an essential component to the dental team. Dental hygienists receive extensive training on medical histories and systemic diseases, as well as oral diseases such as periodontal disease. The dental hygiene process of care is multifaceted to include assessment, implementation and evaluation of outcomes.²⁷ Bell et al stated that it "is the responsibility of the dental hygienist to make assessments based on patients' systemic health to promote a healthy lifestyle in addition to providing safe and effective dental hygiene care."²⁸ The Bell et al study also reported on practice behaviors of dental hygienists incorporating oral systemic evidence into patient care. In this study, a survey was conducted to assess whether dental hygienists updated medical histories at every appointment, assessed blood pressure and obtained blood sugar readings. During the assessment phase of care, 84% of the respondents reported that it is the dental hygienist who performs a periodontal exam on new patients. The survey also indicated that 64% of the respondents performed periodontal examinations at every visit for periodontal maintenance patients. Sixty-eight percent of respondents reported that medical histories were updated at every visit, and 92.9% discussed medications and medical diagnoses with all patients. However, very few record blood sugar levels. The results from this survey exhibited that respondents are incorporating some aspects of oral systemic evidence into patient care.²⁹

Although there is some evidence that there is an association between periodontal disease and cardiovascular disease, little is known about medical providers' knowledge about the link. The purpose of this study was to examine the knowledge, opinions, and practice behaviors of North Carolina cardiologists' regarding the association between cardiovascular disease and periodontal disease.

Methods and Materials

A cross-sectional survey was designed to assess North Carolina cardiologists' knowledge, opinions and practice behaviors regarding the relationship between cardiovascular disease and periodontal disease. The survey was adapted from a questionnaire developed at the University of North Carolina that focused on a similar topic regarding oral and systemic health. The survey was modified to address the current research questions. Thirty four questions were included

and divided into 6 sections that included the following topics:

1. Practice setting
2. Oral examinations
3. Oral and systemic health
4. Opinions about periodontal disease
5. Education
6. Demographics

A list of cardiologists was obtained from the North Carolina Medical Board. Although the list contained the names of 1,160 registered cardiologists in the state of North Carolina, only 625 were actively practicing cardiology, so surveys were mailed to 625 cardiologists. The selection criteria included cardiologists practicing full time or part time in a public, private or government practice in North Carolina. Retired cardiologists, pediatric cardiologists or cardiologists practicing outside of the state were excluded from the study.

The survey was reviewed and approved by the Institutional Review Board. Following the approval, the survey was pilot tested with 5 practicing cardiologists. After minor changes, the survey was produced using Teleform, a scannable format that simplifies data entry. The survey, along with a cover letter explaining its purpose and business reply envelope was mailed using the Salent and Dillman method.³⁰ There were 2 mailings in the fall of 2012 and a final mailing in January 2013. To maintain confidentiality, there were no identifiers on the surveys and random identification numbers were assigned to each subject. All data was stored in a password-protected database that was only accessible to the research team and statistician. The data were analyzed using SAS version 9.1 (SAS Institute Inc., North Carolina) using descriptive statistics.

Results

A total of 119 surveys were completed as requested and were useable for data analysis, resulting in a 19% response rate. Demographic data is reported in Table I. Seven percent of respondents have been providing patient care for less than 5 years, and 40% reported providing more than 20 years of care to patients with cardiovascular disease. Eighty-six percent were male and 78% were 60 years old or younger. Eighty-five percent reported receiving dental care within the last year, and 90% reported their oral health as "good" or "excellent." Eighteen percent had been told that they have periodontal disease. (Table II)

Table I: Demographics of North Carolina Cardiologists (Respondents)

	n	Percent of respondents
Age (in years)		
30 to 40	18	16
41 to 50	40	35
51 to 60	32	28
61 to 70	18	16
>70	6	5
Gender		
Female	15	13
Male	97	87
Practice setting		
Private group practice	54	48
Solo practice	10	9
Academia	36	31
Other	13	12
Years providing care to patients with cardiovascular disease		
<5 years	8	7
5 to 10 years	22	19
11 to 15 years	13	11
16 to 20 years	28	23
>20 years	45	40
Hours per week providing patient care		
<10 hours	7	6
11 to 20 hours	10	9
21 to 39 hours	7	6
>40 hours	84	79

Practice Behaviors and Oral Examinations

Forty-one percent of cardiologists refer patients to a dental facility when they express concerns about their mouth, and 31% refer if they see something that should be further examined. However, 22% never refer patients to a dental clinic or facility. In the past year, 46% of respondents reported referring between 1 to 5 patients to a dental facility due to periodontal disease, and 13% referred more than 6 patients within the last year. Respondents' answers were similar for referring a patient for tooth decay, with 43% referring between 1 and 5 patients to a dental facility for tooth decay, whereas 12% referred 6 or more patients (Table III).

Physicians were asked how often they perform oral examinations on their patients, and 18% responded that they perform an oral exam at the initial visit, while 21% never perform oral examinations on their patients (Figure 1). When asked the reasons for not doing so, 46% responded that

Table II: North Carolina Cardiologists' Oral Health Status

	n	Percent of respondents
Last time received dental care		
<1 year	97	85
1 to 2 years	13	11
>2 years	4	4
Never	0	0
Last time received a periodontal examination		
<1 year	94	83
1 to 2 years	15	13
>2 years	4	4
Never	0	0
How would you rate your oral health		
Excellent	44	39
Good	59	51
Fair	11	10
Poor	0	0
Very Poor	0	0
Ever been told you have periodontal disease		
No	92	82
Yes	20	18
Maybe	0	0

it is the responsibility of the dental professional and 45% were not sure what type of exam to perform (Figure 2)

Knowledge and Opinions about Periodontal Disease and Systemic Health

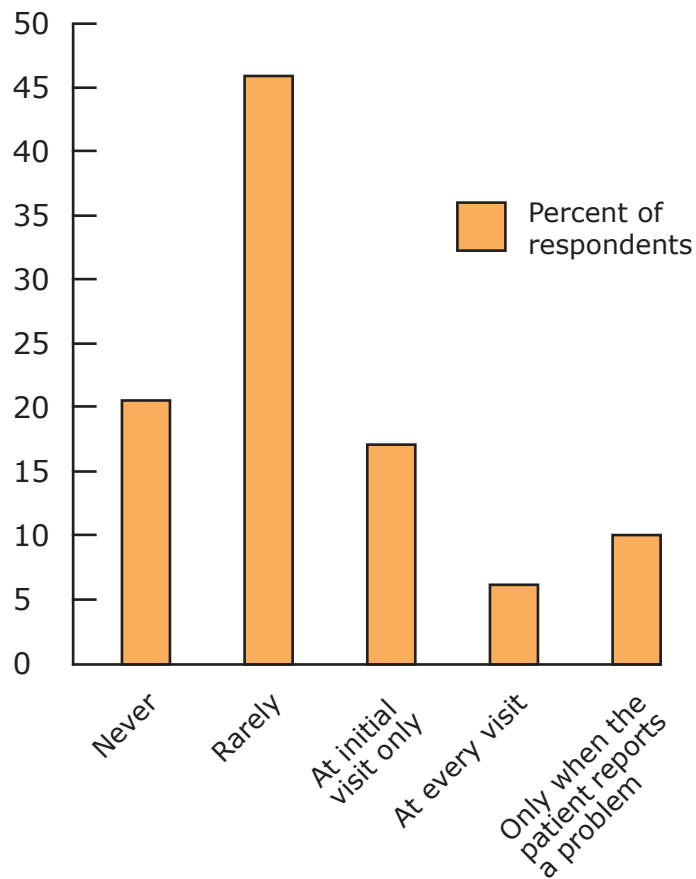
Cardiologists' knowledge about periodontal disease was moderate, with 70% reporting that bone loss describes periodontal disease. Sixty-three percent of respondents answered correctly about the first sign of periodontal disease as being bleeding gums, and 50% were aware that periodontal disease is an infection in the gums. Conversely, 18% described tooth decay as a sign of periodontitis, and 31% recognized reversible redness/inflammation as a clinical indication of periodontitis.

The majority (92%) of cardiologists agreed or strongly agree that inflammation is a key component between periodontal disease and cardiovascular disease, and 66% agree that controlling infection and inflammation is important for managing cardiovascular disease. When asked about their knowledge about the studies regarding an association between cardiovascular disease and periodontal disease, 50% agreed and 50% were unsure or disagreed. When asked if patients with periodontal disease were more likely to have increased atherosclerosis and risk for myocardial in-

Table III: Survey Respondents' Patients with Cardiovascular Disease Referred to Dental Facility within the Past Year

	n	Percent of respondents'
Patients referred with periodontal disease		
0	46	41
≤5	53	46
≥6	15	13
Patients referred for tooth decay		
0	49	45
≤5	47	43
≥6	14	12
Patients referred to you from a dentist/dental facility		
0	67	60
≤5	21	19
≥6	24	21

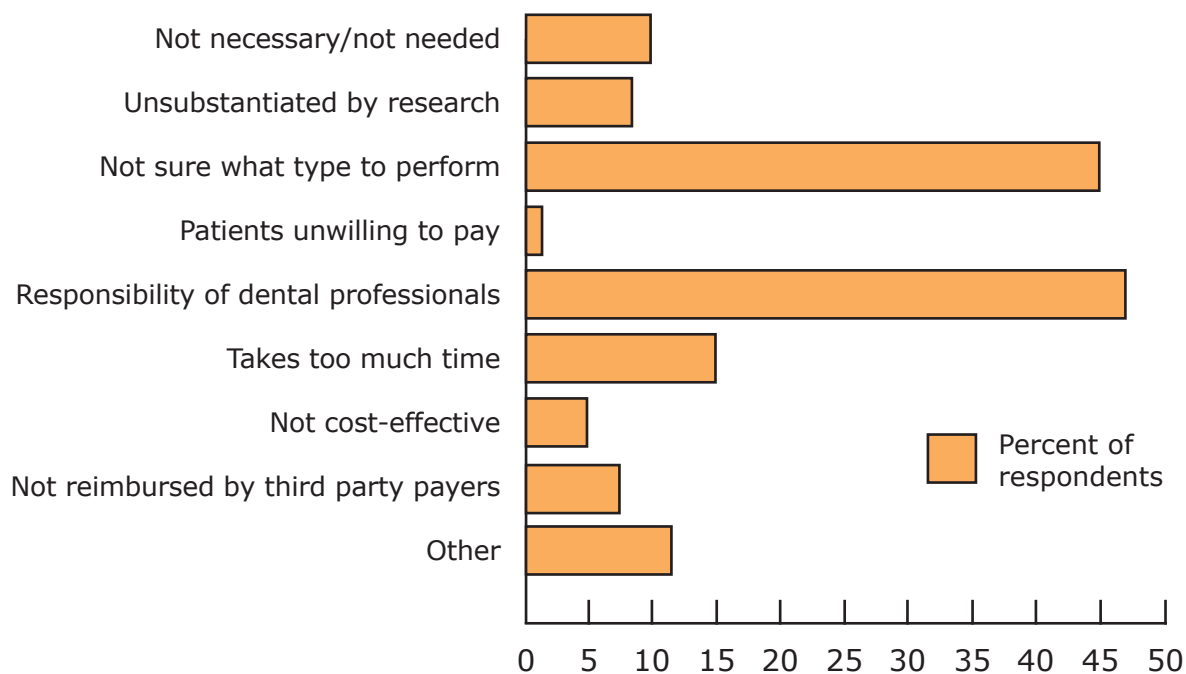
Figure 1: Frequency Survey Respondents Perform Oral Health Exams on Patients with Cardiovascular Disease



farction and stroke, 72% agreed (Table IV).

Only 39% agreed that treatment of periodontal disease could decrease a patient's risk for cardiovascular disease. However, 72% were interested

Figure 2: Survey Respondents' Reasons for Not Performing Oral Exams



in learning more about the relationship between cardiovascular disease and periodontal disease. The majority of physicians (71%) agreed it is important for cardiologists' and periodontists to work together to educate their patients about oral systemic disease risks (Table IV).

Cardiologists were asked if they were familiar with the 2009 clinical recommendations regarding the relationship between cardiovascular disease and periodontal disease.¹⁷ Sixteen percent were slightly familiar while 78% were not familiar. When asked if these recommendations changed the way they treat their patients, 76% indicated they had not changed procedures. Twenty-two percent of respondents were familiar with the recent 2012 statement from the AHA and 86% said that the statement has not changed their opinion about the importance of oral health to overall health.²³

Physicians' Education

Physicians reported that 20% of their professional education included oral health content. However, 80% reported not receiving any education on oral health care. For the majority of physicians who did receive oral health education, 90% received less than 3 hours. Twelve percent reported having clinical requirements regarding assessments of the teeth or gums, while only 5% reported observing a dentist or dental hygienist. When asked to rate the quality of their oral health education, 69% reported it as poor. Sixty percent of cardiologists believe that medical and dental students should be trained to work collaboratively,

and 39% responded that "maybe" they should be trained to do so (Table V).

Discussion

This study was the first of its kind to question cardiologists about their knowledge and behaviors regarding periodontal disease and the potential association with cardiovascular diseases. While studies have been conducted with other health care providers, cardiologists have not been investigated.^{25,26,31,32} It has been determined that individuals who have cardiovascular disease and periodontal disease share many of the same risk factors such, as smoking, diabetes, obesity and age.^{6,10-17} But how this evidence is translated into the clinical practice of cardiologists has not been studied until this investigation.

There is evidence that periodontal bacteria and the byproducts of the bacteria have a detrimental effect on distant sites.^{21,22} Although the specific mechanism has yet to be confirmed, scientists agree that there is an association between periodontitis and cardiovascular diseases.²³ When other health care providers have been questioned about their knowledge regarding the etiology of periodontal disease, most have some knowledge of the bacteria and their detrimental effects. For example, a recent study of internists and endocrinologists found physicians knew that bacteria was related to the etiology of periodontal disease (86%) and bone loss around teeth is a description of periodontal disease (77%).²⁵ Sixty-six percent knew that bleeding gums were a first sign of periodontitis. But the physicians also

Table IV: Opinions About Periodontal Disease and Systemic Health

	Strongly Agree	Agree	Unsure/ Don't Know	Disagree	Strongly Disagree
	Percent (n)	Percent (n)	Percent (n)	Percent (n)	Percent (n)
Inflammation is a key component between periodontal disease and cardiovascular disease.	28 (31)	64 (71)	5 (6)	3 (3)	0 (0)
Good oral health is important to the rest of the body.	36 (39)	58 (63)	5 (5)	1 (1)	0 (0)
I am knowledgeable regarding the studies linking periodontal disease and cardiovascular disease.	7 (7)	44 (49)	21 (23)	23 (26)	5 (6)
Patients with periodontal disease are more likely to have increased atherosclerosis and risk for myocardial infarction and stroke, even after adjusting for traditional cardiovascular disease risk factors.	14 (15)	58 (64)	20 (22)	7 (8)	1 (1)
Controlling infection and inflammation is important for managing cardiovascular disease.	17 (19)	49 (54)	30 (33)	4 (5)	0 (0)
Patients diagnosed with cardiovascular disease are more likely to have periodontal disease.	6 (7)	40 (44)	49 (54)	5 (6)	0 (0)
Treatment of periodontal disease can decrease a patient's risk for cardiovascular disease.	7 (8)	32 (36)	46 (51)	13 (14)	2 (2)
I am interested in learning more about the relationship about cardiovascular disease and periodontal disease.	15 (17)	58 (65)	22 (24)	5 (5)	0 (0)
It is important for cardiologists and periodontists to work together to educate their patients on these diseases.	17 (19)	54 (60)	24 (27)	4 (4)	1 (1)

thought that tooth decay was a sign of gum disease (30%). The current study found similar results, with 63% of cardiologists reporting bleeding gums as a first sign of disease, and 70% knowing that bone loss is congruent with periodontal disease. Sixty-six percent reported the first sign of periodontitis as bleeding gums, and 18% also thought that tooth decay was a sign of periodontitis. While their knowledge is high in some areas, they are confused in other oral health topics. Most studies of other health care providers have reported that they view their oral health education in professional school as being poor and they are interested in learning more about oral disease.^{25,26,32}

The research team for this study anticipated that more than 16% would be familiar with the guidelines. The most recent statement from the AHA regarding the association of periodontal disease to atherosclerotic vascular disease has gained much atten-

tion since it was published in May, 2012; however, the cardiologists in this study did not seem aware of the statement and indicated it had not changed the way they view the importance of oral health. While a cause and effect has not been established between periodontal disease and cardiovascular disease, the statement does support an association between the 2 conditions.²³ Clearly more work needs to be done to educate cardiologists about periodontal disease and the potential detrimental effects to systemic health.

The relationship between oral health care providers and medical providers is an area that needs improvement. Wooten et al reported that 62% of nurse practitioners and certified nurse midwives conduct an oral exam as part of routine care at initial visits.²⁶ The current study concluded that only 18% of North Carolina cardiologists' conduct an oral exam at the initial visit. Practitioners stated that it is the respon-

sibility of the dentist to perform the exam. Another reason for not doing an exam is that they simply do not know what it entails. This is an area that could be incorporated into medical school education through interprofessional education.

With an increase in oral systemic disease, it is important to examine the need for interprofessional education. Wilder et al recommended that faculty development, curricular changes and interprofessional education initiatives be incorporated into dental education. Dental schools should seek relationships with local clinics and private practice dentists and other health professionals.³³ The paper reinforces the Commission on Dental Accreditation recommendation that states students should be encouraged and participate in service learning (Haden, personal communication, December 2007). Lopes et al reported that only 21% of diabetes educators received formal education on oral health.³¹ The current study reported similar findings and concluded that while the majority of respondents did not receive oral health education, they believe it is an important area for students to work collaboratively. An interprofessional education curriculum would provide the atmosphere for collaboration to occur.

Interprofessional practice can be improved by providing options for continuing education in the area of oral systemic health. Higher education administrators and leaders should begin examining these areas and incorporating them into health professions curricula. In 1989, Rutgers School of Biomedical and Health Sciences began implementing oral health modules into the second, third and fourth years of medical school. Modules in head/neck examination and oral cancer screenings were incorporated into the curriculum along with rotations throughout the dental school to learn more about oral conditions.³⁴ This study, along with other studies, concluded that oral health is an important part of overall health.^{25,26,31-34} To provide the best care and practices for patients, multidisciplinary fields need to collaborate.

Limitations of this survey include a low response rate. Cartwright investigated response rates of physicians from 19 professional groups. The response rate varied from 56 to 99%.³⁵ Factors affecting response rates included length of questionnaire and the available time to complete it. While the method used for the conduct of the survey was a recommended procedure for survey research,³⁰ it is also recognized that busy physicians may not take the time to complete a longer questionnaire or the physicians may not actually see the survey if they do not review the mail. In addition, this sample of North Carolina cardiologists may not be representative of all cardiologists, thus limiting the external validity.

Table V: Physicians' Education Regarding Oral Health

	n	Percent of Respondents'
Did your professional education include oral health content in the curriculum?		
Yes	23	21
No	88	79
How many hours of content regarding oral health/periodontal health were covered in the curriculum?		
<1 hour	12	40
1 to 3 hours	15	50
>10 hours	3	10
Did you have any clinical requirements regarding assessments of the gums or teeth?		
Yes	11	13
No	77	87
Did you receive any clinical experiences with dentists or dental hygienists?		
Yes	4	5
No	83	95
Regarding your medical training, rate the quality of oral health education you received		
Very good	3	3
Good	3	3
Fair	21	24
Poor	40	46
Very Poor	20	24
Do you believe that medical and dental students should be trained to work collaboratively?		
Yes	54	60
No	1	1
Maybe	35	39

However, the study does provide a view of how oral health is incorporated (or not incorporated) into the clinical practices of cardiologists.

Future studies should investigate how oral health content can be incorporated into the curricula of medical providers. Other studies might evaluate scenarios where oral health care (dentists and dental hygienists) and medical providers work collaboratively in providing patient care.

Conclusion

This study found that North Carolina cardiologists' have some knowledge about periodontal disease but are unclear in other areas. Half of cardiologists' surveyed were unsure that treatment of periodontal disease can decrease a patient's risk for cardiovascular disease. Approximately half of respondents referred 1 to 5 patients to a dental facility for either tooth

decay or periodontal disease. Further education in oral diseases will help physicians refer patients to the appropriate oral health care provider. Though North Carolina cardiologists' were not implementing the published clinical recommendations into practice, the majority were interested in learning more about the association between the 2 diseases. Respondents agreed that it is important for health care providers to work together to educate patients on systemic diseases.

Megan Mosley, BSDH, MS, graduated in 2013 from the University of North Carolina at Chapel Hill with a Masters in Dental Hygiene Education, and currently works in private practice in Raleigh, NC. Steven Offenbacher, DDS, MS, PhD, is a member of the department of periodontology at UNC School of Dentistry,

and is the director of the Center for Oral and Systemic Diseases. Ceib Phillips, MPH, PhD, is a Professor in the Department of Orthodontics at the University Of North Carolina School Of Dentistry. Christopher Granger, MD, is a cardiologist at Duke University. Rebecca Wilder, BSDH, MS, is a Professor and Director of Faculty Development for the University of North Carolina at Chapel Hill School of Dentistry, and also serves as Director of the Master of Science Degree Program in Dental Hygiene Education.

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Tooth Loss and Stroke: Results from the Behavioral Risk Factor Surveillance System, 2010

R. Constance Wiener, MA, DMD, PhD

Introduction

Strokes (cerebral vascular accidents, cerebral infarctions, cerebrovascular ischemia) were among the 5 leading causes of death in the U.S. in 2010.¹ Of the 1,796,620 deaths of older (>65 years) Americans in 2010, 6% were attributed to stroke.¹ There are more than 795,000 strokes each year with 610,000 occurring as first-time strokes.²

Poor outcomes are often associated with stroke – 15% of people having a stroke die, and stroke is the leading cause of adult disability.³ Disabilities may include paralysis, cognitive impairment, repeated strokes, seizures, falls, pain, depression, confusion, and difficulty or inability to speak.⁴ In addition to the physical burden, the financial burden has been estimated at \$54 billion per year.⁵

Delayed care, symptom denial, or lack of knowledge of symptoms have resulted in poor patient outcomes.⁶ The 5 sudden warning signs are:⁷⁻⁹

1. Confusion/speech problems
2. Headache
3. Dizziness
4. Blurry vision
5. Numbness/weakness

Risk factors for stroke are a history of high blood pressure, hyperlipidemia, smoking, diabetes, atrial fibrillation, heavy alcohol use, heart disease, previous stroke or transient ischemic attacks.⁶

Oral health and periodontal disease in particular has been studied as a risk factor for atherosclerotic cerebrocardiovascular diseases, including stroke. A positive association has been reported by some authors,¹⁰⁻¹³ while no association/non-significant association has been reported by others.^{14,15} Additionally, positive, though not necessarily strong, asso-

Abstract

Purpose: Strokes are common events of significant morbidity and mortality. Poor oral conditions may share or exacerbate pathways that lead to stroke.

Methods: This study was a cross-sectional study of 410,939 participants from the 2010 Behavioral Risk Factor Surveillance System. Stroke was defined as the participant's response (yes/no) to the survey's question, "Has a doctor, nurse or other health professional ever told you that you had a stroke?" The definition for tooth loss was based upon participant's response to the survey's question, "How many of your permanent teeth have been removed because of tooth decay or gum disease?" Descriptive, Chi Square and logistic regression analyses were conducted. Other variables that are known etiologic factors were also included in the analysis.

Results: The participants with increasing numbers of teeth lost had increasing adjusted odds ratios for stroke independent of the other factors. In adjusted logistic regression analysis, the participants who had 1 to 5 missing teeth had an adjusted odds ratio (AOR) of 1.29 (95% Confidence Interval (CI): 1.17, 1.42), participants who had 6 or more, but not all missing teeth had an AOR of 1.68 (95% CI: 1.50, 1.88), and participants who were edentulous had an AOR of 1.86 (95% CI: 1.63, 2.11).

Conclusion: Evidence from this cross-sectional study indicates that tooth loss had a potential, although weak positive association as an independent factor in multivariable analysis with stroke.

Keywords: stroke, cerebrovascular accident, cerebral vascular accidents, edentulous, tooth loss, missing teeth

This study supports the NDHRA priority area, **Clinical Dental Hygiene Care:** Investigate the links between oral and systemic health.

ciation was determined in 2 systematic reviews,^{16,17} a review of literature¹⁸ and 2 consensus reports/scientific statements (with no current evidence of causation, or that periodontal intervention will prevent atherosclerotic vascular disease).^{19,20}

Similarly, poor oral health, in terms of fewer teeth, has also been associated with atherosclerotic cerebrovascular diseases, including ischemic stroke.^{13,21-23} In a prospective study of 41,380 older male professionals with no cardiovascular disease at baseline, after 12 years, the men who had fewer

than 25 teeth at baseline had a hazard ratio of 1.57 as compared with men who had 25 or more teeth at baseline.²¹ In a cross-sectional study of 4 U.S. communities with 1,491 edentulous adults and 6,436 dentate adults, stroke/transient ischemic attack was prevalent in 22.5% of the edentulous adults and they had an odds ratio of 1.4 as compared with the quartile of dentate participants with the least extent of attachment loss.²² Similarly, a study of 358 patients (those having had a stroke - n=181, those discharged after other medical conditions - n=177) showed an association of tooth loss and early occurrence of stroke.²³ However, a prospective study of 7,674 adults ages 20 to 89 years, followed for 12 years, indicated that participants who had fewer than 10 teeth, as compared with participants who had greater than 25 teeth, had a 7-fold increase of coronary heart disease, but there was no dose relationship with stroke.¹⁰ And a study of 392 community dwelling older adults in Finland indicated people with a large number of teeth had a slight, non-significant increase in the likelihood of ischemic stroke as compared with the people who had fewer teeth.²⁴

Dental diseases may be categorized as lifestyle-related diseases.²³ As such, people at risk of stroke may have poorer oral health than people at lower risk of stroke. It has not been fully established that there is a relationship between tooth loss and stroke. If such an association exists, it may be a simple way of identifying otherwise healthy individuals with increased risk of stroke and may be useful in stroke prevention.¹³ The purpose of this study is to determine whether an association between increasing tooth loss and non-fatal stroke exists.

Methods and Materials

The data for this study were obtained from the publically available results of the 2010 Behavioral Risk Factor Surveillance System (BRFSS). Starting in 1984, the BRFSS is a yearly survey providing health related data through a cross-sectional telephone survey.²⁵ The BRFSS is state-based with assistance from the Centers for Disease Control and Prevention (CDC). Each month, the states' researchers contact non-institutionalized adults, ≥18 years, to ask about health risk, injuries, prevention and access to health care.²⁵ The interviewers use a standardized questionnaire and computer-assisted telephone interviewing computer files.²⁶ An interview with at least age, race and sex is considered complete.²⁶ A second contact is made for individuals who initially refuse to respond to the survey, unless the person is verbally abusive.²⁶ The Behavioral Surveillance Branch of the CDC created a complex survey design to adequately represent race/ethnicity. The

survey is de-identified and is available to the public. Each year, there are more than 350,000 adults who respond to the survey.²⁶ For 2010, the BRFSS data set had 451,075 records.²⁷

The dependent variable/outcome of interest was the participant's response to the question, "Has a doctor, nurse, or other health professional ever told you that you had a stroke?"²⁸ The possible responses were yes, no and don't know/not sure. The main independent variable/exposure was the participant's response to the question, "How many of your permanent teeth have been removed because of tooth decay or gum disease?"²⁸ The participants were asked to, "Include teeth lost to infection, but do not include teeth lost for other reasons, such as injury or orthodontics." The potential responses were none, 1 to 5, ≥6 but not all, all and don't know/not sure.

Other variables of interest relevant in studying stroke were sex (male v. female), race/ethnicity (Hispanic, non-Hispanic Black, non-Hispanic other v. non-Hispanic White), age in years (30 to 44, 50 to 59, 60 to 69, ≥70 v. 18 to 29), education (less than high school, high school completion, some college or technical school v. college or technical school completion), health insurance (not insured v. insured), smoking status (current, occasional, former v. never smokers), physical activity (no v. yes), dental visits within the previous year (no v. yes), heavy drinking (for men more than 2 drinks per day, for women more than 1 drink per day) (yes v. no), diabetes (yes v. no), and body mass index (BMI) (25 to <30, ≥30 v. less than 25).⁶

Data were analyzed using SAS 9.3 (Cary, NC). Bivariate association between stroke and variables of interest were tested using the Chi-Square test. Model development used multivariable logistic analysis, specifically using Proc Surveylogit in SAS 9.3, and weighting to accommodate the complex multilevel sampling design using the variables: STSTR (stratum), PSU (primary sampling unit) and FINALWT (weight). Participants were excluded if there were missing, refused or did not know responses to the variables of interest (missing teeth and stroke). The final sample size was 410,139. A priori statistical significance was defined as $p < 0.05$.

Results

Table I includes the descriptive characteristics of the study population in addition to the Chi Square analyses. There were 51.6% women, 69.4% non-Hispanic whites, 9.6% non-Hispanic blacks and 14% were Hispanic. A total of 17.1% of respon-

Table I: Chi Square Analysis for Stroke and Variables of Interest - Behavioral Risk Factor Surveillance System, 2010 (n=410,139)

	Stroke Column		No Stroke Column		Total	Weighted Percentages*
	n	Weighted Percentages*	n	Weighted Percentages*		
Number of missing teeth (Significance<0.0001)**						
No missing teeth	3,557	23.9	176,294	55.6	179,851	54.8
1 to 5 missing teeth	5,184	31.2	129,008	30.3	134,192	30.3
6 or more/not all	4,748	25.8	56,253	9.7	61,001	10.1
All teeth are missing	4,058	19.2	31,837	4.4	35,895	4.8
Sex (Sig=0.0014)**						
Women	10,947	53.9	245,766	51.5	256,713	51.6
Men	6,600	46.1	147,626	48.5	154,226	48.4
Race/Ethnicity (Significance<0.0001)**						
Non-Hispanic White	13,645	70.4	313,725	69.4	327,370	69.4
Non-Hispanic Black	1,889	13.0	30,502	9.5	32,391	9.6
Hispanic	904	9.8	27,974	14.2	28,878	14.0
Non-Hispanic Other	1,109	6.7	21,191	7.0	22,300	7.0
Age (in years) (Significance<0.0001)**						
18 to 29	106	2.5	23,978	17.6	24,084	17.1
30 to 49	1,403	16.0	108,520	40.9	109,923	40.2
50 to 59	2,771	19.3	87,620	18.2	90,391	18.3
60 to 69	4,629	22.5	84,853	12.3	89,482	12.6
70 and above	8,535	39.7	85,778	11.1	94,313	11.8
Education (Significance<0.0001)**						
Less than High School	2,995	17.8	34,360	9.6	37,355	9.8
High School	6,210	34.1	114,480	27.1	120,690	27.3
Some college, tech	4,639	26.3	105,196	26.4	109,835	26.4
Degree or above	3,661	21.8	138,543	36.9	142,204	36.5
Income level (Significance<0.0001)**						
<\$15,000	3,791	223.0	38,326	10.2	42,117	10.5
\$15,000 to <\$25,000	4,399	27.7	59,020	15.1	63,419	15.5
\$25,000 to <\$35,000	1,979	12.2	41,081	10.3	43,060	10.4
\$35,000 to <\$50,000	1,883	13.8	52,650	13.7	54,533	13.7
\$50,000 and above	2,686	23.4	151,767	50.7	154,453	49.9

*Weighted percentages were obtained to control for complex sample design, therefore division of individual cell sizes by the total sample will not reflect weighted percentages. Significant group differences were tested by Chi Square statistics.

**Rao-Scott Chi-Square p-values

dents were 18 to 29 years of age, 40.2% were 30 to 49, and 11.8% were ≥70 years. The education level of respondents was 62.9% who had some college (technical school or more), 26% had incomes <\$25,000 and 14.8% were not insured. There were 83.1% reporting being a former or never smoker, and 35.8% had a BMI <25, 36.2% had a BMI of 25 to <30 at 36.2%, and 28% had a BMI of ≥30. The majority of participants were physically active outside of work (76%), had dental visits within the previous year (70%), were not heavy drinkers (95.1%) and did not have diabetes (88.7%).

Table I also provides the Chi Square analyses

of the variables of interest versus the report of a history of stroke. Statistically significant differences in relation to stroke history existed among the number of missing teeth, sex, race/ethnicity, age, education, income, health insurance, smoking status, BMI, physical activity level, dental visits within the previous year, heavy drinking and diabetes.

The results of the logistic regression analyses are presented in Table II. The unadjusted odds ratios in support of an association between missing teeth and stroke were 2.40 (95% Confidence Interval (CI) 2.21, 2.60, p<0.0001) for 1 to 5 missing teeth, 6.22 (95% CI: 5.72, 6.77, p<0.0001)

Table I: Chi Square Analysis for Stroke and Variables of Interest - Behavioral Risk Factor Surveillance System, 2010 (n=410,139) (continued)

	Stroke Column		No Stroke Column		Total	Weighted Percentages*
	n	Weighted Percentages*	n	Weighted Percentages*		
Health Insurance						
Insured	16,324	89.9	351,011	85.0	367,335	85.2
Not insured	1,180	10.1	41,512	15.0	42,692	14.8
Smoking (Significance<0.0001)**						
Current	3,376	21.7	60,730	16.8	64,106	16.9
Former	6,764	37.6	117,792	24.5	124,556	24.9
Never	7,294	40.7	212,521	58.7	219,815	58.2
BMI (Significance<0.0001)**						
<25	5,343	30.3	132,054	36.0	137,397	35.8
25 to 30	6,067	36.4	138,255	36.2	144,322	36.2
>30	5,576	33.3	106,965	27.8	112,541	28.0
Physical Activity (Significance<0.0001)**						
Yes	9,874	57.8	290,152	76.5	300,026	76.0
No	7,639	42.2	102,811	23.5	110,450	24.0
Dental Visits (Significance<0.0001)**						
Dental visits within year	9,644	55.8	276,966	70.5	286,610	70.0
No visits within year	7,771	44.2	225,056	29.5	122,827	30.0
Heavy Drinking (Significance<0.0001)**						
Yes	523	3.3	18,223	5.0	187,46	4.9
No	16,754	96.7	367,832	95.0	384,586	95.1
Diabetes (Significance<0.0001)**						
Yes	5,698	32.4	55,799	10.7	61,497	11.3
No	11,821	67.6	33,7300	89.3	349,121	88.7

* Weighted percentages were obtained to control for complex sample design, therefore division of individual cell sizes by the total sample will not reflect weighted percentages. Significant group differences were tested by Chi-square statistics.

**Rao-Scott Chi-Square p-values

for ≥6 missing teeth but not all missing teeth, and 10.20 (95% CI: 9.27, 11.01, p<0.0001) for edentulism compared with the referent group of no missing teeth as the referent.

Results of the multivariable logistic regression are also in Table II. The model was controlled for sex, race/ethnicity (Hispanics, non-Hispanic blacks, non-Hispanic others v. non-Hispanic whites), age (30 to 44, 50 to 59, 60 to 69, ≥70 v. 18 to 29), education (less than high school, high school, some college or technical school v. graduate of college or technical school or above), income level (<\$15,000, \$15,000 to <\$25,000, \$25,000 to <\$35,000, \$35,000 to <\$50,000 v. \$50,000 and above), health insurance (not insured v. insured), smoking status (current, occasional, former v. never), dental visits within the previous year (no v. yes), physical activity (no v. yes), heavy drinking (for men more than 2 drinks per day, for women more than 1 drink per day) (yes v. no), diabetes

(yes v. no), and BMI (25 to <30, >30 v. <25). The adjusted odds ratios were 1.29 (95% CI: 1.17, 1.42; p<0.0001) for 1 to 5 missing teeth, 1.68 (95% CI: 1.50, 1.88, p<0.0001) for 6 or more but not all missing teeth, and 1.86 (95% CI: 1.63, 2.11, p<0.0001) for edentulism compared with the referent group of no missing teeth.

Discussion

This study indicated that, in an adjusted logistic regression analysis, there remains a significant independent relationship of missing teeth and stroke. Participants who had 1 to 5 missing teeth had an adjusted odds ratio of 1.29, participants with ≥6 missing teeth but not all missing teeth had an adjusted odds ratio of 1.68, and participants who were edentulous had an adjusted odds ratio of 1.86 as compared with participants who did not have any missing teeth. These results support findings of other studies that increasing tooth loss is associ-

Table II: Odds Ratios and Adjusted Odds Ratios for Stroke from Logistic Regression on Number of Missing Teeth - Behavioral Risk Factor Surveillance System, 2010

Unadjusted	Odds Ratio	95% Confidence Interval	Significance
Number of teeth removed			
None	1.00	-	<0.0001
1 to 5	2.40	[2.21, 2.60]	
6 or more; not all	6.22	[5.72, 6.77]	
All	10.10	[9.27, 11.01]	
Adjusted	Adjusted Odds Ratio	95% Confidence Interval	Significance
Number of teeth removed			
None (Reference Group)	1	-	<0.0001
1 to 5	1.29	[1.17, 1.42]	
6 or more; not all	1.68	[1.50, 1.88]	
All	1.86	[1.63, 2.11]	

The adjusted model is controlled for: sex (male v. female), race/ethnicity (Hispanic, Non-Hispanic Black, Non-Hispanic Other v. Non-Hispanic White), age (30 to 44, 50 to 59, 60 to 69, 70 and above v. 18 to 29), education (less than high school, high school, some college or technical school v. degree or above), income level (less than \$15,000, \$15,000 to less than \$25,000, \$25,000 to less than \$35,000, \$35,000 to less than \$50,000 v. \$50,000 and above) health insurance (not insured v. insured), smoking status (current user, occasional user, former user v. never user), physical activity outside of work (no v. yes), dental visits within the previous year (no v. yes), heavy drinking - men more than 2 drinks per day and women more than 1 drink per day (yes v. no), diabetes (yes v. no), and BMI (25 to less than 30, and over 30 v. less than 25).

ated with stroke independent the established risk factors of gender, age, education, smoking status and body mass index.^{13,21-23,29,30} Common risk factors (sex, race/ethnicity, age, education, income, health insurance, smoking status, physical activity, heavy drinking, diabetes and BMI) were included in the multivariable logistic regression analysis as stroke shares etiological factors with periodontal disease and progressive tooth loss.²¹ Heitman and Gambourg, in a prospective observational study of 2,932 adult Danes, indicated a hazard ratio of 3.25 for the edentulous participants as compared with participants who had most teeth (highest quintile).²⁹ With data from the National Health and Nutrition Examination Survey, Wu et al indicated a lower hazard ratio of 1.37 for stroke in people with periodontitis and 11 or more missing teeth compared with people with no periodontal disease, gingivitis or tooth loss.¹³ A similar hazard ratio was determined by Choe et al in a prospective study of 867,256 Korean men and women.³⁰ For men with ≥ 7 missing teeth, the hazard ratio for stroke was 1.3, and for women the hazard ratio was 1.2.³⁰

The proposed mechanisms, by which such an association is biologically plausible, involve direct bacterial challenge (chronic infection), atherogenic bacterial endotoxins and proinflammatory cytokines (which are factors in thromboembolic events).^{13,30,31} Tooth loss may suggest a constitutional predisposition to increased inflammatory response after prolonged exposure to inflammatory stressors.³² There is also a potential altered nutritional status associated with total tooth loss in

which citrus fruits (Vitamin C) are often reduced, leading to a proinflammatory state.³² Another mechanism may be the development of a proinflammatory state in edentulous individuals from chronic *Candida albicans* infection. More research involving longitudinal surveillance is needed to disentangle the potential mechanisms. Such research will require a standardized definition of periodontal disease, and evidence of tooth loss specific to periodontal disease. Biomarkers for bacterial load would enhance the results.

Some limitations need to be considered with this study. The study participants self-reported number of teeth and misclassification may have occurred, however, the discrepancies would have been random and would have biased estimates to the null. The study participants were not queried about the relative prevalence of superficial caries (not considered to have a role in systemic disease) and periodontal disease.³³ Results of this study should be interpreted with caution. Although results were statistically significant, all 3 adjusted odds ratios for tooth loss were below the standard 2.0 considered epidemiologically to be relevant associations. Additionally, this study was cross-sectional, precluding the use of the more powerful measurement of association, the risk ratio. Of importance, however, is that the odds ratios did increase with additional tooth loss. Therefore, additional studies, such as cohort and interventional trials, should be conducted to further explore these results.

Study strengths include the large, national sam-

ple size with rigorous criteria, validation and reliability in the BRFSS 2010. Additionally, the sample is recent and reflects current population conditions.

Conclusion

Evidence from this cross-sectional study indicates a potential, although weak association that the participants with fewer teeth had increasing adjusted odds ratios for stroke. This study adds to the literature additional support for the association of tooth loss and stroke.

The role of dental hygienists in helping people maintain their teeth is critical. This study indicates the association of having maintained one's teeth and the lowered odds of stroke. Further study is

needed to determine if periodontal interventions will decrease the risk of stroke.

R. Constance Wiener, MA, DMD, PhD, is assistant professor, Department of Dental Practice and Rural Health, School of Dentistry; and Department of Epidemiology, School of Public Health at West Virginia University.

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The Origins of Minnesota's Mid-Level Dental Practitioner: Alignment of Problem, Political and Policy Streams

Anne E. Gwozdek, RDH, BA, MA; Renee Tetrick, MSW, MPP; H. Luke Shaefer, PhD

Introduction

The 2000 Surgeon General's report Oral Health in America states, "Oral health is an integral part of overall health."¹ Yet, due to geographic inaccessibility and high costs of care, nearly one-third of individuals in the U.S. lack access to basic preventive and primary dental care.² In addition, the Surgeon General identified that the decline of the dentist-to-population ratio, causing concern about the oral health demands of society being met by the current workforce.¹ In 2003, the National Call to Action to Promote Oral Health identified the need for an expanded oral health workforce.³

One proposal to increase access through expanding the workforce in the U.S. was the introduction of a mid-level dental practitioner within the dental profession. Conceptually similar to nurse practitioners and physicians assistants in the broader health care field, mid-level dental practitioners provide basic preventive and restorative care in more than 50 countries around the world. Yet mid-level dental practitioners have been the subject of significant opposition by organized dentistry for decades in the U.S. Currently, only 2 states, Alaska and Minnesota, allow a mid-level dental practitioner to practice with somewhat different scopes of practice (Table I).⁴ In Alaska, the mid-level dental practitioner is educated and trained through a federal program and can only practice on federal (tribal) lands.⁵ Minnesota is the first state where the mid-level dental practitioner structure was established by legislation. So why was the mid-level dental practitioner model adopted by law in Minnesota? What makes this case unique?

Abstract

Purpose: Using John Kingdon's agenda-setting model, this paper explores how Minnesota came to legislate a mid-level dental practitioner to its oral health workforce. Using a pluralist framework embracing the existence of various interests and convictions, this analysis highlights the roles of issue formation, agenda setting and politics in policymaking.

Methods: Using Kingdon's agenda-setting model as a theoretical lens, and applying case study methodology, this paper analyzes how Minnesota came to legislate a mid-level dental practitioner to its oral health workforce. Data have come from scholarly research, governmental and foundation agency reports, interviews with leaders involved in the mid-level dental practitioner initiative, news articles, and Minnesota statute.

Results: After 2 years of contentious and challenging legislative initiatives, the problem, policy and political streams converged and aligned with the compromise passage of a bill legalizing mid-level dental practitioner practice. The Minnesota Dental Therapist Law was the first-in-the-nation licensing law to develop a new dental professional workforce model to address access to oral health care.

Conclusion: The Minnesota mid-level dental practitioner initiative demonstrates the important convergence and alignment of the access to oral health care problem and the subsequent collaboration between political interest groups and policymakers. Through partnerships and pluralist compromise, mid-level dental practitioner champions were able to open the policy window to move this legislation to law, enhancing the oral health workforce in Minnesota.

Keywords: Kingdon's agenda-setting model, mid-level dental practitioner, access to care, policy, dental therapist, advanced dental therapist, dental health aide therapist

This study supports the NDHRA priority area, **Health Services Research:** Evaluate strategies dental hygienists use to effectively influence decision-makers involved in health care legislation (e.g., to provide direct access to dental hygiene care, autonomy and self-regulation of dental hygienists).

Using John Kingdon's agenda-setting model, this paper explores how Minnesota came to be the first U.S. state to legislate a mid-level dental practitioner to its oral health workforce.⁶ Using a pluralist framework acknowledging the existence of multiple interests and convictions, this analysis highlights the roles of issue formation, agenda setting and politics in policymaking.⁶ The following questions will be explored:

Table I: Overview of U.S. Mid-Level Dental Practitioners Education, Licensure and Scope

	Alaskan Dental Health Aide Therapist (DHAT)	Minnesota Dental Therapist/ Advanced Dental Therapist (DT/ADT)	Advanced Dental Hygiene Practitioner (ADHA)
Education	Alaska Native Tribal Health Consortium-Community Health Aide Program <ul style="list-style-type: none"> Program through University of Washington DENTEX 	Metropolitan State University and University of Minnesota School of Dentistry <ul style="list-style-type: none"> DT minimum Bachelor's-level degree ADT-Master's-level degree <ul style="list-style-type: none"> Metropolitan State University ADT Program requires applicants to be licensed RDH with bachelor's degree 	Developed by the American Dental Hygienists' Association based on Master's level education at accredited institutions; open to currently licensed dental hygienists who have a Bachelor's degree
Licensure	Certified and regulated by Indian Health Service's Community Health Aide Program	State licensed providers	Providers are envisioned to be state licensed
Supervision	Remote/general supervision of a dentist; presence of dentist not required	<ul style="list-style-type: none"> DT: On-site or general supervision depending on the service; collaborative management agreement with dentist ADT: Collaborative management agreement with dentist, presence of a dentist not required for most services 	Collaborative arrangement envisioned with referral network; presence of dentist not required
Preventive Scope	<ul style="list-style-type: none"> Oral health and nutrition education Sealant placement Fluoride application Supragingival scaling Coronal polishing 	<ul style="list-style-type: none"> Oral health and nutrition education Sealant placement Fluoride application Oral cancer screenings Caries risk assessment Coronal polishing 	<ul style="list-style-type: none"> Oral health and nutrition education Full range of dental hygiene preventive services
Restorative Scope	<ul style="list-style-type: none"> Restorations of primary and permanent teeth Uncomplicated extractions 	<ul style="list-style-type: none"> Restorations of primary and permanent teeth Extractions of primary teeth Nonsurgical extractions of permanent teeth (ADT only) Pulpotomies Stainless steel crowns Atraumatic restorative therapy 	<ul style="list-style-type: none"> Restorations of primary and permanent teeth Palliative temporization Uncomplicated extractions of primary and permanent teeth
Additional Scope	<ul style="list-style-type: none"> Local anesthesia and nitrous oxide 	<ul style="list-style-type: none"> Local anesthesia and nitrous oxide Dispense analgesics, anti-inflammatories, and antibiotics (DT) Provide, dispense, administer analgesics, anti-inflammatories, and antibiotics (ADT only) Assessment and treatment planning as authorized by collaborating dentist (ADT only) 	<ul style="list-style-type: none"> Local anesthesia and nitrous oxide Diagnosis within scope of practice Limited prescriptive authority Triage and case coordination Public health programming and advocacy

Adapted from American Dental Hygienists' Association Oral Health Care Workforce-Current and Proposed Providers

- How did dental access and the mid-level dental practitioner model become a part of the political agenda?
- What interest groups were important in determining the issue's fate?
- What factors led to the successful passage of mid-level dental practitioner legislation in Minnesota?

Background

Over one-third of American households report neglecting dental care or dental examinations because of lack of access to care and cost.¹ In 2000, Oral Health in America, Report of the Surgeon General reported on "profound and consequential" oral health disparities, particularly affecting racial and ethnic minority groups, people in rural areas, immigrants, individuals experiencing homelessness, children, the elderly, and people with developmental disabilities and chronic diseases.¹ Furthermore, tooth decay is the most prevalent chronic disease faced by children, and children in poverty are twice as likely to suffer from dental caries.¹ Tooth pain is a primary reason that children miss school and adults miss work.¹

Oral health is integral to overall health. Research suggests an association between periodontal disease and diabetes, cardiovascular disease, respiratory disease, as well as pre-term and low birthweight.^{7,8} The 2003 National Call to Action to Promote Oral Health invited professional organizations and those concerned about the health of Americans to expand oral health promotion and disease prevention plans for vulnerable populations.³ Included in this report was a call to increase oral health workforce diversity, capacity and flexibility with a focus on health professional shortage areas.³

Driving the movement to improve access to oral health care were the deaths of 2 children who died from infections from abscessed teeth in 2007. Twelve year old Deamonte Driver of Maryland died after bacteria from an untreated abscessed tooth spread to his brain.⁹ On Medicaid, Deamonte's mother struggled unsuccessfully for months to find a dentist who would see her children and accept the insurance's low reimbursement rates. This became even more complicated as prior to Deamonte's death the family's Medicaid insurance had lapsed during a period of homelessness. In addition, Alexander Callendar, a 6 year old from Mississippi died as a result of infection from recently extracted abscessed teeth.⁹

As this national discussion ensued, oral health professionals as well as associations and advocates

representing vulnerable populations weighed in on the debate. Data emerged identifying the maldistribution of the dental workforce, reduction in the number of dentists due to pending retirements and the lack of a representative workforce that mirrors the population in the U.S.³ The need for a more flexible, efficient workforce pointed to a need for legislative changes to allow for alternative models of delivery. The mid-level dental practitioner became a part of this conversation.

Although the mid-level dental practitioner scope of practice internationally has variations, most often their education and training focuses on oral assessment and basic restorative services, including tooth preparation.¹⁰ The scope of practice may include placement of stainless steel crowns and pulpotomies on primary teeth, and surgical services may include uncomplicated extractions of primary and permanent teeth.¹⁰ Preventive services may include fluoride application and sealant placement in addition to oral health education and care coordination.¹⁰ In the past, restorative and surgical procedures have been within the purview of the dentist. However, Edelstein identifies that between a quarter and a third of services provided by dentists could be delegated to a mid-level dental practitioner.¹⁰ If the mid-level dental practitioner also holds an active dental hygiene license, the number of treatment needs the mid-level dental practitioner can address increases significantly. This expands the preventive scope of care and adds periodontal procedures allowed by the dental hygiene license.

Socially disadvantaged populations suffer disproportionately from untreated dental disease. For these vulnerable populations, mid-level dental practitioners serve to expand the availability of basic restorative services.¹⁰ mid-level dental practitioner's education and training focuses on the provision of a limited range of services. Thus, a mid-level dental practitioner can command a lower salary than a dentist, resulting in cost savings.¹⁰ Recruiting dentists to practice in rural and urban federally funded health centers (safety net clinics) has been a significant challenge.¹⁰ Placement of mid-level dental practitioners in such centers serves to address this need.

Evidence shows the mid-level dental practitioner provides safe and competent care to patients. In a review of all existing studies that evaluate the clinical competency of mid-level dental practitioners, Phillips and Shaefer conclude, "Rarely in the scientific literature, in fact, do we find such an overwhelming consensus based on empirical research."¹¹ They conclude, "Rather than representing a different standard of care, dental therapists simply rep-

resent a different provider.”¹¹ Despite this evidence, the American Dental Association (ADA) and most state dental associations’ oppose this workforce model, most often citing concerns for patient safety and viability in the U.S. market.¹²

One example of this opposition was associated with the creation of the dental health aide therapist (DHAT) program in Alaska. In 2003, the Alaskan Native Tribal Health Consortium began an initiative to train this new practitioner to provide oral health care for Alaska’s native population, many of which live in remote areas of the state, under the auspices of the federal Community Health Aide Program. The Community Health Aide Program, an Alaska Native Tribal Health Consortium initiative, worked to create and implement the DHAT program to provide basic restorative and preventive care.^{10,13} In 2006, the ADA and the Alaskan Dental Society filed a lawsuit in the state Superior Court in Anchorage, Alaska in an attempt to stop the DHAT program.¹⁴ ADA claimed that the services performed by DHATs were usually done by licensed dentists and that not having the extensive education and training required by dentists put the public at risk.¹⁴ The court confirmed that DHAT practice was legal under federal law and this ruling was also sanctioned by the Alaska Attorney General. The lawsuit eventually ended in a settlement with ADA contributing \$537,500 to the Alaska Native Tribe Consortium Foundation and \$75,000 to the state of Alaska to cover the legal expenses incurred from the lawsuit.¹⁵

Despite wide utilization of mid-level dental practitioners around the world, and despite empirical evidence supporting their adoption, no U.S. state had passed legislation adopting and authorizing mid-level dental practitioners until Minnesota in 2009. What happened in Minnesota that made this a reality? In an effort to understand this, John Kingdon’s famous agenda-setting model was used to analyze the Minnesota case through problem, political and policy streams.

Methods and Materials

In essence, Kingdon asks a single question, “How does an idea’s time come?”⁶ To answer this question, Kingdon theorizes that 3 separate but somewhat related streams impact the public agenda, including the problem, political and policy streams.⁶ The problem stream addresses how problems arise, who defines them, and how policy decision makers are persuaded to prioritize one problem over others.⁶ The political stream focuses on how changes in the political environment, advocacy or voices of opposition can influence the public agenda.⁶ Finally, the policy stream deals with how policy propos-

als are developed, debated, revised and adopted.⁶ When these 3 streams converge they can often determine the agendas of formal governmental decision-making bodies.⁶ When they align at a critical time, windows may open for policy changes.⁶

Kingdon’s model was used as a theoretical lens to analyze the case of mid-level dental practitioner adoption in Minnesota. Kingdon’s model is contextualized within the broader theoretical framework of pluralism, which argues that public policy is controlled by groups outside of government who exert influence over those responsible for decisions.⁶ Data related to this case came from scholarly research, governmental and foundation agency reports, interviews with leaders involved in the mid-level dental practitioner initiative, news articles, and Minnesota statute. Whenever possible, a variety of sources were utilized to fully understand and confirm the development of the mid-level dental practitioner, relying on government-provided data whenever possible while also cross checking information against a wide range of sources with different potential sources of bias, such as media accounts and interviews and written accounts provided by key stakeholders. This analysis showed that problems were pressing down on the oral health care system, there was a shift in interested parties and a changing political environment. It created the kind of moment that Kingdon talked about, inspiring “an idea whose time has come.”⁶ The end result was the introduction and passage of mid-level dental practitioner legislation in Minnesota.

Results

Problem Stream

The access to care “problem stream” rose to attention in Minnesota, as well as on a national level, around the time of the landmark Surgeon General’s 2000 report, *Oral Health in America*. Minnesota had documented thousands of people, especially vulnerable populations such as children, underrepresented people of color, elderly, low-income and special needs populations, who could not access dental care.^{16,17} Dental care was out of reach for approximately 350,000 low-income Minnesotans, with 80% of tooth decay found in 25% of children, most of them low-income.^{16,17} In one year (July 2004 to June 2005) in the Minneapolis-St. Paul area alone, more than 10,000 emergency room visits were for toothaches, abscesses and other dental problems.¹⁸ It was identified that this problem would escalate over the next 15 to 20 years by which time 60% of practicing dentists in Minnesota were projected to retire.¹⁹

Access issues in Minnesota were prevalent within

rural communities, nursing and group homes, community clinics and health centers, Head Start programs, hospital emergency rooms, and Indian reservations.²⁰ Past steps to improve access included dental coverage through state programs and higher payment rate for dental providers working in geographically remote (critical access) health care facilities and/or those facilities that serve a significantly disproportionate number of low-income patients.²⁰ Other initiatives included student loan forgiveness program for dental graduates, grants to safety net providers and utilization of community health workers.²⁰

Concurrently, dental hygiene collaborative practice became a law in Minnesota in 2001, allowing registered dental hygienists to provide preventive services to underserved populations without supervision if the dental hygienist was practicing according to a collaborative management agreement entered into with a dentist.²¹ Another section of this law allowed dental hygienists and dental assistants who completed additional education to pack and carve restorations and place stainless steel crowns if a dentist was present.²¹ In 2003, the law in Minnesota was enhanced by allowing dental hygienists to place sealants in alternative settings without an initial examination by a dentist. In 2005, delivery of local anesthesia and nitrous oxide analgesia by the dental hygienist was added to the scope of collaborative dental hygienists.²¹ However, all of these initiatives were still not enough to stem the tide of rising access-to-care problems. Vulnerable populations were not getting care they needed, and the dental workforce was not able to meet those needs.

Policy Stream and its Entrepreneurs

Policy entrepreneurs, as titled by Kingdon, come up with ideas to solve a problem.⁶ By 2004, with the DHAT initiative in its infancy, the American Dental Hygienists' Association (ADHA) had developed core competencies for an advanced dental hygiene practitioner (ADHP) (Table I).^{4,22} The goal of this practitioner was to provide diagnostic, preventive, restorative and therapeutic services directly to the public.^{22,23} Competencies developed would support a standardized curriculum for such a practitioner. A draft version of the competencies was distributed to communities of interest nation-wide. The Minnesota dental hygiene educational community looked at this document with interest. Colleen Brickle, Dean of Health Sciences at Normandale Community College (NCC), began to take steps to propose such a program in Minnesota (Brickle, personal communication, 2013 February 10). A first hurdle was that the ADHP competency framework led to a master's degree, which meant NCC, a community college, would need to partner with Metropolitan State University (MSU), a 4-year institution, to develop an

ADHP program (Brickle, personal communication, 2013 February 10). Both NCC and MSU are part of the Minnesota State Colleges and University system (MnSCU), which made such a partnership a realistic possibility. Another hurdle that had to be overcome was the required legislation that would allow this mid-level dental practitioner to practice in Minnesota. This spurred the political stream to take action.

Political Stream

Changes began to occur in the political environment and the public agenda. Kingdon's model works within a pluralist frame assuming all interest groups have tools available to affect governmental decisions regarding issues that affect them.⁶ Three organizations were instrumental in embracing the concept of an ADHP as a viable means of addressing access to oral health care and initiating discussions about mid-level dental practitioner legislation: the Minnesota Safety Net Coalition (MN SNC), the MnSCU, and the Minnesota Dental Hygienists' Association (MnDHA) (Brickle, personal communication, 2013 February 10). The MN SNC advocates for policies that make health care more accessible to underserved populations.²⁴ Michael Scandrett, Staff Director of the MN SNC through LPaC Alliance, a division of Hallelund Habicht Consulting, LLC, was a principal leader in the development of and lobbying for the successful passage of the dental therapist law.²³ He organized the 3 major groups who assisted in identifying over 50 health care providers, hospitals and related organizations to support the legislation.²⁰ In 2007, when access to care and health care reform conversations were happening in multiple venues, the MN SNC made oral health a top priority as members recognized the oral health issues affecting the citizens of Minnesota were alarming.²⁴ Through financial assistance by the Greater Twin Cities United Way, the MN SNC created an oral health committee to focus on improving oral health access.²⁰ After studying the issues and discussing it with dentists, dental hygienists, researchers, health care professionals, consumer groups and educational institutions, the Coalition's members developed a set of legislative proposals to improve dental access. This included a proposal to establish a mid-level dental practitioner who could offer treatment where dentists were not available and also reduce the cost of treatment for low-income and uninsured patients (Brickle, personal communication, 2013 February 10). To assist with raising awareness about this issue, MN SNC contracted lobbyist Linda Sandvig, who began her career working for the Minnesota Nurses association 35 years prior during the development of the nurse practitioner.²⁴

Another political stream that was critical in the development of a mid-level dental practitioner licensure in Minnesota was a key legislator, Senator Ann Lynch.

In 2007, Lynch began her first and only term as Minnesota State Senator. During 2007 to 2010, the majority of the Minnesota House and Senate were democrats. Lynch was appointed Vice Chair of the Health Finance Division (Lynch, personal communication, 2013 February 26). Lynch had no background in health care service delivery; however, the Mayo Clinic resided in her district so health care in general was very important to her constituents. Early in her tenure, she attended a National Academy for State Health Policy conference in Colorado where oral health and workforce models were discussed. At this time, there were a number of legislative health-related initiatives introduced in Minnesota, but Lynch recognized that little attention was given to oral health. She had obtained information about the Alaska DHAT program and, considering the tribal lands prevalent in northern Minnesota, felt that this type of provider had promise. More importantly, she recognized that the access to oral health crisis in Minnesota went far beyond the Native American Indian population. Lynch also had preliminary discussions about this issue with members of the MN SNC Oral Health Committee. In 2008, Lynch introduced a bill (SF 2895) in the State Senate and Representative Cy Thao did the same in the State House of Representatives (HF 3247), proposing the creation of a licensed mid-level dental practitioner.⁹

Opposed to the legislation were the ADA, the Minnesota Dental Association (MDA) and the University of Minnesota School of Dentistry.^{20,25,26} The process was challenging and contentious. The first bill of this type to create a new type of dental provider in Minnesota called for mid-level dental practitioners to perform dental procedures without on-site supervision of a dentist. The MDA enlisted support from the ADA in opposition to this.⁹ Their efforts included communicating opposition to their association members and the public via MDA newsletters, town hall meetings and public media campaigns (television, radio, newspaper and telemarketing automated-calls) with increased momentum prior to major legislative hearings. The MDA messages focused on promoting only trained dentists performing surgery without indicating that dental therapists would also receive education and training within a more limited restorative scope.^{9,25}

At the same time, members of the MN SNC, the MnDHA grassroots members and MnSCU continued to partner with Lynch and Thao to deliver a consistent message regarding their position on a mid-level dental practitioner, and more broadly the importance of access to oral health care for all citizens of Minnesota to the members of the legislators and their constituents.²⁷ Scandrett also played an important role in negotiating about this issue, especially with the MDA. In addition, he garnered critical support among a broad spectrum of MN SNC members to include

hospitals and their respective emergency departments, who were keenly aware of the dental access issue (Brickle, personal communication, 2013 February 10). MnDHA grassroots supporters of the legislation continued to communicate their support through information sheets (Myths vs. Facts), interviews with several newspapers and numerous visits to legislators in 2008 and 2009 (Lynch, personal communication, 2013 February 26). Administrators, staff and faculty members from both MnSCU campuses, as well as individuals from the System Office, were dedicated to this legislation. They assisted in organizing meetings with groups who became part of the coalition, lobbying throughout the legislative process and testifying as needed. The forging of important relationships in the Senate and House and the commitment to access to care by Lynch and key individuals representing MN SNC, MnDHA and MnSCU came at a critical time.

Returning to the Policy Stream

The problem stream served to demonstrate oral health care need, while the political stream shifted accountability and public opinion, which led to the policy stream and policy changes. This legislation was rolled into the Higher Education Omnibus bill (SF 2942) In a pluralist compromise agreement by the Minnesota Legislature, SF 2942 passed in the Senate with 64 yeas and 0 nays.²⁸ It also passed in the House of Representatives with 132 yeas and 0 nays.²⁹ This bill was signed into law by Governor Tim Pawlenty, however, only the mid-level dental practitioner (at that time given the title of "Oral Health Practitioner") scope of practice framework was included.²⁷ The education and scope of practice parameters of a mid-level dental practitioner was not defined in this bill.²⁷ To address this, the 2008 legislation created a workgroup to develop recommendations on these to the 2009 Legislature.²⁷ This oral health practitioner Workgroup consisted of 13 members appointed by 9 organizations (Table II).

To develop the mid-level dental practitioner parameters, between August and December of 2008, the workgroup met regularly in addition to some members visiting dental therapist programs in Canada, New Zealand and the United Kingdom. The members of the workgroup represented both proponents and those opposed to this new law, making completion of its task that much more challenging. The key areas of concern consistently revisited at all the workgroup meetings included: level of dentist supervision required, scope of practice and where the education and training would occur (Brickle, personal communication, 2013 April 29).

In January of 2009, the Minnesota Department of Health and the Board of Dentistry presented the

workgroup's recommendations to the Minnesota Legislature.³⁰ The 118 page report included an executive summary and recommendations, requirements to practice primarily in underserved areas, educational program requirement, scope of practice and level of supervision, need for assessment of economic impact and quality of care of this practitioner, plus licensure and regulatory requirements.⁹ Legislation based on the workgroup's recommendations was introduced in both the House (HF 1226) and Senate (SF 1106) in February 2009.³¹

Returning to the Political Stream

Returning to the political stream, concurrently with the development and release of the oral health practitioner workgroup report, the MDA developed legislation (SF 641) establishing a dental therapist.²⁷ By early 2009, the House and Senate had 2 pieces of legislation to consider, one bill further defining the oral health practitioner (from the Oral Health Workgroup Report) and a new bill establishing the dental therapist.²⁷ The oral health practitioner legislation called for an already licensed dental hygienist whose scope would be expanded to deliver basic restorative services and extractions without on-site dentist supervision.²⁷ The dental therapist bill offered the delivery of a more limited set of services without the need for a dental hygiene license.²⁷ Also included in this bill was the need for indirect supervision of the dental therapist, requiring the dentist to be on-site. Both bills included provisions for care provided in practice settings focusing on underserved populations and both required collaborative management agreements with supervising dentists.²⁷

With the introduction of this new bill, the contention further escalated, and 2 new, prominent interest groups were brought into the mix: the University of Minnesota School of Dentistry and the MnSCU (Lynch, personal communication, 2013 February 26). Lynch, also a member of the Senate's Higher Education and Workforce Development Committee, determined that supporting one bill over the other could be problematic as the University of Minnesota School of Dentistry supported the MDA's legislation (SF 641) and MnSCU supported the original bill (SF 2895-2008), as well as the report from the Oral Health Workgroup. This had the potential to pit legislators against one or the other of the 2 largest public higher education institutions in the state. The reinstated oral health practitioner bill and the dental therapy bill were both scheduled for a hearing with the Senate's Health and Human Services Budget Committee on the same day. Testimony related to the oral health practitioner bill was heard first. Lynch testified, focusing her message on access to oral health care for all. In an unpredicted move, Lynch ultimately proposed an amendment

Table II: Oral Health Practitioner Workgroup

Role	Affiliation
Dentist: Patrick Lloyd, DDS, MS	University of Minnesota School of Dentistry
Dental Hygienist: Christine Blue, RDH, MS	University of Minnesota School of Dentistry
Representative: Marilyn Loen, PhD	Minnesota State Colleges and Universities
Dentist: Craig Amundson, DDS	Minnesota State Colleges and Universities
Dentist: Joan Shepard, DDS	Appointed by Board of Dentistry
Dentist: Mike Perpich, DDS	Minnesota Dental Association
Dentist: Mike Flynn, DDS	Minnesota Dental Association
Dental Hygienist: Colleen Brickle, RDH, RF, EdD	Minnesota Dental Hygienists' Association
Representative: Michael Scandrett	Safety Net Dental Providers
Pediatric Dentist: Pat Tarren, DDS, MS	Safety Net Dental Providers
Pediatric Dentist: Chris Carroll, DMD	Minnesota Academy of Pediatric Dentists
Representative: Karen Rau	Minnesota Department of Health
Representative: Christine Reisdorf	Minnesota Department of Human Services
The following individuals were also involved in the workgroup:	
<ul style="list-style-type: none"> • Marshall Shragg – Executive Director of the Minnesota Board of Dentistry • Mark Schoenbaum – Minnesota Department of Health, Office of Rural and Primary Care • Ellen Benavides – hired group facilitator • Kris Gjerde-project support staff from the Minnesota Department of Health, Office of Rural and Primary Care 	

that added language from the dental therapy bill to the oral health practitioner legislation amalgamating both bills, indicating that there was enough need out there for both mid-level dental practitioner models to serve.

The combined oral health practitioner/dental therapy legislation was again rolled into the Higher Education Omnibus bill (SF 2083) sponsored by Senator Sandra Pappas (Lynch, personal communication, 2013 February 26). As this bill was brought to the Senate floor for a vote, there was an amendment of-

ferred to eliminate the oral health practitioner. This amendment failed by 1 vote.³² The Minnesota legislature chose to take a pluralist compromise approach to this situation, taking aspects from both the oral health practitioner and dental therapy bills to create a dental therapist and an advanced dental therapist.²⁷

Alignment of Problem, Political and Policy Streams

The problem, political and policy streams finally converged and aligned. The Higher Education Omnibus bill, which included the compromise dental therapy legislation, passed in the Senate with 54 yeas (29 Democrats and 15 Republicans) and 12 nays (9 Democrats and 3 Republicans).³³ This bill was presented to the House; it passed with 103 yeas (88 Democrats and 15 Republicans) and 31 nays (1 Democrat and 30 Republicans).³⁴ It was signed by Pawlenty on May 16, 2009.³⁵ The Minnesota Dental Therapist Law was the first-in-the-nation licensing law that developed a new workforce model to address access to oral health care. This was made possible by problems pressing down on the oral health care system, creating both a shift in supporters and a need for policy changes.

Discussion

Leading Minnesota mid-level dental practitioner advocates acknowledged important lessons for those in other states working to increase dental access by creating a new type of dental provider.^{9,24} These lessons learned include:

- Clear purpose: State practice act changes were required for the development of a licensed mid-level dental practitioner. The Minnesota legislation was written with a distinct goal of improving oral health care access for all residents of the state.
- Focus on the data: The foundation of the mid-level dental practitioner initiative in Minnesota stemmed from the alarming oral health disparities data. The proponents' message on improving access to legislators, the public, and the media was grounded in data.
- Build a broad coalition: The mid-level dental practitioner legislation was successful because it was supported by a large coalition that included interest groups from both outside and inside of oral health who exerted influence over those responsible for decisions (pluralism).
- Identify unlikely allies: Organized dentistry was the strongest opposition of this legislation. However, there were a significant number of dentists who were supportive of a mid-level dental practitioner and were willing to testify about their quality and safety. The advocates for this legislation

actively sought out such dentists.

- Utilize historical successes: The state of Alaska and over 50 countries had mid-level dental practitioners providing care. Utilizing their outcomes data and understanding their education and licensing requirements served as evidence-based support for the Minnesota legislation.
- Work with legislators: Those in position to pass laws are important stakeholders in the process. They understand rules, process, strategy, and the political landscape. However, they have many special interest groups looking for their support. Advocates must commit to fully educating legislators on issues and listen to them in return. Although this takes time and tremendous human resources, the personal contact and willingness to ensure full understanding of the issue was paramount in the successful passage of mid-level dental practitioner legislation. Lynch remained a mid-level dental practitioner champion throughout the legislative process, during the implementation phase and beyond. She was not re-elected in 2010. However, she now works with the ADHA as their Director of Governmental Affairs.
- Create comprehensive legislation: The Minnesota mid-level dental practitioner legislation was very complex yet comprehensive. The advocates were also very attentive to areas of contention and worked towards pluralist compromise.
- Beyond the signing of the bill: Passing the mid-level dental practitioner legislation was monumental. However, the implementation phase has been equally challenging. Advocates must remain steadfast for the "long haul" to see this through all phases and continue vigilance in monitoring regulation and reimbursement policies. Additionally, an evaluation plan should be implemented to gather data on the outcome of this new workforce model.^{9,24}

Conclusion

The Minnesota mid-level dental practitioner initiative demonstrates the important convergence and alignment of the access to oral health care problem and the subsequent collaboration between political interest groups and the policymakers. Kingdon identifies the advantages of those in the political advocacy community who can generate an evidence-based message that promotes community consensus on policy proposals. It was through such partnerships and pluralist compromise that mid-level dental practitioner champions were able to open the policy window to move this legislation to law, enhancing the oral health workforce in Minnesota.

Those advocating for mid-level dental practitioner legislation would be well served to consider Kingdon's

model in issue prioritization, agenda setting, and politics in policy development. Dedicated effort given by a coalition of advocates is needed to successfully address problem, policy, and political streams. The lessons learned can also aid states in aligning these streams and moving mid-level dental practitioner licensure forward. Additional research is needed to evaluate strategies used to effectively influence decision makers involved in health care legislation.

Anne E. Gwozdek, RDH, BA, MA, is a Clinical Assistant Professor & Director of Dental Hygiene Graduate and Degree Completion Programs in the Department of Periodontics and Oral Medicine, University of Michigan School of Dentistry. Renee Tetrick, MSW,

MPP, is a 2013 graduate of the University of Michigan School of Social Work and the Ford School of Public Policy. H. Luke Shaefer, PhD, is an Associate Professor, University of Michigan School of Social Work.

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Executive Directors' Perceptions of Oral Health Care of Aging Adults in Long-Term Care Settings

Patricia M. Wintch, RDH, BSDH, MSDH; Tara Johnson, RDH, PhD; JoAnn Gurenlian, RDH, PhD; Karen Neil, PhD, RN, SANE-A

Introduction

By the year 2040, approximately 25% of the U.S. population will be over age 65.¹ People are living longer and retaining more of their natural dentition. Retention of the natural dentition predisposes older adults to dental caries and periodontal disease. Untreated dental and periodontal diseases may intensify health problems in an already medically complex population. Oral health has been identified as a key factor in general health and systemic disease in long-term care populations.²⁻⁵ Oral infection contributes to poor outcomes in persons with metabolic, cardiac, cerebrovascular and pulmonary disorders, and all are more prevalent conditions in older adults.²⁻⁵

The dental and oral health care needs of aging adults residing in long-term care facilities are not being adequately met due to several key factors:¹⁻⁶

1. Lack of knowledge of the importance of oral health care on the part of residents, their families, and the staff
2. Difficulties faced by residents in performing self-care due to physical limitations
3. Dementia and/or behavioral problems, making it difficult for patients and staff to perform needed care
4. Ageism prejudices evident among staff and families
5. Severely limited reimbursement for professional dental services as well as inadequate financial standing among residents
6. Poor oral health in elderly adults upon admission to a facility

Abstract

Purpose: The objective of this study was to investigate knowledge and perceptions of executive directors of long-term care facilities in a large western state regarding oral health of residents, barriers to the provision of optimal oral health care and the collaborative practice role for dental hygienists.

Methods: A descriptive, exploratory online survey research design was utilized. A purposive sample of executive directors of long-term care facilities in a large western state certified for Medicare/Medicaid reimbursement was used. An online survey was developed to investigate perceptions and knowledge regarding oral health of long-term care residents, protocol for provision of, and barriers to optimal oral health care, and support for employment of dental hygienists in long-term care facilities. Statistics used for data analysis included frequency distributions, Spearman's rho correlation coefficient and the Mann-Whitney test.

Results: Executive directors in long-term care facilities included in the study perceived oral health as an important aspect of general health; however, a knowledge deficit was identified related to oral disease as an exacerbating factor to systemic disease. Financial concerns and low interest among residents/families were identified as major barriers to accessing care. Executive directors supported interprofessional practice of nurses working with dental hygienists to optimize oral health care of residents. No significant associations were found between demographics and facility characteristics.

Conclusion: Awareness of the knowledge and perceptions of executive directors providing leadership in these facilities can provide avenues to creating needed change, which can foster improvement in the oral and overall health status of long-term care residents. Support for interprofessional work of nurses and dental hygienists can open a door for innovative practice that optimizes oral health care of long-term care facility residents through the application of shared expertise.

Keywords: long-term care, oral health, oral hygiene, executive directors, aging, barriers, geriatric dentistry

This study supports the NDHRA priority area, **Health Services Research:** Identify how public policies impact the delivery, utilization, and access to oral health care services.

Aging long-term care residents are more susceptible to clinically significant oral health problems including fungal, viral and bacterial infections, severe dry mouth (and other drug side effects), and/or loss of function from missing/diseased teeth and ill-fitting

oral appliances. Oral infections may lead to more severe systemic and life-threatening infections such as pneumonia, cerebral abscess, bacterial endocarditis, osteomyelitis and septicemia.^{4,5} Abundant evidence exists denoting poor oral health of long-term care residents and barriers to provision of oral care, yet there is no consensus as how best to address these problems within or outside the dental profession.⁶⁻⁹

Legislation has been introduced in Utah to create a strategy which would allow dental hygienists to better address the oral health needs of underserved populations, including long-term care residents. During the 2012 general session of the Utah State Legislature, the state in which this study was completed, H.B. 125: Access to Dental Health Care, was passed. This legislation established a plan to pilot dental health care payment and delivery reform models and to evaluate cost. The program extends Medicaid coverage to provide dental care for some adults with limited access to dentistry, and residents of long-term care facilities comprised a major section of the study sample. Lines 62 to 64 of the bill state, "The pilot program shall establish compensation models for dentists and dental hygienists that: increase access to quality, cost effective dental care..."¹⁰ While hiring a dental hygienist may require legislative changes, depending on the state, having a dental hygienist on the team can contribute to an improved level of care or provide oversight to nursing assistants in developing oral care plans tailored for each resident.¹¹⁻¹³

Knowledge and perceptions of executive directors with respect to oral health of long-term care residents have not been well-studied and documented. A 2005 survey of executive directors of all long-term care facilities in Ohio investigated how the oral health of residents was perceived. Knowledge, interest, value and priority assigned to the oral health of those residing in facilities were assessed. All responding executive directors valued oral health and agreed that it was an integral part of general health. A vast majority expressed a high level of importance for oral care, yet half considered oral health a lower priority than general medical care. A total of 53% rated their residents' oral health as fair or poor but were still satisfied with the oral care provided at their facilities, illustrating the critical nature of executive directors' attitudes toward oral health.¹⁴ In a study of long-term care administrators completed in Michigan, executive directors perceived a lack of willingness on the part of dentists to provide oral health care to residents in the dental office or facility, creating a major barrier to oral health provision.¹⁵ Ekelund evaluated oral health training programs and reported that only 20% of long-term care executive directors considered oral care more important than hairdressing. That perception underscores the importance of executive direc-

tors' attitudes toward oral health if improvement for residents is to be achieved.¹⁶

The Targeting Revolutionary Elder Care Solutions (TRECS) Institute, a non-profit organization dedicated to the improvement of health care for residents in the long-term care industry, undertook a study designed to identify methods of assuring better dental and oral care services for residents in Florida nursing homes. In the final report, the TRECS Institute research team made 2 recommendations directly relating to findings from this study. First, it was suggested that development of a "commercial dental insurance program specifically designed for nursing home residents should be tested as a realistic approach to improving dental care services by increasing reimbursement for dental professionals thereby eliminating the access problem that dominates the industry today."¹⁷ A second proposal generated from the study supported that the scope of practice for dental hygienists be expanded by allowing collaborative relationships with dentists similar to the relationship nurse practitioners share with their collaborating physicians in many states.¹⁷

Executive directors of long-term care facilities are in prime positions to provide direction for oral health care professionals and lawmakers to positively impact the oral health of this increasing portion of the population. Their knowledge, perceptions, and roles concerning the oral health of long-term care residents may hold implications for the role dental hygienists can play in improving the general and oral health of the residents. Executive directors are key stakeholders for engaging interprofessional health care teams to meet the oral health needs of frail aging residents of long-term care who are dependent on others for their daily care. The executive director is in a position to initiate innovative changes in oral health policies and management of health care personnel that can improve the oral care and health status of residents.

Conceptual Framework

The key concept in this study is role definition, and how this can influence action to improve the health care of older adults in long-term care settings. An individual's knowledge and perceptions define how one's role is realized, and role definition can influence action.¹⁸ The executive director of a long-term care facility has a crucial responsibility in overseeing provision of care. Although the nursing professional provides most direct patient care, in assistance with care providers from other disciplines, the executive director is responsible for leadership and quality of care within this health care system. All caregivers involved in direct service provision are influenced by the role of the executive director whose leadership

provides guidance in care coordination and delivery. Ultimately, executive directors have a vital role in implementing meaningful reforms to improve care for long-term care residents.¹⁸

Given that little data exists related to executive directors' perceptions of oral health in long-term care facilities, this study was designed to answer the following research questions:

- What are the knowledge levels and perceptions of executive directors regarding the oral health of residents?
- What are the current methods of oral health care delivery and barriers to provision of oral health care in the facilities in which the executive director has a primary leadership role?
- What level of support do executive directors have for legislative initiatives to change supervision laws regulating the practice of dental hygiene in long-term care settings?
- What level of support do executive directors have for employment of dental hygienists in long-term care facilities?

Methods and Materials

Sample

Study participants included a purposive sample of executive directors employed in long-term care facilities that were certified for Medicare/Medicaid reimbursement in the state of Utah. Deliverable email contact information was obtained for executive directors employed in 80 of the 100 certified long-term care facilities in Utah. The web-based, self-administered survey was e-mailed to executive directors through the utilization of a SurveyMonkey® questionnaire. Executive directors were sent an email to invite participation and obtain informed consent, followed by 2 reminders at 7 day intervals.

Survey Design

The Institutional Review Board of Idaho State University approved this study. A descriptive, exploratory design was utilized. A 29-item survey was developed by the primary investigator to address 3 main themes:

1. Knowledge and perceptions of executive directors regarding the oral health of facility residents
2. Oral health care delivery methods for residents
3. Level of support for employment of a dental hygienist and legislative initiatives to extend the scope of practice for dental hygienists in long-term care facilities

Table I: Executive Director Demographics and Facility Characteristics

	Response Percentage
Demographics	
Male	66%
Female	34%
Age	
21 to 29	0%
30 to 39	34%
40 to 49	23%
50 to 59	31%
60 or older	11%
Facility Characteristics	
Proprietary	80%
Non-proprietary	11%
Government	9%
Number of Beds	
0 to 50	34%
51 to 100	40%
101 to 150	20%
151 to 200	3%
Greater than 200	3%
Locality	
Urban (>50,000)	71%
Rural (<50,000)	26%
Frontier (<1,000)	3%

The instrument was designed based on extensive literature review and analysis, and included 18 multiple-choice items, 9 Likert items and 2 open-ended questions. A statistician from Idaho State University and 6 faculty members from Dixie State University, with expertise in survey methodology and geriatric oral health care, reviewed the survey for clarity and content validity. Eight executive directors from long-term care facilities in Nevada pilot tested the survey to establish construct validity and reliability. The primary investigator revised the survey according to feedback provided by the reviewers and statistician.

Statistical Analysis

Upon completion of data collection, results were analyzed using SPSS 16.0 software. Nonparametric tests were used including Spearman's rho correlation coefficient and Mann-Whitney Test statistics to calculate measures of association. Statistical significance was set at $p < 0.05$.

Results

Of the 80 executive directors, 38 responded to the email survey, resulting in a 48% response rate. Participating executive directors' demographics and facility characteristics are illustrated in Table I. As can be seen from this table, a majority of respon-

Table II: Executive Directors' Oral Health Knowledge and Perceptions

Statement	Strongly Agree	Somewhat Agree	No Opinion	Somewhat Disagree	Strongly Disagree
Dental care is important but would fall below the priority of general nursing care	21%	26%	0%	24%	29%
Residents may experience pain, loose teeth, decay, or become physically ill from oral disease	84%	8%	5%	0%	3%
Residents with dentures need annual screening oral examination by a dentist	53%	29%	8%	5%	5%
Residents with teeth should have a dental prophylaxis or periodontal therapy twice yearly	34%	37%	21%	8%	0%
Residents with dental decay should have it treated	78%	19%	0%	3%	0%
Residents with oral infection are at risk for aspiration pneumonia	47%	21%	29%	3%	0%
Residents with oral infection are at risk for Bacterial endocarditis	47%	17%	33%	0%	0%
Oral infection exacerbates effects of diabetes mellitus	19%	36%	42%	3%	0%
Oral infection increases risk of joint replacement infection	31%	19%	44%	6%	0%
Residents with oral disease experience negative social or emotional effects	66%	24%	8%	0%	3%

dents were male, with age distribution appearing to be equal between 30 to 39 and 50 to 59 years of age. A majority of the facilities had 51 to 100 beds. Most facilities were located in urban areas and were proprietary in nature. No significant associations were found between demographics and facility characteristics and other responses.

A total of 73% of executive directors (n=38) reported having a written protocol for oral health procedures to be completed by nursing staff, frequency for provision of oral care, procedures for referral to a dentist and documentation requirements. Fifty-one percent indicated no protocol for oral health in-service training for nursing staff. Most facilities do not have a regular protocol for presenting oral health in-service training for nursing staff. Training that is provided is presented by nursing staff themselves. Of the facilities that provide training, the majority include demonstrations of proper techniques for providing daily oral health care, explanations regarding the effect of oral health on physical health and staff assignments for the provision of and barriers to oral care. Fewer include instruction on how to recognize oral infection or caries. Within these facilities, most daily oral care is performed by the residents themselves or by certified nursing assistants. Only 63% of responding executive directors

Table III: Barriers Limiting Access to Oral Health Care

To what extent do the following barriers limit access to oral health care?			
Barrier:	Very limiting	Somewhat Limiting	Not at all Limiting
Financial concerns	54%	43%	3%
Physical frailty	28%	61%	11%
Dementia level	44%	50%	6%
Availability of a dentist	25%	36%	39%
Transportation	9%	27%	65%
Recognition of oral disease by nursing staff	6%	67%	28%
Residents' interest in obtaining care	17%	71%	11%
Residents' families' interest in obtaining care	14%	74%	11%

reported that a dentist is affiliated with the facility. Most of these dentists provide in-house screening examinations. Half provide in-house emergency

Table IV: Interest and Support for Dental Hygiene Services

How interested are you in having a dental hygienist come in-house to perform the following services?					
Service:	Extremely Interested	Somewhat Interested	Uncertain	Somewhat Disinterested	Extremely Disinterested
Present oral health training for staff	38%	50%	6%	3%	3%
Perform oral health screenings and referrals to dentists	34%	44%	3%	9%	9%
Perform oral prophylaxis or periodontal treatments if legal in the state	41%	38%	6%	6%	9%
Institute a fluoride varnish program	27%	36%	15%	9%	12%

treatment. Almost no facilities have on-site dental equipment. Only 27% reported that a dentist comes on-site at least monthly.

A majority of the executive directors perceived residents' oral health as good and most considered oral health an important aspect of general health (Table II). Fifty percent of respondents agreed that dental care is as important as general nursing care.

Lower levels of knowledge were evident when executive directors were asked how strongly they felt medical conditions may be exacerbated by oral infection. A significant number indicated that financial concerns were a major barrier limiting access to oral health care by long-term care facility residents (Table III). Level of dementia was another major limiting factor while transportation was deemed the least limiting barrier. Comments from the open-ended questions reflected this concern as well (Figure 1).

Respondents indicated a high level of support for the inclusion of a dental hygienist professional in the care of long-term care residents. Forty percent supported employment of dental hygienists in the long-term care setting. Results indicated interest in having dental hygienists provide an extension of oral care delivery in this setting. Additionally, executive directors indicated a "somewhat" to "extreme" interest level in a dental hygienist providing screening, training, education and preventive care to residents of the long-term care facility (Table IV).

Discussion

The inclusion of a dental professional in the care of the aging adult in the long-term care facility allows for interprofessional collaboration that may improve the health status of a growing and vulnerable population.^{11-13,19,20} Protocols and support for oral health

Figure 1: Executive Directors' Comments

Comment:
<ul style="list-style-type: none"> • "Individuals who only have Medicaid coverage receive much less oral care in the community than they do in skilled nursing facilities. Most residents in skilled nursing facilities have their stay paid for by Medicaid. Lack of Medicaid funding both inside and outside health care facilities is, in my opinion, the greatest barrier to dental health in Utah" • "There are few to no dentists in this town that accept Medicaid for dental care" • "It is very difficult to find a dentist who some of our residents can afford. Medicaid does not pay for dental work and we have a dentist who will do some work for a nominal fee, but only when a tooth is bad and then it usually just gets pulled" • "The greatest barrier to good oral health for long term care residents in the State of Utah is the total lack of funding through the Medicaid program" • "the only barrier would be funding" • "Our facility is very remote...an hour's drive from the dentist who sees most of our residents"

in-service training involving the dental hygienist can facilitate opportunities for knowledge building and shared expertise, with a goal of improving the oral health and overall health status of residents.^{11,12} Research has shown that implementation of effective oral health interventions and inclusion of dental hygienists as part of a collaborative healthcare team results in decreased costs and improved health status in older adults.^{12,13,19,20}

Executive directors participating in this study were slightly less interested in employing dental hygienists for provision of these services than they were in having dental hygienists provide oral health training

to staff. This small difference may be attributed to a perceived inability to hire and reimburse their professional staff in a manner that makes working with long-term care facility residents an economically sound business model.²¹ Executive directors realized there are barriers to accessing dental care, and funding was by far the most limiting factor in providing oral health care for residents. Unfortunately, payment for oral health care is primarily the responsibility of individual residents, and as a result, they may forego regular dental visits. This decision to “do without” can have serious consequences, and can lead to increased risks for oral infection and associated systemic disease.²¹⁻²³

An interprofessional perspective where both nursing and dental hygiene professionals contribute expertise could be used to co-develop individualized prevention and treatment care plans for long-term care residents.²⁴ This innovative idea is supported by the finding that Utah executive directors perceive a benefit to having dental hygienists train caregivers within their facilities as well as provide a variety of preventive oral services. Hygienists are well-suited to offer preventive services, educate staff and residents, act as liaisons between dentists and long-term care facility personnel, and serve as champions of oral health for residents. Moreover, by the nature of their educational preparation, dental hygienists are considered to be experts in the areas of preventive oral care, oral health promotion and knowledge of the oral-systemic link.^{12,25,26}

While providing insight and useful baseline data, there were several limitations of this study. The research does not reflect a representative sample of

executive directors, as only the executive directors of long-term care facilities in Utah were included to support this initial, exploratory research. The survey items consisted of close-ended questions that may not exactly represent participants’ actual perceptions, knowledge or behaviors. Furthermore, this method was descriptive and cannot offer insight into cause-and-effect relationships.

Conclusion

This study provides preliminary evidence that executive directors are open to innovative changes to improve oral health for residents. There may be an opportunity for improving the health of long-term care residents through collaboration with dental hygienists and other health care providers in these settings. Further studies should build on these initial findings to examine the cost-benefit ratio for employment of dental hygienists in long-term care facilities, as well as explore outcomes in oral health status of long-term care residents who receive direct and indirect care from a dental hygienist, and test the recommendations presented by the TRECS Institute.

Patricia Wintch, RDH, BSDH, MSDH, is a dental hygiene educator at Dixie State University in St. George. Tara Johnson, RDH, PhD, is an Assistant Professor in Dental Hygiene at Idaho State University. JoAnn R. Gurenlian, RDH, PhD, is Professor and Graduate Program Director of the Department of Dental Hygiene at Idaho State. Karen Neill, PhD, RN, SANE-A, is an Associate Director for Graduate Studies and Professor in Nursing at Idaho State University School of Nursing.

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Dental Hygiene Students' Views on a Service-Learning Residential Aged Care Placement Program

Janet P. Wallace, Dip DT, BOH, Grad Cert PTT, PhD; Fiona A. Blinkhorn, BDS, MDS, PhD; Anthony S. Blinkhorn, BDS, MDS, PhD, OBE

Introduction

The roots of service-learning can be traced back to the early part of the twentieth century, with one important part of the social reform and educational movements promoted by Dewey and colleagues from the University of Chicago.¹ They changed the concept of learning from an authoritarian method to a more experiential process whereby students are encouraged to learn through experimentation and practice.² The focus was on reflection to assist in problem solving and using experience to understand key learning objectives. Dewey's early work was developed and refined by Lewin's^{3,4} model of action research and Kolb and Fry,⁵ who gave even more of a role to experience in the learning. Kolb⁶ later developed a Learning Style Inventory based on 4 components of the experiential learning model which included reflection on a concrete experience, thoughtful observation, abstract conceptualization and active experimentation. A model developed by Grundy⁷ in the 1980s proposed that the reflective process should be considered within the experiential learning of a group. Learners need to have the freedom of choice and a level of autonomy without the influence of the teacher for self-reflection to occur. The key concept is that equal power relationships must occur within the experiential framework to enable students to achieve autonomy in learning. This concept has influenced the subsequent framework of most service-learning models of education.

Service-learning is a teaching strategy which provides students with opportunities to learn both in the classroom and in the wider world. The philosophy is one of service and learning that occurs in experiences, reflection and civic engagement within a collaborative relationship involving com-

Abstract

Purpose: To record the views of final year dental hygiene students from the University of Newcastle, Australia about a placement in 17 residential aged care facilities, on the NSW Central Coast.

Methods: Final year dental hygiene students undertook a 12 week placement, 1 day per week, in 1 of 17 residential aged care facilities. They were asked to participate in focus group discussions after the placement to determine their ability to transition from the classroom to the real-life experience of the residential aged care facility placement.

Results: Students felt ill-equipped for the aged care placement program even though they had attended a pre-placement orientation. Students expressed feelings of being overwhelmed by the residential aged care environment, particularly by the smells and unexpected sights of the aged, fragile and cognitively impaired residents, and the difficulties in providing them with oral hygiene care.

Conclusion: To enable students to transition from the classroom to the aged care environment in a more effective manner, a more realistic pre-placement orientation program is necessary.

Keywords: service-learning, residential aged care, dental hygiene students, oral hygiene care, experiential education

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

munity stakeholders. Students engage in activities that address both individual and community needs together with structured opportunities designed to promote student learning and development.⁸

Service-learning is different from volunteer experiences because of its direct links with course objectives and community interaction to meet specific educational needs. It can also be distinguished from internships because of its civic engagement and the reflection element.⁹ Service-learning engages faculty, students and community partners in a structured program to meet academic learning objectives and potentially creates an apparatus by which dental hygiene students can gain skills that enable them to become more competent to work with different populations and individuals with special needs. It

also enables students to meet objectives outlined in educational accreditation standards while also addressing the core competencies for entry into the dental hygiene profession.⁹⁻¹⁴

Participation in service-learning schemes enables educational institutions to reach out to different communities to foster partnerships.¹⁵ Yoder noted service-learning has become an important component of higher education, and integrating service-learning into dental hygiene curricula should deliver graduates who are better prepared to work effectively among diverse populations with the ability to function dynamically in the health policy arena.¹⁶

Application of service-learning in Australian dental hygiene education is a new concept along with the employment of dental hygienists in Australian residential aged care facilities. In order for students to benefit from service-learning, the University of Newcastle, Australia, implemented an innovative service-learning residential aged care facility placement program for final year dental hygiene students in 2009. Since then, students have attended placements each year as part of their undergraduate studies. The placement program was based on an experiential education model in which students engaged in activities that addressed community needs together with structured opportunities designed to promote student learning with a clear connection between placement activities and course learning objectives.¹⁷⁻¹⁹ Although based on an experiential model, the development and structure of the residential aged care facility placement program was an original concept for dental hygiene education in Australia.

To prepare students for the residential aged care facility program, a pre-placement orientation workshop was designed to provide them with an overview of the medical and dental issues common to older people living in residential aged care facilities. The structure of the orientation workshop consisted of a number of guest specialist presenters who discussed Dementia and Alzheimers disease, the effects of co-morbidities and poly pharmacy on oral and general health, the lack of existing dental and oral hygiene care in residential aged care facilities, and the challenging behaviors directly linked to residents with reduced cognitive function.

Students were allocated to 17 residential aged care facilities for 1 session a week during the first semester of their final year. Students worked in pairs to provide dental education and oral hygiene care to residents and oral health education information sessions for residential aged care facility staff, with the aim of enabling them to provide oral hygiene care

for residents. Students were also required to complete formative and summative assessment tasks and make entries into their reflective journals after each placement. Initially the placement caused some problems for students and in the early weeks students reported that they were not adequately prepared for the residential aged care facility environment.

A number of evaluations of the Newcastle placement program have been undertaken including an analysis of student ability, willingness and knowledge gained after attending the placement.²⁰⁻²² This study is linked to those earlier student and program evaluation research strategies and finally examines the process of student transition from the clinical classroom to the residential aged care facility environment.

Methods and Materials

All final year dental hygiene students (n=35) who volunteered for the residential aged care facility student placement program were asked to participate in a qualitative research study. Focus groups and interviews were conducted gathering data to identify student transition from the classroom to the residential aged care facility environment.

The placement was offered for 12 weeks, with students being required to attend their residential aged care facilities 1 day each week for a period of 4 hours. Students worked in pairs and were allocated to the residential aged care facility nurse educator with whom they could interact while working in a predominantly autonomous capacity. At a faculty level, students had access to the course co-ordinator at all times by email or phone. During the placement students completed formative and summative assessment tasks and make entries into their reflective folios after each placement session. In addition, they were required to provide dental education and oral hygiene care to residents and dental education sessions to residential aged care facility staff.

During the focus groups, students were asked to concentrate their discussions on 3 main research questions:

- What did you find most difficult about the transition from the classroom orientation workshop to the real-life residential aged care facility student placement program?
- In retrospect what would have helped you to transition is a more positive way?
- Is there anything specific you would like to tell us about your residential aged care facility experience?

The focus groups took place in a supportive and friendly atmosphere over a period of 1 hour. The researcher encouraged interaction between students asking them to focus on the main topics during group discussions. However, the students were permitted to deviate from the themes where valuable information pertaining to the placement program was revealed. All focus group discussions were transcribed and annotated with concurrent field notes. All transcripts were read by 2 researchers and coded into themes using the constant comparative method.²³ Each item within the data was compared with the rest of the data to establish the themes. Consensus of final key themes was achieved through discussion and re-reading of the transcripts. A final text was prepared by the researchers and individual identifying statements were removed in the final report. The results were presented to the participating students to gain agreement on content and accuracy. The study was approved by the University of Newcastle, NSW, Australia, Ethics Committee.

Results

Of the 35 students, 22 attended the 3 focus group sessions and 6 to 8 students were present at each. The 22 students who participated in the focus groups were all females between the ages of 20 to 47. The 2012 cohort was predominately female with only 2 male students. All students were actively involved contributing to focus group dialogues.

Discussions throughout the focus group established that students were confronted by the workings of the residential aged care facility environment, by images of older frail people and by the challenging behaviors of people with cognitive disorders. Students discussed their feelings of inadequacy in their ability to communicate with residents who had dementia and Alzheimers disease and felt they did not have the necessary knowledge or skills to communicate effectively with these residential aged care facility residents. Students reported that the first few weeks of the placement were particularly difficult because they were unsure of how to manage the resident's oral hygiene care and unsure of how to provide oral hygiene information to people who seemed unable to understand or follow instructions.

The main discussion topics are presented according to the 3 predetermined questions:

1. What did you find most difficult about the transition from the classroom orientation workshop to the real-life residential aged care facility student placement program?

Generally, students felt confronted by the residential aged care facility environment, citing smell, cognitive impairment and physical appearances of the older residents as being overwhelming (Table I). Students expressed their frustration at not feeling confident to communicate and build rapport with residents suffering from dementia and Alzheimer's disease and that often residents did not remember that they had spoken to them during the previous week's placement session. Students found that providing oral hygiene care and instruction was difficult without a designated dental clinic setup.

2. In retrospect what would have helped you to transition is a more positive way?

Students discussed the need for a pre-placement orientation workshop that included realistic scenarios depicting the residential aged care facility environment including demonstrations of students providing oral hygiene care and education to residents and staff; and specifically to residents with cognitive impairments (Table II). Students generally voiced the need to see more experienced students greeting residents and providing them with care, including a demonstration of an oral hygiene session. Some students went as far as to say that audio recordings of the noises made by some cognitively impaired residents would better prepare them for the residential aged care facility experience. Most students wanted to be shown how to develop rapport with residents, before commencing any oral hygiene instruction or care.

3. Is there anything specific you would like to tell us about your residential aged care facility experience?

Students reported that interest and support from residential aged care facility staff was at times insufficient because they were under great time pressure to provide residents with general and personal hygiene care, ensure meals were delivered and generally meet the needs of the elderly residents (Table III). After the first few placement sessions, the students came to the conclusion that there was insufficient time for staff to devote to the residents' oral hygiene needs. Students observed that residents' weekly oral health plans they had devised often needed to be changed to accommodate the residents' general mood, health or motivation on the day. Students discussed the fact that text book idealistic oral hygiene practices were difficult to achieve for many residents. Students reported that although initially the placement was overwhelming, after a settling in period the majority started to enjoy the experience, were able to

Table I: Focus Group Discussions Relating to Difficulties Transitioning From the Classroom to the Residential Aged Care Facility Environment

Students comments during the focus group	Number of students reporting the same theme
I was really unprepared for what I saw and smelled at the residential aged care facility	20
The residential aged care facility was very confronting, it was worse than I had expected	15
I was not fully prepared in regards to approaching residents and the reality of what we were expected to achieve during the residential aged care facility placement	18
I thought I would be able to provide oral hygiene care easily, the reality was I had to build a relationship with the residents before I could get anywhere near their mouths	21
I was nervous and not sure how to deal with the elderly people	14
I found the first few weeks of the placement really difficult, it took me weeks to get used to the residential aged care facility	9

Table II: Focus Group Discussions about What Would Improve the Transition from Classroom to Residential Aged Care Facility Environment

Students comments during the focus group	Number of students reporting the same theme
It would be helpful to see images showing the residential aged care facility environment and the residents	12
Watching role plays on the interactions between students providing residents with oral hygiene care would help us in the early stages of the placement	15
I would like to see 'real life' scenarios of what to expect when I get to the placement	17
It would be good to visually prepare us of what to expect before the placement	8
Watching re-enactments of students communicating with cognitively impaired residents would be helpful	17
Talking with students who have already done the placement would be a good idea	4
I would like to see a demonstration of students talking to residents and helping them care for their teeth	14

develop management strategies for residents' oral hygiene care and reported that they had learned from the placement.

Discussion

Focus groups have been used in qualitative research for decades, and they have 1 feature which inevitably distinguishes them from other 1 to 1 interviews or questionnaires, specifically the interaction between the research participants.²⁴ In qualitative research the potential for bias is always present. In this study, students had completed the unit of work associated with the residential aged care fa-

cility placement and had received their final mark before participating in the focus groups, thereby reducing the possibility of bias from students giving positive statements just to please the researcher. Those students participating in the focus group did so with honesty and enthusiasm. They were pleased to have the opportunity to comment on the residential aged care facility program and appeared to be relaxed during discussions.

They were comfortable with their peers as they had shared 3 years of study and the discussions were wide ranging and unrestricted. The focus groups enabled students to expand on their expe-

Table III: Examples of Student Comments during Focus Group Discussions about Their Experiences during the Residential Aged Care Facility Placement

Students comments during focus groups	Number of students reporting the same theme
Once I became familiar it was a good experience – we were able to see regular patients and I really enjoyed the interaction with the residents	12
The placement was a very good experience, I feel I gained a lot, I learned about the needs of residents/patients that required constant care. I really enjoyed it – very satisfying	17
The placement made me realize the need for oral health care in residential aged care facilities	19
I would have like a bit more of an orientation before the placement, it would have been helpful	22
We had to restructure our plans on a week to week basis to fit in with the residents	7
It was very difficult to gather all the residential aged care facility staff to give dental health education sessions to them	15
The placement made me realize the need for oral hygiene care in residential aged care facilities	22
The first few weeks were really challenging, but I eventually settled in and learned from the placement	20
Residents really need oral hygiene and dental care on a daily basis in residential aged care facilities	22

riences of the residential aged care facilities, supporting each other’s comments. In retrospect, the participation rate might have been even greater if the focus groups had not been held at the end of the students’ clinical session when they were anxious to return home.

A common theme was established between the focus group findings and student experiences at each placement session by reading all of the students’ (n=35) reflective journals. Throughout the focus groups and in early journals entries, students reported feeling ill-prepared emotionally for the behaviors and appearances of older frail people with cognitive deficiencies. They discussed feeling emotionally unprepared for the day to day workings of the residential aged care facility environment, with its challenging and often visually disconcerting behaviors of residents with dementia and Alzheimer’s disease. Students reported initially having difficulties communicating with residents and felt their preparation for the placement was deficient. They discussed feeling nervous and unsure of what was expected of them. They found the noises and movements made by people with dementia and Alzheimer’s disease very distressing and confronting. The majority of students reported being very overwhelmed during the early stages of the placement, not knowing how to approach residents, not

knowing what to say, or how to provide oral hygiene care in the residential aged care facility environment. The inability to effectively communicate with residents in the early stages of the placement was a common theme with students. An assumption has been made that the inability to communicate is linked to lack of skill and experience of dealing with people who have cognitive disorders rather than a generational communication gap. This assumption is supported by the fact that there was a wide age distribution within the student cohort ranging from 20 to 47 years of age. Students discussed the need to develop a friendly relationship with the residents and to build rapport before being able to look in their mouths. Students talked about the considerable time and effort this involved and their lack of understanding of this necessity prior to the placement experience. They explained that this communication and rapport building often had to be replicated on a weekly basis as many residents had no recollection of who the students were from week to week. Some developed strategies to remind residents of their previous visits by taking photos of themselves with individual residents. Students talked about the need to restructure their plans on a week to week basis and discussed the importance of being flexible in achieving realistic goals of oral hygiene education and care rather than being able to accomplish an idealistic theoretical model of care.

Students felt that the implementation of a more real life orientation would assist them in settling into the placement sooner and would to some extent reduce the shock of the early placement sessions. It seemed that students spent a good proportion of the first few sessions recovering from the impact and astonishment of the residential aged care facility environment, before they felt comfortable and able to provide appropriate oral hygiene care for residents and complete their assessment tasks.

Although the original format of the pre-placement orientation workshop had been evaluated and amended to meet student feedback on a yearly basis, results from this study indicate that the changes had still not provided students with a sufficiently realistic orientation. To address this, an educational DVD depicting the residential aged care facility environment is currently in production.

Conclusion

Based on the results of this study, a comprehensive orientation to service-learning projects is required to assure student comfort in an alternative learning environment. This orientation should in-

clude specific visual images of the residential aged care facility placement environment depicting a real-life documentary re-enactment of students demonstrating how to communicate and provide oral hygiene education and care for the elderly residents. In this way students would be more prepared for the residential aged care facility environment and the student experience would be enhanced enabling early learning to be maximized.

Janet P. Wallace, Dip DT, BOH, Grad Cert PTT, PhD, is Faculty of Health at the School of Health Sciences, University of Newcastle. Fiona A. Blinkhorn, BDS, MDS, PhD, is at the School of Health Sciences, Faculty of Health, University of Newcastle, Ourimbah, Australia. Anthony S. Blinkhorn, BDS, MDS, PhD, OBE, is a Faculty of Dentistry, University of Sydney, Westmead, Australia.

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Marketing Strategies and Warning Labels on Children's Toothpaste

Corey Hannah Basch, EdD, MPH, CHES; Sonali Rajan, EdD, MS

Introduction

Research has suggested that the overconsumption of fluoridated toothpaste has health implications and may pose risk for fluorosis and fluoride toxicity.¹ These risks are heightened among young children, because they often swallow toothpaste while brushing, particularly as they learn to implement best oral care practices.² Further, children's toothpastes typically contain at least 1,000 parts per million of fluoride - therapeutic levels on par with adult toothpastes.³ Given that fluoride is a drug, the U.S. Food and Drug Administration (FDA) is responsible for the labeling of products with fluoride in addition to regulating both the safety and efficacy of such products. The American Dental Association (ADA), is not a regulatory agency, but plays an important role in following and supporting FDA regulations.⁴ Therefore, in an attempt to inform consumers about the safety and effectiveness of toothpaste, the ADA initiated the ADA Seal of Acceptance program, in line with FDA guidelines.⁵ As such, toothpaste manufacturers who seek to have the ADA seal on toothpastes must include the following warning, "Do not swallow. Use only a pea-sized amount for children under 6. To prevent swallowing, children under 6 years of age should be supervised in the use of toothpaste."⁵ The authors posit that these efforts to warn parents and children about possible consumption risks, however, are often missed, as toothpaste manufacturers use aggressive techniques to market toothpaste to children as if it is a food product.

No studies currently exist that look at the presence of warning labels on children's toothpaste and marketing strategies that might encourage consumption of toothpaste. Therefore, this study was conducted to determine the presence, placement and size of warning labels, as well as to describe the marketing strategies currently used in selling chil-

Abstract

Purpose: The overconsumption of toothpaste has negative consequences, particularly for children. This study's objectives were to describe misleading marketing strategies used in selling children's fluoridated toothpaste and identify warning label characteristics. Two researchers independently coded the packaging from 26 over-the-counter toothpastes that are specifically marketed for children. Aggressive marketing strategies targeting children were identified: every toothpaste in this sample displayed at least 1 children's animated character, 50% had at least 1 picture of a food item, 92.3% stated they were flavored and 26.9% depicted a full swirl of toothpaste, directly contradicting dentist recommendations for young children. Further, on most toothpaste tubes, warnings regarding fluoride overconsumption for young children were only listed on the back and in very small font. Misleading marketing strategies are regularly used in selling children's toothpaste as if it is a food product, while warnings regarding overconsumption among youth are minimized. Dental hygienists are in an important position to help parents of young children implement safe oral care practices.

Keywords: toothpaste, advertising, warning labels, fluorosis

This study supports the NDHRA priority area, **Health Promotion/Disease Prevention:** Investigate how diversity among populations impacts the promotion of oral health and preventive behaviors.

dren's toothpaste. The authors hypothesized that the implications of this study are important for all dental clinicians, with a particular emphasis on dental hygienists given the crucial role that dental hygienists play in the education and advocacy of oral self-care behaviors among their patients. As such, this work is aligned with the Health Promotion and Disease Prevention category of the American Dental Hygienists' Association National Dental Hygiene Research Agenda. More specifically, this study aligns with the following priority area: "Investigate the effectiveness of oral self care behaviors that prevent or reduce oral diseases among all age, social and cultural groups."⁶

Methods and Materials

Two researchers independently coded toothpastes from drug stores and pharmacies in New York City. The researchers continued to visit locations throughout the city until all brands of chil-

dren’s toothpastes were located. The study’s final sample was derived from 9 different drugstores. An additional 7 locations were visited and all products overlapped. A coding sheet was created to capture not only the size and placements of warnings about consuming too much fluoride, but to also highlight the marketing tactics used on the product, specifically pictures of food, characters and other endorsements. Each toothpaste tube was counted individually based on the packaging and brand. All data were cleaned and warehoused in SPSS (version 20.0). This research was determined to be exempt by the Human Subjects Committees at William Paterson University and Teachers College, Columbia University.

Results

A total of 26 fluoridated toothpastes for children were identified from drug stores and pharmacies in New York City. Children’s toothpastes were identified from a range of well-known toothpaste companies (including Colgate® (Colgate-Palmolive Company, New York, NY), Crest® (Procter & Gamble, Cincinnati, Ohio), Aquafresh® (GlaxoSmith-Kline, Brentford, England) and Oral B® (Procter & Gamble, Cincinnati, Ohio)). Inter-rater reliability was calculated to determine the level of internal consistency between the 2 coders. Specifically, there were a total of 71 independent items captured via the coding sheet and 26 toothpastes coded, yielding 1,846 responses provided by each coder. Of these 1,846 responses, the coders had consistent responses in 98.7% of entries across the data set. The few discrepancies were readdressed and agreed upon prior to data analysis.

Marketing Strategies

All 26 toothpaste products had at least 1 children’s animated character or cartoon on the tube of toothpaste. Dora the Explorer was the most frequently observed character (38.5%, n=10). In addition, 21.1% (n=6) of the toothpastes were endorsed by a children’s entertainment company, such as Nickelodeon or Disney. The authors also noted that 50% (n=13) of the sample had at least 1 picture of a food item, such as a strawberry, orange slices or watermelon present on the toothpaste tube itself. Further, 92.3% (n=24) of

Table I: Summary of Key Marketing Strategies and Warning Label Characteristics (n=26)

Toothpaste Flavor	<ul style="list-style-type: none"> Berry: 3.8% (n=1) Bubble Fruit: 19.2% (n=5) Bubble Gum 15.4% (n=4) Bubble Mint 3.8% (n=1) Mint 19.2% (n=5) Orange Mango 3.8% (n=1) Other Flavor: 19.2% (n=5) Strawberry 7.7% (n=2)
Children’s Entertainment Company	<ul style="list-style-type: none"> Disney/Pixar/Disney Junior: 11.5% (n=3) Marvel: 3.8% (n=1) Nickelodeon: 7.7% (n=2)
Picture of Animated Character or Cartoon	<ul style="list-style-type: none"> Angry Birds: 3.8% (n=1) Animated Fruit: 7.7% (n=2) Cinderella: 3.8% (n=1) Disney’s Cars: 3.8% (n=1) Dora the Explorer: (n=10) Hello Kitty: 3.8% (n=1) One Direction: 3.8% (n=1) Other Animated Character: 15.4% (n=4) Scooby Doo: 3.8% (n=1) Spiderman: 3.8% (n=1) Spongebob: 3.8% (n=1) Toy Story: 3.8% (n=1) Transformers 3.8% (n=1)
Toothpaste “Swirl”	<ul style="list-style-type: none"> 26.9% (n=7)
ADA Approval/Acceptance	<ul style="list-style-type: none"> ADA Approval: 3.8% (n=1) ADA Acceptance: 38.5% (n=10)
Warning: Use pea-size amount	<ul style="list-style-type: none"> 84.6% (n=22)
Warning: Use by children only over 2 years	<ul style="list-style-type: none"> 96.2% (n=25)
Warning: Consult dentist or physician before use among children under 2 years	<ul style="list-style-type: none"> 96.2% (n=25)

the sample stated they were flavored toothpastes, with sweet and appealing flavors ranging from strawberry to bubblegum to orange mango. Interestingly, 26.9% (n=7) depicted a picture of a full swirl of toothpaste on the tube, in direct contradiction with dentist recommendations for children under the age of 12. In 2 of these cases, the swirl of toothpaste was illustrated as an animated character. Table I summarizes the key marketing strategies and warning label characteristics observed across the study sample.

Warning Labels

Nearly the entire sample (96.2%, n=25) stated that the toothpaste was fluoridated on the front of the toothpaste tube. Nearly half (42.3%, n=11) had ap-

proval or acceptance from the ADA.³ Regulations state that in order to receive ADA approval or acceptance, the pea-sized amount warning must be included directly on the toothpaste tube. Specifically, while the majority of the sample (84.6%, n=22) indicated that children should use a pea-sized amount of toothpaste and be supervised by an adult when brushing and rinsing to minimize swallowing, all 22 of these toothpaste products listed this warning on the back of the tube and in a very small font (size 8 font or smaller).

Similarly, the entire sample listed a warning for use of fluoridated toothpaste by children over age 2 years. Nearly all (96.2%, n=25) listed this warning on the back of the tube and in a very small font (size 8 font or smaller). The same trend was observed regarding warning parents that a dentist or physician be consulted before using fluoridated toothpaste among children under the age of two years. All 26 toothpastes listed this warning on the back of the toothpaste tube and 100% of these toothpastes listed this warning on the back of the tube and in a very small font (size 8 font or smaller).

Discussion

The findings of this study are of interest for 3 reasons. First, the small size and the minimally accessible placement of the warning labels presents a problem for parents and guardians of young children who may miss this important information. Second, the ubiquitous presence of food pictures and appealing flavors on the toothpaste creates a distinct conflict. While the labels warn the consumer to use only a pea-sized amount and note that toothpaste is not intended to be swallowed, many toothpastes simultaneously boast pictures of fruit with flavoring to match - a common signal to a child that toothpaste is intended to be consumed as if it were food. It should be mentioned that in some cases, the pictures of food were not animated nor did they resemble a cartoon; rather, they were an actual photograph. Third, a large swirl of toothpaste was depicted on nearly one-third of toothpaste tubes. Again, this directly conflicts with recommendations and warnings for how much toothpaste should be used by a child. Indeed, findings from a study of advertisements in popular parenting magazines also found this confusing marketing tactic to be used with regularity.⁷

Special efforts should therefore be made to bring these aforementioned issues to light among parents who may not be aware that the amount of toothpaste depicted in advertisements or on actual tooth-

paste tubes is well over the recommended amount.⁸ In addition, given that 21,513 calls were received by the Poison Control Center in 2011 that specifically related to the over-consumption of fluoridated toothpaste, measures need to be taken to deter children from eating toothpaste rather than drawing them to it.⁹ Aside from addressing these manipulative marketing tactics, efforts should be made to encourage parents of young children to instill proper supervised tooth brushing habits.¹⁰⁻¹³ It should be noted that these marketing tactics are used, in part, to encourage positive oral care practices among youth. However, to discourage high rates of toothpaste consumption, particularly among young children, the authors suggest that marketing tactics specifically limit the use of pictures of food and addictive flavorings. Similarly, the authors suggest that warnings are made clearer on the toothpaste package by increasing the warning label font size and label placement. Lastly, the use of an animated full swirl of toothpaste ought to be removed as well, as it is in direct conflict with the ADA's pea-sized recommendation.

The natural extension of these efforts includes educating parents. One qualitative study involving interviews with hygienists confirmed that hygienists feel education is an important component of their job.¹⁶ In addition, a national survey indicated that high percentages of dental hygienists actively seek new information related to staying relevant in their practice.¹⁷

Conclusion

The role of dental hygienists has evolved greatly over the past 100 years.¹⁴ Dental hygienists play a very important role in the oral health of children and while it can be challenging, research indicates that dental hygienists are in a key position to provide oral health education to children as well.¹⁵

The results of this study provide another opportunity for dental hygienists to play a crucial role in speaking with and educating parents and young children about best oral self-care behaviors, given the possibility that parents (and their children) likely have difficulty understanding the amount of toothpaste to use and the corresponding dangers of overuse.

Corey Hannah Basch, EdD, MPH, CHES, is an Associate Professor of Public Health at William Paterson University in Wayne, NJ. Sonali Rajan, EdD, MS, is an Assistant Professor of Health Education at Teachers College, Columbia University.

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2014 CLL Poster Abstracts

A Survey of Clinical Faculty Calibration in Dental Hygiene Programs

*Nichole L. Dicke, RDH, MSDH; (Indiana University Purdue University Fort Wayne)
Kathleen O. Hodges, RDH, MS; Ellen J. Rogo, RDH, PhD; Beverly J. Hewett, RN, PhD
(Idaho State University)

Purpose: This study investigated the calibration efforts of entry-level dental hygiene programs in the U.S. Four constructs were explored, including attitudes, satisfaction, characteristics and quality, to evaluate current practices of clinical faculty calibration.

Methods: A descriptive comparative survey design was used. Directors of accredited dental hygiene programs (n=345) were asked to forward an electronic survey invitation to clinical faculty. Eighty-five directors invited 847 faculty, 45.3% (n=384) of whom participated. The 17-item survey contained multiple-choice and Likert scale questions and was available for 3 weeks. Descriptive statistics were used to analyze demographic data and research questions. The Kruskal-Wallis, Spearman Correlation Coefficient and Mann-Whitney U tests were employed to analyze hypotheses ($p=0.05$).

Results: The demographic profile for participants revealed that most worked for institutions awarding associate entry-level degrees, had 1 to 10 years' experience, taught clinically and didactically, and held a master's degree. Clinical instructors value calibration, believe it reduces variation, want more calibration, and are not offered quality calibration.

There was a difference between the entry-level degree awarded and the program's evaluation of clinical skill faculty reliability, as analyzed using the Kruskal-Wallis test ($p=0.008$). Additionally, full-time versus part-time employees reported more observed student frustration with faculty variance, as evaluated using the Mann-Whitney U test ($p=0.001$, $bfp=0.004$).

Conclusions: Faculty members value calibration's potential benefits and want enhanced calibration efforts. Calibration efforts need to be improved to include standards for measuring intra- and inter-rater reliability and plans for resolving inconsistencies. More research is needed to determine effective calibration methods and their impact on student learning.

NDHRA: This study supports the objective: Critically appraise current methods of evaluating clinical competency, under Professional Education and Development.

Quality and Efficacy of Preventive Oral Health Care Provided by ECP Dental Hygienists in a School Based Dental Home

*Melanie Simmer-Beck, RDH, PhD; Bonnie Branson, PhD; Cynthia Gadbury-Amyot, MSDH, EdD; Patricia J. Kelly, PhD, MPH, RN, FPN; Arif Ahmed, BDS, PhD, MSPH; Mary Walker, DDS, PhD (University of Missouri-Kansas City, USA)

Introduction: Lack of access to oral health care is a growing problem for low income children in the U.S. One proposed solution to this problem is utilizing dental hygienists to the full extent of their education and training. In 2003, Kansas altered the dental hygiene scope of practice, to address this crisis, by creating extended care permit (ECP) dental hygienists. The purpose of this study was to assess the quality of oral health care provided by ECP dental hygienists in a school-based dental home.

Methods: Using a case-study design, electronic medical records of children (n=986) who participated in the intervention were mined for data. Numerators and denominators from the Dental Quality Alliance Concept Set provided the framework for measurement. Patient-oriented outcomes were examined using multivariate ANOVA and Kruskal-Wallis, in a multi-encounter cohort (n=295), to analyze decreases in decay, increases in restorations and decreases in treatment urgency.

Results: Twenty-six percent of the children eligible to participate in the intervention chose to do so. Nearly half (48.7%) of the program participants had 2 or more topical fluoride applications. On average, 52.8% of the children had sealants placed. The number of encounters with ECP dental hygienists had a statistically significant effect on changes in decay ($p=0.014$), changes in restorations ($p=0.002$) and changes in treatment urgency ($p=0.022$). A statistically significant effect of the number of fluoride applications on changes in restorations ($p=0.031$) was also present.

Conclusions: The results suggest that in school-based settings ECP dental hygienists provide high quality care that can positively impact children's oral health status.

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The Effect of the Isolite Suction on Aerosols and Splatter During Ultrasonic Scaling

*Jessica L. Holloman, BSDH; Sally M. Mauriello, RDH, EdD; Roland R. Arnold, PhD; Luiz A. Pimenta, DDS, PhD (University of North Carolina at Chapel Hill)

Introduction: Aerosols and splatter are a concern in health care due to their potential adverse health effects on both patients and health care workers. Both the CDC and ADA have recommended use of the HVE during dental procedures that produce high amounts of aerosols and splatter, such as ultrasonic scaling. The Isolite™ is an attachment to the high-volume suction hose and may provide the added benefit of aerosol and splatter reduction. This study compared the Isolite™ and saliva ejector on aerosol and splatter reduction during ultrasonic scaling.

Methods: Fifty participants were randomly assigned to a control (n=25, saliva ejector) or test group (n=25, Isolite™) and were scaled with a 30 KHZ Cavitron SPS ultrasonic scaler unit with Dentsply 30 KHZ Slimline tip set at 50% power and 50% lavage for all patients in an enclosed room. Plaque extent scores (modified Greene and Vermillion) and exposure times were recorded. Aerosols were collected in a Petri dish placed 6 inches from the patient's oral cavity. After scaling, aerosols were collected in a second Petri dish for 35 minutes. Participants were surveyed regarding device comfort. Bacterial colony forming units (CFU) were counted following incubation in an anaerobic chamber for 72 hours. CFU were log transformed for normalization and data were analyzed using a student t-test.

Results: During ultrasonic scaling, no significant difference occurred between groups in aerosol reduction (p=0.25). A significant decline in aerosols after ultrasonic scaling occurred in each group (p<0.0001). Mean+SD of log₁₀ CFU/ml collected during ultrasonic scaling in the control and test group were 3.60 + 0.95 and 3.30 + 0.88, respectively. There was not a significant difference in plaque extent scores or time spent using the ultrasonic scaling between groups (p>0.05). All samples contained alpha hemolytic streptococcus bacteria and many samples contained strict oral anaerobes. Survey responses indicated that the test device was not well accepted for reasons related to stretching of the cheeks, lips, and causing gagging.

Conclusions: A significant amount of aerosol and splatter contamination occurred while ultrasonic scaling in both device groups, as indicated by high CFU and the identification of oral anaerobes in all plates.

As recommended by the CDC and ADA, the HVE

should continue to be used during dental procedures that produce high amounts of aerosols and splatter. Additional measures, such as patient positioning and reducing the patient's plaque load prior to ultrasonic scaling, should be used with these devices to decrease the likelihood of disease transmission risks.

An Analysis of Faculty Perceptions on Assessment Methods Utilized to Evaluate Student Competency in Dental Hygiene

*Kristeen R. Perry, RDH, MSDH; Linda D. Boyd, RDH, RD, LD, EdD; Debra November-Rider, RDH, MSDH; Heather Brown, RDH, MPH (MCPHS University/Forsyth School of Dental Hygiene, United States of America)

Purpose: The purpose of this study was to evaluate clinical dental hygiene faculty perceptions regarding assessment methods utilized in determining clinical competency among entry-level dental hygiene programs within the U.S. The study also explored the influence of demographic criteria on the type of assessment selected.

Background: Competency based education (CBE) has become an integral part of dental hygiene education with the adoption of the Commission on Dental Accreditation (CODA) standards in 1997. CODA standards are not meant to be prescriptive to allow for flexibility with methods of assessment. However, this makes it difficult to determine if methods used are effective in measuring student competency for entry into dental hygiene practice.

Methods: This study was a descriptive, cross sectional survey design. The survey instrument was developed based on the literature and contained 31 questions related to the following areas: demographic characteristics, level of knowledge regarding assessment methods and perceptions of assessment methods. An email to all entry-level dental hygiene programs was sent to request dissemination and participation by program faculty. Data was gathered from a convenience sample of dental hygiene clinical faculty (n=181).

Results: Results revealed use of objective structured clinical evaluation (OSCE)/practical skill exams (83%) was perceived most effective in assessing competency followed by formative feedback (69%) and daily clinical grading (63%). Demographic characteristics, age and experience were analyzed to determine if there was a significant difference in the choice of methods utilized. As age increased, there was a decreasing interest in OSCEs and practical skill examinations as a good method of assessment. Thematic analysis of qualitative data

revealed formative assessment with the inclusion of summative assessment was rated the highest (44%) among the respondents as an effective method of evaluation followed by comprehensive patient care, summative assessment (16%). The overarching theme of the thematic analysis noted respondents may have a preferred assessment method but feel a blended approach of teaching should be utilized due to student diversity and learning styles.

Conclusion: Literature surrounding assessment methods and use of CBE within dental hygiene is limited. Findings from this exploratory study show respondents are satisfied with assessments that they are currently practicing but report a variety of methods are needed to evaluate student competency.

Further research is recommended with a larger sample and more detail on how programs define assessment methods used to assess competency and outcomes to determine what methods are most effective in the evaluation of student competency.

Practicum Experiences: Effects on Clinical Self-Confidence in Senior Dental Hygiene Students

*Whitney Z. Simonian, RDH, BS; Jennifer L. Brame, RDH, MS; Lynne C. Hunt, RDH, MS; Rebecca S. Wilder, RDH, MS (University of North Carolina at Chapel Hill, School of Dentistry)

Introduction: Educational methodologies should be continuously assessed for effectiveness. The outcomes of practicum experiences should be evaluated to determine whether goals are being met. The purpose of this study was to determine the effects of a 3 week practicum experience on the clinical self-confidence of University of North Carolina (UNC) senior dental hygiene students.

Methods: An embedded mixed methods approach was utilized. Before and after a 3 week practicum experience, UNC senior dental hygiene students (n=32) were asked to complete a 20-statement clinical self-confidence survey based on the dental hygiene process of care. Statements were Likert-scaled, ranging from "not at all confident" to "totally confident." The stratified Mantel Haenszel row mean score test with the subject as strata as a repeated approach was used to assess whether on average across subjects, the pre- and post-surveys had the same mean score. Statistical significance was set at $\alpha < 0.05$. Students were also asked to submit reflective journal entries discussing critical incidents during their practicum experience. The reflective journal entries were a requirement for the course. Relevant com-

ments from students' journal entries were used as qualitative data to support survey results.

Results: Pre- and post-practicum surveys (31/32) were completed and all 32 students submitted their journal entries. The differences in the row mean scores from pre- to post-practicum survey were statistically significant, showing an increase in self-confidence for each given statement. Students' journal entries provided comments that support these results.

Conclusions: The results suggest that a 3 week practicum experience in dental hygiene students' final semester increased UNC dental hygiene students' clinical self-confidence in the dental hygiene process of care. Dental hygiene programs may want to consider the benefits of requiring students to participate in a practicum experience if they do not already do so.

In-vitro Determination of the Applied Dose of Diammine Silver Fluoride

*Marilynn Rothen, RDH, MS; Peter Milgrom, DDS (University of Washington)

Objective: Diammine silver fluoride (DSF) has been shown effective for tooth sensitivity. In an earlier study (Vasquez et al, 2012), DSF was applied 3 times at one appointment; weight of DSF applied was estimated by determining the difference between the brushes loaded with material and the weight after application. The mean DSF applied was 0.002 g. Although the teeth were isolated to prevent moisture contamination, this method likely grossly overestimates the DSF applied. This study was to determine the weight of DSF applied to a tooth in treatment for hypersensitivity in an in-vitro model.

Methods: Twenty hydrated human teeth were dried and weighed. DSF ($\text{Ag}(\text{NH}_3)_2\text{F}$, Saforide, Toyo Seiyaku Kasei Co., Osaka, Japan), from a single lot, was applied by microbrush 3 times to a 4x3 mm area at the cervical of the intact facial surface simulating clinical treatment for hypersensitivity, and the teeth were reweighed. Water was applied to 10 control teeth following the same protocol. The difference of pre- and post-treatment weight determined the mean weight.

Results: Mean (\pm SD) of 15 weight gains after DSF was 0.001 ± 0.001 g. Five teeth were excluded because the weight was zero or negative, which may result from evaporative change, and would bias the amount applied lower. Mean (\pm SD) of 10 weight gains after water treatment was 0.001 ± 0.001 g. Similarity of DSF and water weights is consistent with the specific gravity of DSF close to water and limits of detection.

Conclusions: Weight of DSF was 1 mg per tooth. This value is one-half previously reported and reflects greater control over moisture contamination. The study more precisely estimates DSF applied to the facial surface of hypersensitive teeth clinically. Because the amount applied translates into exposure to fluoride and silver, this study better describes and ultimately enhances the safety profile of DSF.

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Dental Hygiene Patient's Willingness to Undergo HIV Testing

*Winnie Furnari, RDH, MS, FAADH (New York University)

*Susan Davide, RDH, MS, MEd; * Marilyn Cortell, RDH, MS, FAADH (New York City College of Technology)

Petal Leuwisee, RDH, BSDH, MA (Eugenio Maria De Hostos Community College)

Anthony Santella, DrPH, MPH, CHES (University of Sydney, Sydney, 2150, Australia)

Bhuma Krishnamachari, PhD (NYIT College of Osteopathic Medicine)

Introduction: In the U.S., an estimated 20% of people living with HIV are unaware of their status. Expanding rapid HIV testing (RHT) in the dental setting may increase the number of individuals aware of their HIV status and can begin treatment and social support early. RHT is an easy and accepted screening tool. It has been introduced in mostly primary care settings. Dental hygienists are committed to patient education and disease prevention and there is evidence they can effectively conduct RHT. This study aimed to determine knowledge and willingness to accept HIV testing in a dental setting.

Methods: A cross-sectional survey was administered among 300 dental hygiene patients at dental hygiene program clinics in New York City from November 2013 to February 2014. Using the Decisional Conflict Theory, patient acceptance of RHT, provider type preference and willingness to pay were assessed.

Results: The mean age of respondents was 38.03 (SD 14.6), 55.5% were female, 41.5% were White and 37.3% Hispanic. The majority (72.1%) indicated willingness to have HIV testing in a dental setting with 87.1% choosing oral RHT, 6.2% finger prick RHT and 8.4% a blood draw; 94.1% of respondents felt sure about the best choice for them, and 71.9% found testing by dental hygienists to be acceptable, 75.3% found testing by dentists to be acceptable and 30.9% found testing by dental assistants to be acceptable. Cost-wise, 84.8% indicated they would only take the test if

it were \$20 or less. The mean decisional conflict score was 3.5/4.0.

Conclusions: Patients are willing to undergo oral RHT HIV testing with dental hygienists. With a high decisional conflict score, patients appear aware of the benefits and risks associated with RHT. Further research is needed to evaluate the public health benefits and logistical challenges facing the provision of HIV testing in the dental environment.

Comparison of Communications Styles amongst an Inter-Professional Student Cohort

*Amy E. Coplen, RDH, MS; Amber V. Buhler, PhD; Shawn E. Davis, PhD; Bobby Nijjar, RD, EdD (Pacific University)

Introduction: Communication between practitioners of different professions is an integral part of working in inter-professional teams. While Health Professions programs are integrating inter-professional education by co-educating students, the implication of different communication styles between students in different professions has not been addressed. In an Inter-professional Education Course at Pacific University, first year students in 10 health professions completed a communication styles survey to understand their own personal styles and to explore population differences in style between professions. The purpose of this study was to investigate the discipline-specific pattern of communication styles amongst students.

Methods: After obtaining IRB exemption through Pacific University, all first year students in the College of Health Professions were required to complete a brief inventory questionnaire on communication styles as part of their campus-wide introductory inter-professional education course. The Personal Coaching Style Inventory (PSCI) is a tool used by personal coaches who work with executives. This questionnaire allowed students to rank their responses to 4 style types: Director (like to be in control), Presenter (know everyone who is important), Mediator (personable people everyone seems to like) and Strategist (the thorough, painstaking, hardworking tacticians). The primary (highest scored) style was reported by students within each profession. In cases where 2 styles were tied, both were counted as "primary." Means scores for each of the PSCI dimensions by profession were calculated. To determine if there were significant differences in PSCI component scores between programs, a series of one-way ANOVA analyses were conducted.

Findings/Results: Pharmacy and Masters of Health Administration had the highest percentage of students

identifying as “Strategists.” Other differences suggested that Occupational Therapy and Audiology/Speech Language Pathology students had unique style breakdowns, while the other health professions shared relatively similar profiles. Significant differences between programs were found for the Mediator dimension, $F(9, 931)=2.61, p=0.006$. Post-hoc analyses revealed this difference to be between the Physician Assistant (mean=13.47) and the School of Language Pathology programs (mean=18.60).

Conclusions: These results suggest that there are in fact differences in the communications profiles of students within different health professions programs, which in the worst case may contribute to difficulties in communications, but, if tapped for its potential, could be used to increase team productivity. With an increased emphasis on working in inter-professional teams, understanding the differences in communication strategies within different health professions can help our students better adapt to these environments.

The Effect of Teaching Experience on Service-Learning Beliefs of Dental Hygiene Educators

*Sharlee Shirley Burch, RDH, MPH, EdD, MAADH (Bluegrass Community and Technical College and Liberty University)

Introduction: Service-learning is a teaching and learning strategy which benefits both the student and the community. Service-learning research within dental hygiene education has largely focused on students. There is limited research on how dental hygiene educators are impacted by service-learning pedagogy.

Purpose: The purpose of this causal-comparative study was to determine if service-learning teaching experience effects dental hygiene faculty perceived service-learning benefits at the classroom and at the community level, as well as their perceived service-learning barriers at the classroom and at the institutional level.

Methods: 581 entry-level dental hygiene educators in the U.S. received the previously validated Web-based Faculty Service-Learning Beliefs Inventory (wFSLBI). The wFSLBI is made up of twenty 5-point Likert service-learning benefit and barrier sub-scale questions. The dental hygiene educators were placed into comparison groups, those with service-learning teaching experience ($n=230$) and those without ($n=87$). Independent samples t-tests and Mann-Whitney U tests were performed ($n=317$). A response rate of 55% was noted and an a priori level of significance of $p\geq 0.05$ was utilized.

Results: There was a statistically significant differ-

ence between entry-level program dental hygiene educator’s perceptions of the classroom and community benefits and classroom barriers of service-learning instruction based on their service-learning teaching experience. However, in regards to institutional barriers there was no significant difference between the 2 groups.

Conclusions: Entry-level dental hygiene educators who have service-learning teaching experience are more positive about its benefits in the classroom and within the community. These included enriched discussion opportunities, greater enjoyment of the process of teaching, enhanced relationship with their students and emphasis on the value of partnerships, the delivery of beneficial services to special populations and the ability to make a difference within their community. They perceive less difficulty involved in the practice of service-learning pedagogy within their classrooms while participants without service-learning teaching experience perceived greater barriers in regards to overall time constraints, lack of control, and reduced classroom instruction time. Both groups of dental hygiene educators perceived a barrier to service-learning instruction at the administrative level of their institution. Service-learning teaching experience does impact the service-learning beliefs of dental hygiene educators.

Recommendations: It is recommended that other investigations into the service-learning beliefs of higher education faculty include additional health professional educators for contrast and comparison.

A Survey of Dental Hygiene Collaborative Practice in New Mexico and Minnesota

*Allison C. Cahoon, RDH, MS; Kathleen O. Hodges, RDH, MS; Ellen J. Rogo, RDH, PhD; Karen Neill, RN, PhD (Idaho State University, Office of Medical and Oral Health)

Introduction: This descriptive, comparative study examined characteristics, services, models, and opinions of collaborative practitioners (CPs) in New Mexico and Minnesota. CPs were dental hygienists who had entered into a written, cooperative agreement with a licensed dentist(s). Collaborative Practice Dental Hygiene (CPDH) was defined as the prevention and treatment of oral disease without general supervision applying this legal working relationship. Various avenues of direct access care have been developed to broaden practice models and aid the underserved and underinsured. To date, little has been published about CPDH as a model for direct access care. Therefore, the care provided and the opinions of CPs were explored and compared in two states.

Methods: After Human Subjects Committee approval (#3759M), a 43-item self-designed online survey was administered using a multiphase process. Closed and open-ended questions were incorporated as well as Likert items using a 6-point scale of agreement to disagreement. Validity and reliability were established. Descriptive statistics examined six research questions. The Mann-Whitney U, Pearson Chi-Square or Fisher's Exact tests analyzed four null hypotheses ($p=0.05$). Open-ended responses about opinions of CPDH benefits and obstacles were organized into themes.

Results: A 49.3% response rate was achieved (23% New Mexico; 64% Minnesota) ($n=36$). Many participants were experienced clinicians who worked in this alternative setting after 21 years in the profession (66.7% New Mexico; 63.4% Minnesota) and reported "increase access to care" as the reason for practicing collaboratively (33.3% New Mexico; 40% Minnesota). A variety of services were offered and private insurance and Medicaid were accepted, although many practitioners did not receive direct reimbursement. The majority of New Mexico participants worked in private practices, earned advanced degrees and serviced Health Provider Shortage Areas (HPSAs). The majority of Minnesota respondents worked in various facilities, earned associate degrees and were uncertain if HPSAs were served. Improve access to care, autonomy, finances, patient care, and interprofessional practice were benefits of CPDH. Obstacles focused on acquiring or maintaining a collaborative practice agreement, direct reimbursement, employees, facilities, finances, patient follow-up care, and mobile equipment. There were no significant differences between the participants' responses in both states.

Conclusions: New Mexico and Minnesota collaborative practitioners are similar in characteristics, services, and opinions although models of practice vary. CPDH is a viable option for experienced practitioners and offers many preventive and therapeutic services such as prophylaxis, nonsurgical periodontal therapy, fluoride therapy, radiographic assessment, and pit and fissure sealant placement. In New Mexico this care is provided in HPSAs.

A New Opportunity for Dental Hygienists: Certified Diabetes Educator

*Cynthia A. Stegeman, EdD, RDH, RD, LD, CDE (University of Cincinnati, Raymond Walters College, Ohio)

Introduction: This year marks the first opportunity dental hygienists can apply for the Certified Diabetes Educator (CDE) credential. A CDE credential

designates a health professional who has additional training, experience, and comprehensive knowledge of diabetes and the ability to effectively educate patients with diabetes. This creates additional opportunities for dental hygienists who may wish to expand their career options by consulting in hospital or community diabetes education programs, conducting diabetes and oral health research, disseminating information through presentations and publications, or attracting patients with diabetes to the dental practice.

Before 2014, only a select number of health care professionals were eligible to apply. Due to the expanding need for CDEs across the nation, the National Certification Board for Diabetes Educators (NBCDE) has created a new pathway, Unique Qualifications Pathway, which includes dental hygienists.

Methods: The requirements to obtain the CDE certification include 30 hours of continuing education in diabetes and achieving 2,000 hours of direct patient diabetes education. An example of practice experience is conducting an assessment of the patient and synthesizing a tailored education plan to meet the needs of the patient, while an example that is not considered to be practice experience includes the actual execution of debridement or polishing. The final hurdle is passing the Certification Examination for Diabetes Educators.

Results: Once completing the requirements, the dental hygienist will be credentialed for a 5 year term. Armed with the specialized knowledge and experience, dental hygienists can be more confident, active and effective in the management of patients with diabetes. As the oral health expert, the dental hygienist will have more opportunities to educate other health providers on dental issues associated with diabetes.

Evaluation Plan: For initial certification, creating or joining online study groups with other dental professionals pursuing the same goal would be valuable. In addition, obtaining a current CDE as a mentor, especially one with a dental background, would provide valuable insight and support. Recertification after 5 years involves 3 options, including taking and passing the examination. Finally, once the value of dental professionals is realized, the certification may be offered to more dental professionals.

Conclusion: The opportunity to become a CDE provides those graduate level dental hygienists with an interest in diabetes to expand their career path and thoughtfully join other health care colleagues in the pursuit of an improved quality of life for patients with diabetes.

Development of an Oral Health and Nutrition Practice Paper for the Academy of Nutrition and Dietetics

*Lisa F. Harper Mallonee, BSDH, MPH, RD/LD; (Texas A&M University System Health Science Center, Baylor College of Dentistry)

*Linda D. Boyd, RDH, RD, LD, EdD (MCPHS University, Forsyth School of Dental Hygiene)

Cynthia A. Stegeman, EdD, RDH, RD, LD, CDE (University of Cincinnati, Raymond Walters College)

Introduction: Oral health is an integral component of overall health and the Academy of Nutrition and Dietetics acknowledged this first in 1995 when an evidence-based oral health and nutrition position paper was initially developed. The position paper has been updated and adopted by the Academy in 2000, 2005, 2009 and 2013. To further enhance the translation of science to practice and to help guide the practice of dietetic professionals, the Academy began developing Practice Papers as companions to Position Papers in 2007. To date, 14 practice papers have been developed as supplements for the 34 position papers.

Methods: In November 2012, the Academy Positions Committee (APC) of the House of Delegates identified authors for the new practice paper for Oral Health and Nutrition. A practice paper complements the corresponding position paper by presenting strategies to implement the science into practice. The APC workgroup oversaw the development of the practice paper.

Through a critical review of the evidence, the authors who are credentialed as both registered dietitians and registered dental hygienists developed the practice paper. In addition to review of the paper by the APC work group, external reviewers included the American Dental Hygienists' Association, American Dental Association, Maternal and Child Health Bureau, Health Resources Services Administration, and several dietetic practice group representatives. Revisions were made based on the reviewer comments prior to final submission to the APC workgroup.

Results: Following approval of the practice paper by the workgroup, the practice paper was accepted for publication on the Academy web site and the abstract will be published in the Journal of the Academy of Nutrition and Dietetics in the June 2014 issue. The practice paper outlines opportunities for dietetic practitioners to collaborate with oral health care professionals (OHCPs) to prevent dental caries with an emphasis on early childhood caries, support establishment of a dental home, prevention of periodontal disease, minimize dental erosion, and health promotion/disease prevention for special populations at high risk for oral disease.

Evaluation Plan: The Practice paper will be republished on a 3 to 5 year cycle by the Academy of Nutrition and Dietetics. Formative evaluation on the benefits of the paper will be gathered from an online survey sent out to the Academy's House of Delegates as well as members of the various Academy of Nutrition and Dietetics Dietary Practice Groups. This qualitative data will be collected prior to the renewal of the practice paper so that these considerations can be taken into account for the updated publication of the paper.

Conclusion: This initiative provides guidance to dietetic professionals to include support for oral health as a component of overall health and highlights the need for collaborative efforts between dietetics and OHCPs to provide high quality comprehensive patient care.

Analysis of Phone Calls Regarding Fluoride Exposure Made to New Jersey Poison Information and Education System in 2010 to 2012

*Sneha Shah, RDH, MPH; Samuel Quek, DMD, MPH; Bruce Ruck, PharmD, DABAT (Rutgers University, School of Public Health)

Introduction: The American Association of Poison Control Center's annual reports demonstrate that acute fluoride exposure is not an uncommon occurrence. Despite its prevalence, there has been little to no published research on the topic in the last 10+ years. The purpose of this study was to calculate the incidence of acute fluoride toxicity and lethality as it occurs in New Jersey and provide a descriptive epidemiology of acute fluoride exposures.

Methods: The study design was retrospective. Records of phone calls made by individuals reporting excessive fluoride exposure to New Jersey's Poison Information and Education System (NJPIES) from the years 2010 through 2012 were extracted from the center's Toxicall® database. This data was analyzed to calculate the incidence of acute fluoride toxicity and lethality. Characteristics of the affected population, and circumstances and medical outcomes of the acute fluoride exposures were also assessed.

Results: A total of 2,476 phone call records met the inclusion criteria. The fluoride exposures reported were from toothpaste with fluoride (49%, n=1,214), mouth rinse with fluoride (21.6%, n=536), multivitamin with fluoride (21.4%, n=530) and pure fluoride (0.08%, n=199). Medically speaking, 94.75% of calls were asymptomatic cases (n=2,346), 4.24% were symptomatic (n=105) and 1.01% were informational inquiries (n=25). Adverse symptoms reported were mostly minor (83.9% of symptomatic cases, n=88) and moderate (16.1% of symptomatic cases,

n=17). The age group 18 months to 3 years of age showed the highest incidence of acute fluoride exposure (53.2%, n=1,317). There was a slightly higher incidence of acute fluoride exposures among males (n=1,317) vs. females (n=1,159). Most incidences occurred in the home (93.1% of records, n=2,305) and occurred unintentionally (96.7%, n=2,394). Calls were mainly made by the patient's mother (67.5%, n=1,671).

Conclusions: Based on the data, there were no reports of lethality or toxicity due to acute fluoride exposure in New Jersey from 2010 through 2012. Symptomatic reports and informational inquiries were rare. All adverse outcomes due to excessive fluoride intake were easily remedied with a calcium antidote. Dental hygienists should educate patients on safe handling of fluoride-containing products. However, findings in this study suggest that levels of fluoride in available dentifrices will not produce life-threatening events, even if taken in doses higher than recommended.

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School-Based Preventive Dentistry Service Program in Ogun State, Nigeria

*Sherifat Omolola Quadri; (Preventive Dentistry Department, Access Oral Services Inc., Abeokuta, Nigeria)
Kafayat Quadri; Monsurat Ololade Onafuwa (Research and Development Department, Preventive Demonstration Centre, Abeokuta, Nigeria)

Introduction: The need for oral health care is the most prevalent unmet health care need amongst the school-aged population in Nigeria, especially those from needy and disadvantaged families, who have neither been exposed to dental information nor treatment.

The objective of the study was to determine if the combinations of widely used preventive procedures, which consist of oral health education and screening, tooth brushing instructions, plaque control and advice on diet, modification of school lunch programmes to reduce the consumption of sugar, oral prophylaxis and application of fluoride; would make a significant difference in the oral health of school children.

Methods: The oral health status of children aged 6 to 11 years and those between 15 to 19 years were assessed in 55 schools. In each school, approximately 1,000 children were divided into 6 groups, and each group received the preventive procedures. A team of dental hygienists and therapists travelled to selected primary schools in Ogun State to examine each child an-

nually afterwards. The results of the examination were matched with selected groups of preventive procedures used to determine how the oral health status of the children were affected.

Results: The effectiveness of the 8 years preventive program was evaluated using the DMFT index. The outcome of the program was also evaluated by clinical signs of gingival inflammation, oral health status, using the community periodontal index or treatment needs (CPITN). Examinations were carried out by researchers at the respective schools. At the initial examination, there was a mean of 3 decayed teeth per child in the experimental group. After 8 years, the DS score for this group was 0.55 (a mean of less than one decayed teeth). The prevalence of the subject diagnosed as CPITN code 3 showed steady decrease from 76% at baseline to 53% after 12 months. Since the programme involved a range of different interventions, the results of the examinations were matched with particular groups of preventive procedures used.

Conclusion: The tremendous backlog of unmet dental problems amongst low-income children in Nigeria can be dealt with successfully by a combination of sustained preventive and treatment plans. School-based oral health care programs would help resolve the problems of inadequate care for large portions of our population. It would ensure convenient access to a comprehensive and good quality oral health services for all children.

Attitudes of Dental Hygiene Students on Rubber Dam Isolation

*Judy Kwapis-Jaeger, RDH, MA; *Swati D. Chitre, RDH, DDS; Srujalkumar Patel, DDS (University of Detroit Mercy)

Problem Statement: Dental hygiene students, in states where the scope of practice allows them to place rubber dams, are taught this skill to clinical competence while in school. Scientific literature contains limited data on whether hygienist actually utilize this skill in practice and why.

Purpose: The purpose of this study was to assess the knowledge and perceptions of dental hygiene students utilizing rubber dam isolation and if they will continue to use it post-graduation.

Methods: The study utilized a convenience sample of dental hygiene students who were selected to complete a survey investigating the knowledge and perceptions on the utilization of rubber dam isolation. Data from 2 separate classes are included in this analysis. Valid data responses were available from 24 students in one class

and 27 students in the other. The instrument used in the study contained 11 items with open-ended and Likert scale questions. 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. IRB approval was granted from UDM School of Dentistry (UDM IRB#1213-10).

Results: Students felt utilization of a rubber dam was important for a dry field (85%). Educational background and/or training was adequate (50%). Clamp placement was identified as the most difficult task in placing the rubber dam. Additional continuing education post graduation would not be sought (85%). Primary disadvantage of the rubber dam isolation is, it is time consuming (90%) and would prefer other methods of isolation (70%). The number one preferred choice of isolation selected was cotton roll isolation followed by dry angle. Majority felt they would continue to use rubber dam isolation after graduation (60%).

Conclusion: The dental hygiene curriculum appears to educate students on the advantages of utilizing the rubber dam isolation. However most dental hygiene students still perceive the utilization of the rubber dam isolation to be a time consuming task. They would prefer other forms of isolation.

Inter-Professional Collaboration Between Dental Hygiene and Elementary School Health Nurses in One North Carolina County

Vickie P. Overman, RDH, MEd; *Sonal A. Patel, BS, MPH (University of North Carolina at Chapel Hill, USA)

Purpose: Public health dental hygienists, along with the oral health programs in North Carolina, have been utilized for many years to improve the overall dental health for the children of the state. Since 1918, North Carolina has administered oral health programs under the direction of the Oral Health Section (OHS), a division of the North Carolina Department of Health and Human Services. Due to reduction in funding, the number of public health dental hygienists, who staff these programs has decreased, while the public school population has increased. This has resulted in a 33% decrease in the dental public health workforce.

Rationale: Orange County, North Carolina was impacted. There was no longer anyone to provide dental screenings and preventive services to the children in the county's schools. As a result, the Orange County Oral Health Collaboration began at Ephesus Elementary School and included the school health nurses, UNC dental hygiene faculty and students from the UNC School of Dentistry.

Program: A program was designed to fill the gap left when the county lost its public health dental hygienist and the services she provided. Phase One: school nurses were trained to complete oral health screenings and referrals utilizing methods that had been validated for use in North Carolina counties for more than 30 years by the OHS. Phase Two: created educational guides for school health nurses and/or elementary school teachers to aid in presenting oral health education programs to children.

Evaluation and Impact: During spring 2013, dental screenings were conducted at Ephesus Elementary School by the school health nurse and a dental hygiene student intern. The results were utilized to make dental referrals for the children in need. Of the total 490 children at the school, 486 were screened and 42 were found to have obvious decay. Thus, indicating successful implementation of the first phase of the project. The educational guides are currently in use at the school and will also be introduced to another group of school health nurses in an Inter-professional Education session with the UNC School of Nursing in spring 2014. During this IPE session, 30 school health nurses will be solicited for feedback about the possible utilization of this program in their schools. Each nurse will develop an action plan for their school. Follow-up to this action plan will be conducted by the IPE faculty in 6 months to determine utilization rates of the program.

Emerging Tobacco Product Use Associated with Perception of Harm in Urban High School Males: A Pilot Cross-Sectional Study

*Elizabeth T. Couch, RDH, MS; Benjamin W. Chaffee, DDS, MPH, PhD; Gwen Essex, RDH, MS, EdD; Catherine Kavanagh, BS; Stuart A. Gansky, DrPH; Jing Cheng, MD, PhD; Margaret M. Walsh, RDH, MS, MA, EdD (University of California, San Francisco)

Introduction: Tobacco use, a major risk factor for oral disease, is the leading cause of preventable death and morbidity in the U.S. Recently, emerging tobacco product use, including electronic cigarettes (e-cigarettes), little cigars and hookahs (tobacco waterpipes) has significantly increased among high school males nationally. Perceived harm associated with these products may be one factor contributing to use, or intention to use. Understanding the relationships of perceived harm to tobacco use, and intention to use, may better prepare dental hygienists to provide effective prevention and cessation counseling of adolescents.

Purpose: To explore the associations of perceived harm with tobacco use, and intention to use among urban high school males.

Research Investigation of Competence on Oral Assessment and Oral Hygiene Care in Nursing Curriculums in the State of Michigan

*Marguerite Buehner, RDH, RDA, MHSA; Judy Kwapis-Jaeger, RDH, MA (University of Detroit Mercy)

Methods: This cross-sectional pilot study was approved by the University of California IRB. After gaining school permission from an all-male California high school with 750 students, a convenience sample of 138 males attending physical education classes was approached to explain the study and distribute parental consent forms. One week later, an anonymous 30 minute, self-administered web-based survey was completed by students with parental permission.

Prevalence of ever-use (lifetime, even once) and current past month use were determined for cigarettes, e-cigarettes, little cigars and hookahs. Perceived harm was measured for each product, "How harmful is use to general health?" scaled from 0 (not at all harmful) to 100 (extremely harmful). For each product, the Mann Whitney U-test compared perceived harm of: (a) ever-users versus never-users; and (b) participants with no intention to use ("definitely" will not) versus all other responses among never-users.

Results: 104 students completed the survey: 23% reported ever-use for little cigars, 21% for e-cigarettes, 20% for hookahs, 20% for cigarettes and 19% reported current use for any product. Overall, perceived harm was highest for cigarettes and lowest for e-cigarettes and hookahs. For each product, individuals who had tried that product reported significantly lower perceived harm than those who had never tried (all $p < 0.02$). Among never-users of each product, those who reported "probably" intending future use had lower perceived harm than those who reported no intention of future use (all $p < 0.005$).

Conclusions: In this study, perceived harm was associated with tobacco use and future intention to use among male adolescents. Dental hygienists need to understand harm associated with tobacco products to correct misconceptions among male adolescent clients when providing oral health education and tobacco cessation counseling. Additional research in a larger sample of adolescents is needed.

Research reported was supported by grant number 1P50CA180890 from the National Cancer Institute and Food and Drug Administration Center for Tobacco Products. The content is solely the responsibility of the authors and does not necessarily represent the official views of the NIH or the Food and Drug Administration.

Problem Statement: Nurses complete Minimum Data Set (MDS) assessments on nursing home residents at initial and monthly intervals which include oral health assessments. This requires nurses to distinguish between oral health and pathology. To investigate that the nursing curriculum adequately prepares graduates to perform the MDS assessment, a survey was designed.

Purpose: The purpose of this study was to evaluate didactic and clinical curricula of nursing programs in Michigan regarding oral health assessment and pathology.

Methods: Surveys were sent to 56 of the state's nursing programs. Eleven were returned with responses (20% response rate). This single blinded study utilized a convenience sample of 11 nursing programs whose directors were selected to complete a survey about the curriculum and methods used for teaching oral health assessment and oral pathology including clinical experiences and didactic hours. The instrument used in the study contained 15 items with close-ended responses. 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. IRB approval was granted from UDM School of Dentistry.

Results: Nursing students completed 2 didactic hours or less in oral health assessment training (91%). Students were taught to assess the oral cavity as part of routine patient assessment (81%) but only one-third of the programs perform intra oral examinations as part of the routine patient assessment (36%). Three hours or less was spent on clinical assessment of the oral cavity (81.9%). Most programs teach the use of a penlight to complete an oral health assessment (81.8%). Clinical competencies were required to be completed in brushing a patient's teeth (36.4%), care of an oral prosthesis (80%) and providing oral hygiene care in a clinical setting (100%). One hour was spent in clinical intra-oral pathology (90%).

Conclusion: If nurses are responsible for initial and monthly oral health assessments of nursing home residents, additional clinical and didactic experience may need to be incorporated into the curriculum including areas of oral health assessment and oral pathology. An alternative is to have other health care professional such as dental hygienists employed at nursing homes to conduct oral hygiene assessments and oral hygiene protocols.

2012 Dental Hygiene Practice in North America – The physical, economic and workforce impact of musculoskeletal disorders among clinical dental hygienists

*Anne N. Guignon, RDH, MPH; *Cindy M. Purdy, RDH, BSDH, CEAS

Problem Statement: Clinical dental hygiene practice involves physical tasks including awkward positions, static postures, repetitive forces and vibration that increase risks of developing workplace-related musculoskeletal disorders (WRMSD).

Purpose: The purpose of this study was to investigate the prevalence and type of WRMSD and injuries among dental hygiene practitioners.

The study goals included: determine the type of personal equipment hygienists use in clinical practice to reduce risks of WRMSD, the measures hygienists take to prevent or alleviate pain from WRMSD, and establish short and long-term impact on hygienists ability to continue in clinical practice after experiencing WRMSD.

Methods: This study utilized a convenience sample collected through an online survey tool over a 3 week period of time in November 2012. Dental hygienists were invited to participate in the survey via multiple social media sites, including ADHA component and constituent internet sites. Participation in the survey was voluntary. The survey instrument contained 22 close-ended questions including basic demographics, clinical practice activities, perceived risks for injury, strategies to minimize injury and personal accommodations for existing WRMSD. The survey instrument was pilot-tested with 12 dental hygienists. All responses were confidential.

Results: A total of 1,217 licensed dental hygienists representing 47 states and 6 Canadian provinces responded. Descriptive statistics were used to analyze the data:

- Mean age 44
- More than 52% practice 25 to 40+ hours per week

The prevalence of injuries reported was:

- One WRMSD (36%)
- Multiple disorders (15%)
- An additional group (19%) worry about developing an WRMSD

Primary injury sites reported included:

- Neck (63%)
- Shoulders (54%)

- Lower back (36%)
- Dominant hand (36%)
- Mid/upper back (28%)
- Non-dominant hand (20%)

Clinicians reported using the following personal equipment to reduce risks for WRMSD:

- Power driven scalers (85%)
- Larger diameter instruments (77%)
- Magnification loupes (58%)

Individual strategies to mitigate discomfort included:

- OTC pain medications (54%)
- Therapeutic massage (51%)
- Stretching during the clinical day (50%)

Clinicians reporting they had reduced their clinical hours also reported temporary reductions (27%) and permanent reductions (38%) to WRMSD and symptoms.

Conclusions: The relationships between perceived risk of injury and reported neck, shoulder, mid and upper back injuries are highly significant ($p < 0.01$). Reported neck, mid/upper back and dominant hand injuries during 6 to 10 years of practice are triple that of the first year of practice, lower back and shoulder injuries are double and injury rates stabilize over longer practice terms. Further research needs to focus on solutions to reduce the incidence of WRMSDs, with particular attention on the first decade of practice.

Geographic Comparisons of Washington State Non-Traumatic Dental Complaint Emergency Department Patients

*Jacqueline A. Juhl, RDH, MSDH Candidate; Ellen Rogo, RDH, PhD; JoAnn Gurenlian, RDH, PhD (Idaho State University)

Objectives: Individuals who lack access to oral health care use emergency departments (EDs) for their oral health needs. Previous research has shown that care provided to non-traumatic dental complaint (NTDC) patients by EDs is ineffective, expensive, and clinically questionable. The intent of this retrospective study was to describe and compare three variables related to two distinct geographic sites in Washington State: demographic profiles, institutional administrative experiences, and clinical experiences of NTDC patients.

Methods: After receiving IRB approval (HSC #4005), the retrospective descriptive comparative study was conducted. Data were provided by two hospitals, one in an urban (URB) location and the other in a rural-to-

urban (RTU) location, from de-identified patient records from March, 2012 to March, 2013. Data were analyzed using parametric and nonparametric to determine geographic differences between the variables at the a level of 0.05.

Results: The usable records provided by the RTU site numbered 197 and by the URB site were 1,183. The demographic profiles indicated that more males visited the ED at both geographic sites. Between the sites a significant difference was found between the ages of the NTDC patients at the two locations. The only significant difference in the administrative experiences was the month of the year patients presented to the ED. Clinical NTDC patient experiences varied by diagnosis, treating provider, and admissions.

Conclusions: Noted demographic and provider-diagnosis variations might adversely affect NTDC ED patient outcomes, impacting policy development, federal funding, and future research.

Dental Hygiene Student Perceptions of an International Learning Experience In Nicaragua

*Vicki Gianopoulos Pizanis, RDH, MS (Assistant Professor, Division of Dental Hygiene, Department of Dental Medicine, The University of New Mexico)
Dara Zafran, PsyD (Assistant Professor, Center for Development, Department of Pediatrics, The University of New Mexico)

Introduction: In 2013, faculty at The University of New Mexico (UNM), Division of Dental Hygiene created a volunteer international elective for graduate and undergraduate dental hygiene students. A week-long experience was offered for students to provide direct oral health care with an interdisciplinary team to a culturally different community with high dental need. The community chosen was Solidaridad, an impoverished community near Granada, Nicaragua. Little research exists on the impact of such international outreach programs among dental hygiene students. The purpose of this study is to ascertain students' perceptions of the impact of an international dental hygiene elective on their personal and professional growth.

Methods: All trip participants were asked to voluntarily complete pre- and post-trip surveys to evaluate their perceptions of the experience. The surveys stemmed from a previously validated and reliable instrument used to assess the effects of international study abroad programs on student volunteers. Questions investigated the impact of experiential service-learning on student development

across several areas including civic responsibility, personal competency and ability to provide significant contributions to the community. An additional focus of the questionnaires was placed on the influence of self-reflection activities while abroad. Seventeen of the 22 dental hygiene student trip participants completed both the pre- and post-surveys. Responses were analyzed to determine the impact of the experience for the participants.

Results: Using descriptive statistics, results indicated that the international experience positively influenced the 17 student participants' growth in the areas of commitment to service, appreciation for domestic resources, and awareness of other communities. Of the student respondents, 81.3% felt quite certain that this international experience would make them a better professional in their field, 62.5% felt it was "extremely important" and 31.3% felt it was "very important" to participate in an international experience in a professional health care education program. Qualitative analyses further revealed that students believed engagement in reflection practices was a valuable contributor to their learning experience and changes in their development.

Conclusion: Beyond The UNM Dental Hygiene Program's standard curriculum, this international outreach mission to Nicaragua offered students an opportunity to grow in several aspects. In accord with The American Dental Association Commission on Dental Education Standards, this elective further met several of the required standards for dental hygiene programs including community outreach and diversity. Findings from this study suggest that experiential learning through international electives such as this can benefit professional and personal development of students of dental hygiene.

Analysis of Digital and Film Based Radiographic Trends in Kentucky for the Dental Hygiene Educator

*Joseph W. Evans, DDS; Pramod Tadakamalla, BDS (Western Kentucky University Program of Dental Hygiene)

Introduction: As a dental hygiene educator, it is important to understand what trends are seen when using digital and film based radiographic systems in private practice. Knowing this information gives faculty a better idea of which of these systems is more prevalent and reasons why a specific type is implemented. The purpose of the study was to compare digital versus film based radiographic use and interpret the reasoning of selection for each practice.

Methods: This cross-sectional study utilized the email addresses of practicing dentists within Kentucky. Data was requested through the use of an electronic survey containing questions pertaining to the type of radiographic system used, reasons why a particular system was integrated into the practice, and practice demographics within each specific office. The survey instrument used in the study contained 21 items with closed-ended responses. Descriptive statistics were used to analyze the data. Data was collected and analyzed from 240 dentists within the state. IRB approval was obtained from Western Kentucky University.

Results: Of the respondents, 76.7% of dentists are presently using digital radiography while 23.3% are using film based radiography in their practice. Practice size influenced the rate of use of digital systems with 63.4% of solo practices, 94.5% of practices with 2 to 3 dentists, and 100% of offices with more than 3 dentists using digital systems. Length of time practicing impacted the rate of use of digital systems with 100% of dentists practicing less than 10 years, 88.9% of dentists practicing 11 to 15 years, and 68.6% of dentists practicing greater than 15 years using digital. As the age of the dentist increased, the rate of digital implementation in the office decreased indicating 100% use at 20 to 30 years of age, 96.1% at 30 to 40 years of age, 80.3% for 40 to 50 years of age, and 65.6% for greater than 50 years of age. The specific type of digital systems used were 80.8% CCD digital sensors, 15.3% phosphor plates and 4% other types. The most important reason stated for using digital radiography was the ability to enhance the image after exposure. The most important reason for using film based radiography was its low cost in comparison to digital.

Conclusion: A gradual transition is being seen in the private practice setting from film based radiography to digital radiography. Newer dentists and group practices have embraced the digital aspect and are currently using it at a higher percentage. New and future dental hygiene graduates are more likely to encounter digital radiography in private practice because of these numbers. Dental hygiene educators should be aware of this conversion and emphasize the importance of teaching the aspects of digital radiography in both the classroom and clinical settings.

First Clinical Patient Care Experiences of Dental Hygiene Students

Camille Payne, PhD, RN (Kennesaw State University, Kennesaw, GA)

*Suzanne Edenfield, EdD, RDH (Savannah Technical College)

Introduction: Creating successful patient experiences for beginning students is essential to provide a strong foundation in clinical patient care for dental hygiene students. The significance of this study was to address the process for ensuring that students receive adequate first year clinical preparation and skill development, which should be a necessary component of effective performance and patient safety. The purpose of this qualitative study was to gain insight into the first clinical experience of first year dental hygiene students.

Methods: Data were collected from one cohort (n=38) of students in a dental hygiene associate degree program in the first year of study. A questionnaire was developed and piloted among first year nursing students. Following the survey pilot and a semester of patient care, dental hygiene students were asked to respond in writing to the questionnaire to describe their first patient care experiences. Data were analyzed utilizing descriptive statistics, by reviewing for patterned codes and themes.

Results: Data analysis revealed consistent patterns of responses in students, with majority of respondents' identification of specific actions from clinical instructors which enhanced or detracted from the quality of their initial experiences. Three primary themes were revealed: anticipation, processing and affirmation. Anxiety and fear before and during the clinical experience were consistently expressed.

Conclusions: Based on the data, specific recommendations for improving the overall experience in the first clinical setting for beginning dental hygiene students were derived and it is suggested that a patient simulation appointment be implemented prior to actual patient care. Improving the quality and nature of first patient care experiences will provide a strong foundation for beginning practitioners, and foster a more positive clinical role development.

2014 DENTSPLY Posters

The Role of the Dental Hygienist in Screening for Sleep Apnea

*Bethany Bewley, RDH, BA, MSDH

Problem: Sleep apnea (SA) can contribute to a variety of serious health problems and often goes undetected. Dental hygienists are in a good position to assess patients for SA, but limited research exists on the feasibility of incorporating SA screenings into dental hygiene appointments. The purpose of this exploratory study was to obtain information about dental hygienists' attitudes, acceptance of and perceived barriers to performing screening for SA during a dental hygiene appointment.

Methods: Sixteen practicing dental hygienists were recruited to complete a pre-screening survey, screen 5 patients for SA using the Berlin questionnaire, and then complete a post-screening survey. Individual screening time and accuracy determining a Body Mass Index (BMI) were recorded during the screening process. Data were analyzed using descriptive statistics, Spearman's rho and Wilcoxin signed-rank test.

Results: A total of 81 patients were screened and 30% were identified to be at high risk of having SA. Participants determined the BMI correctly for 89% of patients, and the mean time spent on screenings was 4.49 minutes. Pre-screening survey results showed 25% of participants felt that it was very important for dental hygienists to screen patients for SA, compared to 50% post-screening. Participants reported patient's willingness as the most important issue when considering incorporating SA screening into practice.

Conclusions: Results suggest dental hygienists can provide patients a valuable health service by including SA screening as part of routine health assessment. Dental hygienists recognize the importance of screening patients for undiagnosed medical conditions and are proficient at conducting these screenings.

Barriers to Membership in the American Dental Hygienists' Association in the State of Georgia

*Brandy J. Henderson, RDH, BSDH, MSAH

Professional associations must have a significant level of membership to be effective. Georgia membership is increasingly low; therefore, ADHA cannot represent dental hygienists' interests. This study determined factors that caused dental hygienists to

continue to forgo membership in the ADHA. Several theoretical views of professional membership were considered. The population was acquired from an unbiased systematic sampling of 50% (3,270) of registered dental hygienists and a convenience sampling of ADHA nonmembers at 2 continuing education seminars in Georgia. Data collection procedures included an electronic cover letter, consent form, and survey via Survey Monkey or hard copies for seminars. Three-hundred and sixteen participated yielded a 9.6% return rate. Participants were primarily women, holding associate degrees and graduates of programs in Georgia. Participants worked full time in private practice, were satisfied with their working hours, and did not join GDHA because membership fee is too high or not sure of benefits offered. Twenty-one percent stated that lowering membership fee would entice them to join, and participants indicated they obtained their continuing education hours at the Hinman (52%) convention and online (27%).

Calculus Detection Calibration Among Dental Hygiene Faculty Utilizing Dental Endoscopy: A Pilot Study

*Brian Partido, RDH, MS

Dental and dental hygiene faculty do not provide consistent instruction in the clinical environment especially in tasks requiring clinical judgment. From previous efforts to calibrate faculty in calculus detection using manikins, researchers suggested using emerging technology in calculus detection to improve the consistency of clinical faculty instruction. Therefore, the purpose of this pilot study is to determine if a training program, designed to improve calibration of dental hygiene faculty members in calculus detection using an ODU 11/12 explorer, manikins and dental endoscopy, will affect intra- and inter-rater reliability levels for faculty receiving training compared with faculty who do not receive training. This pilot study will recruit participants from the dental hygiene faculty at Sacramento City College and will utilize a 2 group randomized experimental design. Intra- and inter-rater reliability levels will be measured before and after the calibration training. Pre- and post-training Kappa averages of all faculty participants will be compared to determine the effectiveness of the calibration training on intra- and interrater reliability levels. To evaluate for any variances between sample groups, ANOVA analysis of the Kappa averages will be calculated.

Use of Immersive Visualization for the Control of Dental Anxiety During Dental Prophylaxis

*Carmelo Padrino, BSDH, MS

Purpose: The purpose of this study was to determine the effectiveness of immersive visualization therapy in anxious patients during an oral prophylaxis.

Methods: A split mouth design was utilized in a convenience sample of thirty adults (7 males and 23 females). Subjects were randomly divided into two groups: group A (immersive visualization on the right side), and group B (immersive visualization on the left side). Subjects received a full mouth oral prophylaxis, always starting with the right side. At screening medical and dental histories, oral examinations and Corah's Dental Anxiety Scale-Revised (DAS-R) were performed. Individuals who scored a 9 or higher on the DAS-R presented with no severe dental calculus, severe periodontal disease, severe dental caries or medical contraindications were enrolled. At baseline the DAS-R was validated. The Calmness Scale was scored pre- and post Immersive visualization treatment. After the full mouth prophylaxis, subjects completed a post-immersive visualization Opinion Survey.

Results: Results showed there was no statistically significant difference in anxiety level between groups, based on DAS-R ($p=0.69$). There was a statistically significant correlation between Calmness Scale and gender ($p=0.01$); females report higher anxiety levels than men. Ninety seven percent of the subjects responded positively to the use of immersive visualization eyewear during treatment.

Conclusion: The use of immersive visualization eyewear during oral prophylaxis can be an effective method to control anxiety.

The Effect of Piezoelectric and Magnetostrictive Scaling Devices on Treatment Outcomes

*Chadleo Webb, RDH, BSDH

There are 2 types of ultrasonic devices used by dental hygienists: magnetostrictive (M) and piezoelectric (P). Research supports using these devices during prophylaxes/periodontal debridement, but there is little evidence determining which is superior. The purpose of this study is to determine if there is a difference in calculus removal effectiveness between these ultrasonic devices. A secondary purpose is to determine if patient and practitioner preferences exists between the units. Subjects included senior dental hygiene students and patients of The OSU College of Dentistry. This double blinded study employed a quantitative quasi-experimental random-

ized split mouth design on contra-lateral quadrants for the evaluation of calculus removed by each device. Five calibrated examiners recorded the presence of calculus on the quadrants assigned prior to and post treatment. Upon completion of each device, patients completed a visual analog scale (VAS) to gauge patient preference and each student completed a 5-point Likert survey to measure practitioner preference. Sixteen of 40 subjects completed the study. Preliminary data reveals the M device removed more calculus than the P device (73% vs 70%, respectively). Results from the student survey reveal the M device was more user friendly than the P device (1.6 vs 2.5, respectively). Other areas of practitioner preference were comparable. Results from the patient VAS reveal M is preferred for discomfort, vibration and noise factors. Although this study is still in progress and being analyzed for statistical significance, current data suggests the magnetostrictive device is superior for calculus removal, patient and practitioner preference.

The Use of Restorative Procedures Among Allied Dental Health Personnel in Minnesota

*Jennifer Post, RDH, MDH

Background: In 2003, the Minnesota legislature revised the Dental Practice Act to include restorative functions in the scope of practice for dental assistants and dental hygienists. This study examined the impact of this change on dental practice.

Methods: A survey was mailed to all restorative function (RF) certified professionals ($n=387$) in Minnesota to determine how RF was being utilized and by whom. Descriptive statistics were used to summarize the data. T-tests and Fisher's exact tests ($p\text{-value}<0.0001$) were used to make comparisons between groups.

Results: There was a 63% response rate. Less than half (38%) of the participants licensed to perform RF were utilizing this skill. Of those using RF in practice, 71% were dental assistants. Increased access and an increase in the number of patients treated were perceived by respondents as outcomes of RF.

Conclusions: The results of this survey indicated the impact of restorative functions on statewide dental practice has been limited. More dental assistants reported using restorative functions than dental hygienists. The practice location of those using restorative functions was nearly equally distributed between urban areas and Greater Minnesota. Practitioners who obtained their restorative function training through a continuing education program were more likely to use their skills than those who received their training within their professional curriculum. Perceptions of those utilizing this function indicate a positive impact on clinical practice.

Assessing Evidence-Based Practice Knowledge, Attitudes, Access, and Confidence Among Dental Hygiene Educators

*Jennifer Stanley, RDH, BSDH

Purpose: To assess U.S. dental hygiene educators' evidence-based practice (EBP) knowledge, attitude, access, and confidence utilizing the KACE assessment instrument, which was designed and validated for dentistry by Hendricson et al.

Methods: A cross-sectional survey was conducted with a sample of dental hygiene faculty from 334 U.S. dental hygiene schools, which included 246 associate dental hygiene programs and 88 baccalaureate dental hygiene programs. ANOVA and Pearson correlation coefficient statistical analysis were conducted to investigate whether significant differences or a correlation exists between selected demographic variables and the level of knowledge, attitudes, access and confidence in applying evidence-based principles toward patient care.

Results: The response rate was 37% (n=124). Analysis showed a positive correlation between confidence scores and knowledge, attitude and access scores. Study findings also revealed that faculty that held advanced educational degrees scored significantly higher in EBP knowledge and confidence.

Conclusions: The level of EBP knowledge, attitude, access and confidence has been shown to increase with additional education. Therefore, more EBP training may be necessary for faculty that do not possess advanced degree levels of education. Further incorporation of EBP into dental hygiene curricula may occur as dental hygiene educators' knowledge of EBP increases, which in turn could enhance students' acquisition of EBP skills and their application of EBP principles toward patient care.

Oral Health in the Pediatric Primary Care Setting: A Survey of Attitudes and Practice Behaviors of Physician Assistants Nationwide

*Kelly A. Braun, RDH, MSDH, PHDHP

Oral health is a topic absent from the required curriculum for physician assistants, therefore, it is unclear if physician assistants are comfortable or willing to apply fluoride varnish and incorporate oral health topics within their practice. This study sought to determine the oral health training practicing pediatric primary care physician assistants have received and to evaluate the current practice behaviors of physician assistants in regards to oral health. Surveys were distributed to 194 physician assistants at three PANCE board review courses across

the country. Twenty-five valid surveys were returned (n=25), and 80% (n=20) indicated that they did not feel as though they had received adequate oral health education prior to licensure. Mann-Whitney U tests were performed to test the null-hypotheses. There was a slight difference in mean rank when evaluating the physician assistant's comfort level in regards to applying fluoride varnish; however, no statistical significance was present. These tests were also performed to determine the difference between the perceived need for more oral health education prior to licensure and the physician assistant's comfort level in performing certain oral tasks. No statistical significance was evident between the perceived need for additional education and the comfort level of the PA prescribing fluoride supplementation (U=30, p=0.123, r=-0.309). While further research is recommended, physician assistants seem generally willing to incorporate oral health into their practice but believe that further education is necessary.

Physician Evaluation Among Dental Patients who Screen High-Risk for Sleep Apnea

*Kristin D. Dillow, RDH, MS; Gregory K. Essick, DDS, PhD; Anne E. Sanders, MS, PhD, MS; Rose D. Sheats, DMD, MPH; Jennifer L. Brame, RDH, MS

Introduction: Obstructive sleep apnea (OSA) is increasing in prevalence, widely undiagnosed, and a precursor of significant pathology. Collectively these features point to the public health salience of OSA screening in clinical settings. This study sought to investigate the feasibility of screening for OSA risk in a dental practice and to examine the response of patients to a recommendation for physician evaluation.

Methods: A convenience sample of 119 adults was recruited at a community-based dental practice. OSA risk was assessed using the validated STOP screening questionnaire and overnight pulse oximetry. Patients classified as high-risk on one or both instruments were advised to seek physician evaluation within 3 months. Three months later, patients were asked by telephone if they had sought physician evaluation. Prevalence ratios (PR) with 95% confidence limits (95% CL) were estimated using a log-binomial regression model in which the binary dependent variable was physician evaluation. The independent variable was OSA risk classified as low-risk on both instruments or high-risk on: STOP only, pulse oximeter only or both instruments. Covariates were age, sex, body mass index and daytime sleepiness.

Results: Among 119 patients, 50.4% screened high-risk on STOP questions, 58% on pulse oximetry, and 31.9% screened high-risk on both instruments. Physician consultation information was obtained from 111 patients (93.3%). Of those patients who screened high-

risk for OSA, 35.3% (n=42) sought physician evaluation. There was no difference in consultation behavior between patients who screened high-risk on STOP questions alone compared to those at high-risk on pulse oximetry alone (PR=1.42, 95% CL: 0.51, 3.94). Likewise, subjects classified high-risk on both instruments were not significantly more likely to consult a physician than those at risk on the STOP questions alone (PR=1.91, 95% CL: 0.73, 4.99).

Conclusion: Dental patients were equally receptive to seek physician evaluation when screened high-risk for OSA on one instrument versus both. Findings have implications for establishment of recommendations for clinically-based OSA screening.

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Admission Requirements for A.S. Degree Dental Hygiene Programs: Implications for Admission Committees

*Leslie D. Acree, RDH, BS, MDH

Admission requirements for Associate Degree dental hygiene programs differ from program to program. The purpose of this study was to determine which admission requirements were most commonly used by these programs.

To determine differences, a 13 question survey was developed and distributed via Survey Monkey. One-hundred and thirty-four associate degree dental hygiene program directors that participated in the Council on Interstate Testing Agency (CITA) during 2013 received questionnaires to determine program admission requirements. An email with the Survey Monkey survey link and a letter of consent and study explanation was sent. A 2 week window response deadline was given to the study population. A follow up reminder email was sent at 1 week to ensure participation. Two additional reminder emails were sent to potential participants with the last email stating the survey should take no longer than 10 minutes and results of the survey could be mailed to participants upon request to further garner participation.

Based on a small response rate (37%), this study concluded an admissions rubric/use of a points system was the more widely used admission instrument. Included in the rubric were high school and college GPA, entrance exams such as ACT, SAT, Test of Essential Academic Skills (TEAS) and Career Readiness Test, grades earned in science prerequisite courses, and observation of a dental hygienist prior to entering a dental hygiene associate degree program. Future research should include

increasing participation for this study and determining which admission requirement(s) will identify students who will matriculate and subsequently well represent the dental hygiene profession.

Oral Health Knowledge of Eating Disorder Treatment Providers

*Lisa B. Johnson, RDH, BSDH

Purpose: The aim of this study was to explore oral health knowledge and opinions of eating disorder professionals.

Significance: Individuals with eating disorders require significant preventive and/or restorative dental treatment as a result of this disorder, and many lack access to appropriate oral care during treatment.

Methods: A descriptive, exploratory survey of licensed behavioral and medical health providers assessed level of oral health related education, knowledge and treatment recommendations. An invitation to participate in a web-based survey was sent via electronic newsletters and/or list-servs to three professional eating disorder organizations. An inability to track the use of electronic media within the study time frame precluded an exact number for the study population, however, the proportion of respondents (n=107) directly corresponds to the framework of the eating disorder treatment team.

Results: Of the respondents who completed surveys, a majority (64.4%) reported dissatisfaction with their level of oral health education, and 19.5% reported no oral health education. Respondents consider their knowledge of clients risk for oral disease as average or above (84%), and ranked tooth erosion as the greatest reason for oral care (63%) while dry mouth led in the rankings for least significant (33%). Referral for oral care was found to be more common after reports of complication (55%).

Conclusions: Eating disorder professionals may lack understanding of associated oral risk factors, and current oral guidelines. Oral care providers should be considered for inclusion within the eating disorder treatment team.

Assuring Dental Hygiene Clinical Competence for Licensure: A National Survey of Dental Hygiene Program Directors

*Lucinda Fleckner, RDH, MS

Purpose: To conduct a national survey of dental hygiene program directors to gain their opinions of alternative assessments of clinical competency, as qualifications for initial dental hygiene licensure.

Methods: A 22 question survey, comprised of statements eliciting Likert-scale responses, was developed and distributed electronically to 341 U.S. Dental Hygiene program directors. Responses were tabulated and analyzed using Qualtrics® computer software. Data were summarized as frequencies of responses to each item on the survey.

Results: The response rate was 42% (n=143). The majority of respondents (65%) agreed that graduating from a Commission on Dental Accreditation (CODA) approved dental hygiene program and passing the national board examination was the best measure to assure competence for initial licensure. Most (73%) agreed, "The variability of live patients as test subjects is a barrier to standardizing the state and regional examinations." The statement that the one-time state and regional examinations have "low validity in reflecting the complex responsibilities of the dental hygienist in practice" had a high (77%) level of agreement.

Conclusion: Most dental hygiene program directors agree that graduating from a CODA-approved dental hygiene program and passing the national board examination would ensure that a graduate has achieved clinical competence and readiness to provide comprehensive patient-centered care as a licensed dental hygienist.

Do Cardiologists Refer Patients for Periodontal Evaluation?

*Valerie Maxey, RDH, MSDH

Purpose: The association of periodontal disease and atherosclerotic vascular disease is proven in current scientific literature. However no empirical

evidence exists to suggest cardiologists recognize this link or collaborate with dental professionals to improve health outcomes for their mutual patients.

Methods: This qualitative research study utilized grounded theory methodology. A standardized open-ended interview with 12 questions provided data to examine the beliefs and practices of five cardiac specialists. Theories were developed that help explain the central phenomenon of a perceived lack of professional collaboration between cardiology and dentistry.

Results: Results imply that while study participants accept the oral-systemic link as associative and relevant to cardiovascular disease, they are not convinced treating periodontal disease or collaborating with dental providers will affect health outcomes. Theories that emerged to support these findings are: (a) periodontal disease has not been proven causal, (b) cardiac practitioners' lack of time; must focus on well known risk factors, (c) if something is obvious about the patient's oral health, it will be discussed with patient, (d) cardiologists adhere to practice standards and guidelines, and (e) collaboration will only happen when dentist initiates it.

Conclusion: Study findings suggest because patients are not likely to hear about the oral-systemic link at the cardiology office, dental professionals should be prepared to address the oral-systemic link when providing oral care. Additionally, because cardiologists are not formally trained to detect all types of oral infection, and do not routinely refer to dentists for evaluation; the opportunity for medical and dental collaboration is overlooked.