

# Poster Sessions

## Health Promotion/Disease Prevention – Original Research

### Comparing Consumer Acceptance and Perceived Benefits Of Two Floss Technologies

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**Purpose:** The purpose of this quantitative, in-home use study was to evaluate consumer acceptance and benefits of a new floss technology regarding parameters of perceived cleaning efficacy, comfort and overall liking.

**Problem statement:** Can a consumer perceive differences between 2 floss technologies in factors that might affect patient compliance, such as perceived cleaning efficacy, comfort and overall liking?

**Methods:** Two-hundred and sixteen respondents, across 6 different geographic locations in the U.S., completed a questionnaire in this blinded, paired-comparison, 2-way crossover home use study evaluating 2 dental floss products. Respondents were instructed to use each product at least 3 times over a 3 day period with 1 day of rest between test periods. Responses were scored on a 9-point hedonic/intensity, or a 5-point agree/disagree scale. Data was analyzed using a 2-way ANOVA with respondent and floss product as factors.

**Results:** Results demonstrated that the Micro-Grooves™ technology monofilament floss (Reach® Ultraclean™ floss) was superior to a standard monofilament floss (Crest® Glide® Original Mint floss) for overall liking (7.05 vs. 5.99,  $p < 0.05$ , 1 = dislike extremely, 9 = like extremely), perceived cleaning (7.55 vs. 6.99,  $p < 0.05$ , 1 = extremely ineffective, 9 = extremely effective) and comfort (“comfortable to hold” (7.29 vs. 6.14,  $p < 0.05$ , 1 = extremely uncomfortable, 9 = extremely comfortable), “comfortable to grip” (4.10 vs. 3.25,  $p < 0.05$ ) and “having better control while flossing” (3.97 vs. 3.28,  $p < 0.05$ , 1=completely disagree, 5=completely agree)).

Additionally, both flosses were similar for “resistance to shredding or fraying” and easy sliding (“easy to insert,” “easy to remove” and “easy to slide between teeth”), with one exception. Among Crest® Glide® floss users, the new technology was perceived as significantly easier to insert.

**Conclusion:** This home use test demonstrated consumer perceivable differences between 2 floss technologies and the superior performance on overall liking, perceived cleaning efficacy and comfort of a new monofilament floss with Micro-Grooves™ technology compared to a standard monofilament floss.

### The Epidemic Of Dental Disease In Poor Children Of Northeast Philadelphia

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**Purpose:** To determine the extent and severity of dental disease in 2 to 9 year olds in a targeted low socioeconomic Northeast Philadelphia population.

**Problem Statement:** Data compiled by St Christopher's Foundation for Children found in children 2 to 3 year olds 28.4% had dental decay. By 8 to 9 years old, incidence rose to 72.4%. These rates are double those of the state and Philadelphia and triple the Healthy People 2010 target.

**Methods:** The study was a quantitative retrospective study of 2,527 children, ages 2 to 9 years old, treated through the St Christopher's Foundation for Children's Mobile Dental Program (Ronald McDonald Care Mobile) during a 2 year period from Jan. 1, 2007 to Dec. 31, 2009. Data is compiled by age and looks at the children seen with dental decay expressed as number of children and percentage by grouping. The study compiled the severity of dental decay by recording the number of teeth with decay per child.

**Results:** Data showed a significant incidence of disease starting in toddlers, with over 28% of children in this group suffering from decayed teeth. By kindergarten, the incidence doubled to 56.7% and the trend continued to reach 72.4% by age 9, when the incidence began to

level off. Looking at severity, 30% of the 2 to 3 year olds had decay in 5 or more teeth – this increased to 43% by age 8.

**Conclusion:** Dental disease is a major concern for Northeast Philadelphia. The earlier a child accesses dental care, the more likely the child will have fewer decayed teeth. Early intervention reduces the number of decayed teeth, reduces the need for restoration, reduces the cost of dental treatment, reduces the chance of recurrent decay and increases the chance a child will maintain healthy dentition.

## Strengthening The Quality Of Oral Cancer Screening

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**Purpose:** To study current oral cancer screening practices, identify factors that influence this behavior and study the effects of using a novel adjunctive screening device (fluorescence visualization (FV)) within community dental offices.

**Problem Statement:** Oral cancer screening is a noninvasive, quick and painless skill that oral health professionals are taught, yet less than 30% of people surveyed have ever been screened. More than 40% of oral cancers are diagnosed at a late stage where 5–year survival is poor. There is a need for continuing education to maintain and promote this skill, and to incorporate this behavior into consistent daily routine.

**Methods:** Fifteen dental offices from the Vancouver area took part in a 1 day oral cancer screening workshop, offering both didactic and clinical components. Offices screened patients 21 years of age and older for 11 months, collecting demographic, clinical and FV information by questionnaire. Two focus groups were used to identify factors influencing screening behavior and the value of FV. Suspicious lesions were referred to a specialty clinic or reviewed by a community facilitator.

**Results:** Of the 2,599 patients screened, 438 lesions were recorded. Ninety-four of 133 patients asked to return in 3 weeks were reassessed. Twenty-six patients

were referred directly to a specialty clinic while a further 34 were reviewed by a study facilitator who referred an additional 7. Seven patients were biopsied resulting in 3 dysplasia cases.

**Conclusions:** Future workshops should focus on clinical presentation of benign and variations of normal mucosa. Reviewing a lesion 3 weeks after the initial visit greatly reduced the number of confounders and unnecessary referrals.

**Acknowledgements:** Supported by NIDCR grant R01DE13124 and a scholarship from the Michael Smith Foundation for Health Research to DML.

## Biofilm Removal With A Dental Water Jet

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**Purpose:** To evaluate the effect of a dental water jet on biofilm using scanning electron microscopy (SEM).

**Problem Statement:** Traditional measures of detecting biofilm by staining and viewing with the naked eye (Plaque Index) provide limited information on the impact to the biofilm by a device. This study was designed to provide information on biofilm removal at the microscopic level.

**Methods:** Eight teeth with advanced aggressive periodontal disease were extracted. Ten thin slices were cut from 4 teeth. Two slices were used as the control. Eight were inoculated with saliva and incubated for 4 days. Four slices were treated using a standard jet tip and 4 slices were treated using an orthodontic jet tip. The remaining 4 teeth were treated with the orthodontic jet tip but were not inoculated with saliva to grow new biofilm. Experimental teeth were treated using a dental water jet for 3 seconds on medium pressure. Images of the control and samples were taken with the SEM from representative areas of treated and untreated regions of the tooth slices, and total bacteria numbers were counted on standard areas of 10  $\mu\text{m}$  x 10  $\mu\text{m}$ . The mean was determined and the results were extrapolated on a standard area of 1  $\text{cm}^2$ . The extrapolated area was then multiplied with the number of bacterial layers of the biofilm. The total bacterial load was calculated.

**Results:** The standard jet tip removed 99.99% of the salivary (ex vivo) biofilm, and the orthodontic jet tip removed 99.84% of the salivary biofilm. Observation of the remaining 4 teeth by the naked eye indicated that the orthodontic jet tip removed significant amounts of cal-

cified (in vivo) plaque biofilm. This was confirmed by SEM evaluations.

**Conclusion:** The dental water jet (Water Pik, Inc, Fort Collins, Colo.) can remove both ex vivo and in vivo biofilm. Water Pik, Inc. donated the dental water jets used in this study. Water Pik, Inc. has provided unrestricted research grants to the Center for Biofilm, USC School of Dentistry.

#### References

1. Gorur A, Lyle DM, Schaudinn C, Costerton JW. Biofilm removal with a dental water jet. *Compend Contin Dent Ed.* 2009;30(Special Issue 1):1–6.

### Effect Of Low-Temperature Atmospheric Pressure Plasma Pencil On Streptococcus Mutans

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**Purpose:** This study was conducted to determine if low-temperature atmospheric pressure plasma (LTAPP) has the ability to inactivate dental caries causing bacteria, specifically *Streptococcus mutans*.

**Problem Statement:** Given the limited knowledge available on the bactericidal effects of LTAPP, this investigation set out to determine if LTAPP was effective at inactivating the caries causing bacteria *S. mutans*.

**Methods:** *S. mutans* were inoculated at a 1:100 dilution in brain heart infusion broth and exposed to LTAPP at various time intervals (60, 120, 180 and 300 seconds). Seventy-two samples of *S. mutans* were exposed and 18 samples served as controls. Samples were plated on Mitis salivarius agar and incubated 48 hours at 37°C. The number of colony forming units (CFU) and inactivation factor were determined. Data were analyzed using repeated measures ANOVA at 0.05 $\alpha$  significance.

**Results:** Analysis revealed a statistically significant bactericidal effect of *S. mutans* when exposed to LTAPP at each time exposure of 60, 120, 180 and 300 seconds. There was an average 95% inactivation factor for the 300 second exposure.

**Conclusion:** LTAPP has a statistically significant bactericidal effect at 60, 120, 180 and 300 second exposures, as measured by CFU. Inactivation effect on *S. mutans* at 300 second exposure were 95%, 92% at 180 second exposure, 76% at 120 second exposure and 53% at 60 second exposure.

### Comparative Plaque Removal Evaluation Of Two Floss Technologies

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**Purpose:** The objective of these 4 independent clinical studies was to compare the interproximal plaque removal efficacy of Reach® Ultraclean™ floss versus various marketed flosses (Crest® Glide® Original Mint, Oral-B® SATINFLOSS®, Crest® Glide® Deep Clean, Crest® Glide® Whitening Plus Scope®, Crest® Glide® Comfort Plus and Crest® Glide® Shred Guard).

**Problem Statement:** Can a new monofilament dental floss with Micro-Grooves™ technology provide greater interproximal plaque removal than various marketed floss products?

**Methods:** Each Internal Review Board approved clinical study followed the same design: observer-blind, randomized, 3-way crossover, controlled design. A trained dental examiner performed pre-flossing plaque evaluations on subjects according to the Proximal/Marginal Index (PMI), and qualified subjects were randomly assigned to their sequence of treatments. A registered dental hygienist performed surrogate flossing on the 8 incisors followed by post-flossing PMI assessments. Subjects visited the clinical site 3 times with at least a 24 hour rest period between each visit. Data was analyzed based on an ANCOVA model with sequence, period and treatment as fixed effects, subject within sequence as random effect and the corresponding pre-flossing score as a covariate.

**Results:** In these 4 studies, Reach® Ultraclean™ floss removed statistically significantly more interproximal plaque than the comparator dental flosses ( $p < 0.001$ ) with percent reductions from pre-flossing plaque means as follows: Reach® Ultraclean™ (41.7%, 43.4%, 52.7% and 67.27%), Crest® Glide® Original Mint (19.3% and

28.8%), Oral-B® SATInfloss® (21.6% and 29.9%), Crest® Glide® Deep Clean (19.0%), Crest® Glide® Whitening Plus Scope® (17.2%), Crest® Glide® Comfort Plus (31.34%) and Crest® Glide® Shred Guard (32.15%).

**Conclusion:** Reach® Ultraclean™ floss with new Micro-Grooves™ technology removed significantly more interproximal plaque than the comparators tested. Presented at IADR/AADR/CADR 87th General Session and Exhibition, Miami, Florida, April 1–4, 2009, Abstract 1574.

## Understanding Dental Hygienists As Adult Learners In Social Action

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**Purpose:** The underserved population is more vulnerable to oral diseases from the lack of access to care, preventive services and comprehensive care. Dental hygienists are engaged in social action to improve access to care by providing direct care to the underserved population and working on legislative initiatives to expand the scope of practice. The purpose of the study was to understand dental hygienists as adult learners in social action.

**Problem Statement:** The problem addressed by the study was the evolving role of practitioners as they challenged and changed the systems and policies to improve population health, which has not been addressed from the dental hygiene perspective. The significance of the inquiry was to understand what and how dental hygienists learned in their struggle to improve access of care.

**Methods:** A qualitative approach to data collection included personal interviews with 8 participants from California, Oregon and Washington who met the inclusion criteria. Data was analyzed using constructivist grounded theory methods and situational analysis.

**Results:** The grounded theory analysis revealed 3 categories of participant experiences: awareness, adaptation and relationships. Awareness was supported by the subcategories self-awareness, status quo, recognition of power and injustice of systems. Adaptation was supported by the 2 subcategories specialization and creativity, while relationships were supported by the connectedness and collaboration subcategories. The situational analysis illuminated learning in formal settings, non-formal settings and the informal settings of nursing home practices, public health practices, community health center and the professional association. Three significant issues emerged from the analysis: dental insurance reimburse-

ment, dental hygiene education and improving the oral health delivery system.

**Conclusion:** Dental hygiene practitioners as adult learners used a variety of strategies in their work place and as members of the professional association to learn in social action.

## Expanding The Role Of Dental Hygienists Providing Access To Care Using A School Based Model And Teledentistry

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**Purpose:** To provide preventive oral health services in a school based setting.

**Problem Statement:** Can a school-based preventive oral health program improve access to care? How will this affect the rate of decay and number of sealants in children?

**Methods:** This model replicates the “Community Collaborative Practice” model developed by Apple Tree Dental. It allows universal access by providing care “directly in the child’s school.” It expands the role of dental hygienists in the delivery of preventive care services by establishing telehealth links with dentists. The infrastructure promotes holistic care by integrating all health care-related services. Services are provided by dental hygiene students supervised by faculty holding a Kansas dental hygiene extended care permit.

**Results:** Approximately 916 children were eligible to participate in this program during the 2008–2009 school year, with 450 children enrolling. Baseline data from the first target school were collected on 189 children with 119 (63%) exhibiting active decay. Sealants, restorative dentistry and dental hygiene care were rare. Children in our target population had a much higher rate of decay and significantly fewer sealants than children documented in a recent statewide survey, “Smiles Across Kansas 2007 Update.” Additionally, they did not meet the goals of Healthy People 2010 to reduce the proportion of children, adolescents and adults that have untreated dental decay to less than 21%, and to increase the proportion of children who receive sealants on their molar teeth to 50%. As a result, all 189 children received preventive services including teeth cleanings, fluoride, x-rays, seal-

ants and education. Children who had decay were referred to dentists in the community that were part of the program “Dentists Community Care.”

**Conclusion:** This model significantly increased access to care in both unserved and underserved populations. Future efforts will be directed toward obtaining funding to extend the program. This project was approved by the University of Missouri–Kansas City IRB and funded by the REACH Health care Foundation.

## Health Promotion/Disease Prevention – New Programs

### Beneficial Outcomes From A Service–Learning Community Program

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**Purpose:** The purpose of this program was to report the benefits of a school–based sealant program that was a service–learning opportunity for dental hygiene students.

**Significance:** Dental and dental hygiene schools have the opportunity to become involved in programs that benefit their communities and make a significant impact on the oral health of the children in those communities. More outcomes need to be reported on the retention rates of pit and fissure sealants (PFS) placed in school–based sealant programs to provide evidence of the effectiveness of these programs.

**Key features:** Many service–learning activities in dental hygiene curriculum are one–time opportunities for students to experience community service. This program provided feedback on the 1 year retention rates of sealants placed by dental hygiene students using only donated and volunteer resources.

**Evaluation:** During the spring of 2008, the dental hygiene faculty coordinator returned to 5 elementary schools to complete visual dental exams on third graders who received PFS the year before. Of the 205 students in the program, 174 (71.7%) were available to be re–examined. A total of 479 PFS were placed on the first molars of these students. This represented approximately 71% of the total sealants placed during the spring of 2007. Two hundred eighty–nine sealants were identified by visual oral exams. The retention rate was 60.3%. The outcomes from this program suggest that a potential of 289 first molars were protected from dental caries.

## A Team Approach For Community Outreach

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**Purpose:** The purpose of this program was to increase collaborative partnerships with the School of Dental Medicine at Stony Brook University and the Suffolk and Nassau County Dental Societies, in order to provide preventive oral health services to underserved children in the community. Program goals were to reach children in the community who do not have access to oral health care, to provide students the opportunity to participate in a large community outreach program and to increase student’s competency in assessing, managing and treating children of all ages.

**Approach:** As a host site, the dental hygiene program utilized sophomore students as care providers, freshman students as assistants and dental residents to provide urgent care. Notification of the event was given to local elementary schools via the school health nurse. Appointments were made in blocks of 25 and all children were accompanied by a legal guardian. Once arriving at the site each child was paired with a dental hygiene student who reviewed the health history and consent form, completed an intra and extra oral exam, provided oral health education, performed an oral prophylaxis, placed dental sealants and fluoride varnish. Dental hygiene faculty reviewed student findings and the supervising dentist signed the screening forms.

**Evaluation:** Students performed 106 dental screenings and 98 oral prophylaxes, 101 dental sealants were placed, 2 children received urgent care and all children and parents participated in an oral health education program. Of the 106 children seen at Farmingdale, 58% presented with decay, indicating the need for such outreach programs. This collaborative approach toward community outreach was an outstanding way to unite the dental community in reducing health disparities and improve oral health outcomes.

## Application Of Evidence In Health Care Practice: A Cross-Discipline Comparison

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**Purpose:** The purpose of this study was to explore the understanding and experiences of evidence-based practice (EBP) in 3 different disciplines: dental hygiene, nursing and psychiatry.

**Problem Statement:** Research has demonstrated that there is a delay between new research findings and their application to practice. These delays can have serious implications for patient/client outcomes and treatment costs.

**Methods:** This exploratory, qualitative study used a grounded theory approach. A purposeful, convenience sample of 10 health care professionals (n = 3 dental hygienists, n = 4 nurses, n = 3 psychiatrists) was selected based on the individual researchers respective backgrounds. Researchers conducted individual interviews using a semi-structured interview approach. Data was first organized into substantive codes based on predetermined sensitizing concepts (enhancers and barriers to implementing EBP). Next, researchers identified emergent themes. Finally, participant experiences were compared across professions.

**Results:** Over 100 pages of transcribed data were available for analyses. The majority of study participants demonstrated an understanding of EBP, but most described a somewhat limited interpretation, only recognizing the "research" component. All participants were able to identify enhancers and barriers to implementing EBP, and over 50 substantive codes were revealed, which all

fit within the 2 sensitizing concepts. Seven major themes emerged from these codes that researchers categorized as either being individual knowledge and attitudes factors or structural characteristics of the workplace. Through cross discipline comparisons, both differences and similarities within and across the 3 professions emerged.

**Conclusions:** This study revealed that many individual characteristics and attitudes and the workplace culture act together on health care practitioners' ability to implement EBP, which is consistent with the work of others. The investigators concluded that there is a complex interplay between individual factors and, critically, the unique cultural features of different health professions that affects one's implementation of evidence into practice.

## Identification Of Pathogen And Host-Response Markers Correlated With Periodontal Disease

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**Purpose:** This study sought to determine the ability of putative host and microbially-derived biomarkers to predict periodontal disease status from whole saliva and plaque biofilm.

**Problem Statement:** Periodontal disease afflicts over 50% of the adult population in the U.S., with approximately 10% displaying severe disease concomitant with early tooth loss. The development of rapid point-of-care (POC) diagnostics has the potential for early detection of periodontal infection and progression to identify incipient disease and reducing health care costs.

**Methods:** One hundred subjects were equally recruited into a low-risk disease cohort and a periodontal disease population. Whole saliva was collected and analyzed using antibody arrays to measure the levels of multiple pro-inflammatory cytokines and bone resorptive/turnover markers. Salivary biomarker data were correlated to comprehensive clinical, radiographic and microbial plaque biofilm level for the generation of models for periodontal disease identification.

**Results:** Significantly elevated levels of MMP-8 and MMP-9 were found in subjects with advanced periodontitis with Random Forest importance scores of 7.1 and 5.1, respectively. Receiver operating characteristic curves demonstrated that permutations of salivary biomarkers and pathogen biofilm values augmented the prediction of periodontal disease category. Multiple combinations of biomarkers (especially MMP-8, MMP-9 and osteoprotegerin) combined with “red complex” periodontal pathogens displayed highly accurate predictions of periodontal disease category. Elevated salivary MMP-8 and *T. denticola* biofilm levels displayed robust combinatorial characteristics in predicting periodontal disease severity (AUC = 0.88; OR = 24.6, 95% CI = 5.2, 116.5).

**Conclusions:** We have identified host and bacterial-derived biomarkers correlated with progression of periodontal disease. This approach offers significant potential for discovery of biomarker signatures for the development of rapid POC diagnostics for oral and systemic diseases. This work was supported by NIH/NIDCR U01-DE014961 and NCRR UL1RR024986.

## Increasing Utilization Of Preventive Dental Care Services Through Affiliated Practice Dental Hygiene

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**Problem Statement:** Minority children and children from lower income families more likely experience the burden of dental disease. Since oral disease reduces quality of life, it is a priority to increase utilization of preventive dental services.

**Purpose:** Through Arizona’s Affiliated Practice Relationship, hygienists are permitted to provide preventive dental services to qualified underserved children in a variety of community-based health and educational settings without a prior examination by a dentist. The research questions addressed in this study are: “Does Affiliated Practice increase utilization of preventive dental services by underserved children of age birth to 18 years?” and “What are the barriers and the level of importance of these barriers that impede underserved populations from receiving preventive dental services?”

**Methods:** The survey was constructed and administered to parents/guardians of patients of age birth to 18 years old who received preventive dental services from Catholic Health care West (CHW) East Valley Children’s Dental Clinic, the Affiliated Practice dental clinic at San Marcos Elementary in Chandler, Ariz.

**Results:** Thirty-four surveys were completed – 21 in English and 13 in Spanish. The data was analyzed for descriptive statistics and non-parametrically analyzed using the Friedman’s Test, Kendall’s W Test and the Wilcoxon Signed Ranks Test.

**Conclusion:** The study concluded that Arizona Affiliated Practice dental clinics increase utilization of preventive dental services for underserved children of age birth to 18 years old, primarily due to the reduced cost of receiving care from these clinics. Based on this outcome, future funding efforts and legislative policies should support this dental care delivery model of Affiliated Practice to include treatment for adults and seniors. IRB approval from CHW and Northern Arizona University. No funding required for this project.

## Knowledge Translation Along The Continuum From Research Question To Policy

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**Purpose:** Traditional dissemination of research through peer-reviewed presentations and publications leaves gaps in knowledge translation that are critical to moving research into policy. Funding agencies recognize these gaps in knowledge uptake and increasingly require detailed plans for knowledge translation along the continuum from research question, method and results, to practitioners and to decision-makers. A recent call for SEED grants on oral health disparities in Canada required a separate module on the knowledge translation (KT) plan. This presentation describes that process and result.

**Problem Statement:** The development of a KT plan requires prior identification of key points in the continuum along with knowledge translation strategies to inform policy development.

**Methods:** Expertise in KT required the addition of a new type of investigator to the research team. Specific audiences, partners and stakeholders were identified with complementary KT strategies to address groups at

each of the milestones during the research project. The research is informed by social networking theory using linkage mechanisms consistent with the interaction model of KT. These linkages provide greater likelihood that this research will be useful to both researchers and users, increasing the possibility that the findings will be applied and providing maximum benefits to all communities.

**Results:** Dissemination activities include stakeholder networks and key messaging, along with formal reports and professional presentations. Utilization of communication technologies such as video conferencing and Web sites are integral to the KT plan. Five elements suggested by Lavis et al – the message, audience, messenger, process and effect – provide the evaluation framework for the KT strategies for the project. The KT plan with the SEED grant application was funded as 1 of only 4 in Canada.

**Conclusions:** The ultimate success of the KT plan is dependent on successful execution of the research, the communication strategies and careful evaluation of the components.

## Professional Education And Development – Original Research

### Dental Hygienists' Perceptions Of The Bachelor's Degree In Dental Hygiene And The Advanced-Degree Oral Health Care Practitioner

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**Purpose:** Determine hygienists' perceptions about 2 dental hygiene educational issues: bachelor's entry level and the oral health practitioner (OHP).

**Problem statement:** Many dental hygiene educators/students feel that sufficient educational activities/courses are completed to meet requirements for a bachelor's degree in dental hygiene (BSDH). The OHP is one avenue to improving access to care that is not well received by all stakeholders. Information concerning these 2 initiatives would be useful to those trying to implement these proposals.

**Methods:** A survey, sent to 564 graduates of a Midwestern University's dental hygiene program, consisted of statements about the BSDH and the OHP. A 5-point Likert scale evaluated respondents' perceptions. Stu-

dents also ranked perceived benefits/negative impacts. The usable return rate was 33.6%. Data was analyzed using descriptive statistics and Chi-square tests.

**Results:** More than 70% agreed with the statement "An associate degree sufficiently prepared dental hygienists for their positions." Over 20% would leave dental hygiene if practice required a BSDH. Number of years since graduation and age group were significantly associated with 3 statements about the BSDH. In ranking BSDH limitations, the most frequently checked response was "no personal benefit." More than 70% also agreed with the statement "The OHP would have a positive impact on access to dental care." Age and professional association membership were most associated with positive OHP statements. Seventy-five percent felt the master's educated hygienist would be adequately prepared to perform the proposed OHP functions. Approximately 50% did not view the OHP as a direct threat to dentists. In ranking OHP limitations for the current practitioner/student, many checked lack of time/money.

**Conclusions:** Mostly younger dental hygienists view the BSDH in a positive light. Practicing dental hygienists view the OHP as a positive factor in providing more access to care and in advancing the dental hygiene profession. Future research should evaluate other stakeholders' responses to these important issues in dental hygiene education. This study was funded through the Department of Dental Hygiene, Wichita State University. This study was approved by the Institutional Review Board of Wichita State University.

### Tobacco Cessation Training For The Oral Health Care Team

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**Purpose:** The project assessed effectiveness of workshop training for oral health care professionals on changing practice to increase provision of an intervention for tobacco cessation counseling.

**Problem Statement:** The dental/dental hygiene appointment provides a teachable moment for discussing patient's tobacco use and providing guidance and support. However, many oral health care professionals don't address patient's tobacco use, citing lack of time, knowledge and confidence for providing an intervention.

**Methods:** Seven face-to-face interactive workshops were conducted in 7 urban cities in Canada. Dentists, dental hygienists and assistants participated. Workshop



content included an overview of motivational interviewing, identification of Stages of Change, basic facts about pharmacotherapy and nicotine replacement therapies and 2 video vignettes of tobacco users discussing their quit attempts. Evaluation included pre and immediate post-workshop surveys, a 3 week post-workshop telephone interview and a 3 month post-workshop mailed survey. Surveys questions were formatted using 5-point Likert responses and written feedback.

**Results:** Numerical data from the 3 written surveys was entered using SPSS. Written responses were grouped according to specific themes. Data analysis is ongoing but preliminary analysis on 5 components has displayed similar trends. Each of the 5 components for the clinician's knowledge, motivation, skills, importance of providing an intervention and availability of time to complete an intervention show an increase immediately following the workshop compared to pre workshop responses. However, this decreases at 3 months post-workshop training.

**Conclusion:** Preliminary analysis supports that the interactive workshop was successful in immediately increasing desired practices regarding tobacco cessation interventions by oral health care professionals. However, the level decreased at 3 months, and further training or other resources may be needed to maintain implementation.

**Funding:** Funding for this project provided by Alberta Alcohol and Drug Abuse Commission.

## Comparison Of 1-Year And 2-Year Degree Completion Students

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**Purpose:** To compare the academic success of 1 and 2 year dental hygiene degree completion students at the University of British Columbia (UBC).

**Problem Statement:** The UBC Dental Hygiene Degree Program enables graduates with 2 and 3 years of post-secondary education to earn a 4 year degree by building onto their diploma-level education. It was important to explore the outcomes of these 2 options within the program.

**Methods:** The admissions and academic progress records of students from 1992 to 2008 (n=93) were analyzed to determine whether demographic variables were determinants of academic success. The analysis was based on graduating GPAs and was related to learners'

continuation to graduate education. T-tests and ANOVAs were conducted to assess differences between students who required 1 and 2 years of academic work to complete the program.

**Results:** Data revealed that students are distributed across Canada but concentrated in British Columbia and Ontario. No statistically significant differences were found in the students who entered the third and fourth year with respect to the length of previous diploma education, years of practice experience, province of education and diploma GPA. To date, 25% of graduates have completed or are in a graduate program. Students who entered at the fourth year were more likely to pursue graduate studies than those who entered at 3rd year.

**Conclusions:** The lack of difference in GPAs between groups upon graduation suggests that the third year of the degree program adequately compensates for any differences in dental hygiene background. On-going research is necessary to determine if this trend continues with the on-line approach introduced in 2006. Further investigation is also warranted to further explore the variables influencing the pathways to graduate education.

## Assessing Where And How Dental Hygiene Students Apply Women's Health Knowledge

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*Division of Dental Hygiene*

**Purpose:** These studies were to investigate the settings and methods dental hygiene students apply knowledge about women's health learned in school and investigate if there is a significant difference based on program degree.

**Problem Statement:** Many women live in settings that prohibit access to oral health care and wellness. Having dental hygiene students provide oral health care education and services to women in alternative living situations promotes students' "experiential learning" and enhances self-confidence.

**Methods:** Dental hygiene directors were surveyed in 2001 and 2007, and were asked what settings and methods students experienced to apply women's general and oral health knowledge. The response rate was 62.1% (159 out of 256) for 2001 and 25.34 % (73 out of 288) for 2007. The Over Dispersed Poisson regression and Fisher's exact test were used to analyze the data with JMP.

**Results:** Both surveys identified that students most commonly applied women's health knowledge in dental hygiene clinics, community/public health clinics and nursing homes. Other sites were hospitals, public/private schools, domestic violence shelters, penal institutions and rehabilitation centers. The most common methods of applying knowledge were research projects, course work with dental students and community based research. Other methods included interdisciplinary work with medical, nursing or allied health professionals, treating patients in clinic and schools. No statistically significant relationship was identified based on program degree.

**Conclusions:** It was identified that the most commonly applied setting and method was the dental hygiene clinics and research projects and, although it is evident that students are working with women in alternative living situations, there are different settings and methods that may be considered. It is important that dental hygiene students and professionals learn women's general and oral health issues and use this information to improve women's access to health care in order to comprehensively treat females throughout life.

## Implementation Of A Tobacco Use Intervention (TUI) Program Into Clinical Dental Hygiene Education

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**Purpose:** A simplified tobacco use intervention (TUI) program was tested to determine if students can learn to address tobacco use and non-use with patients. This involves brief cessation intervention with users and health promotion with non-users. The program's effects on students' comfort, confidence and intentions to continue providing TUI in their future clinical practice were evaluated.

**Problem Statement:** Educational institutions need curriculum components to prepare health care graduates with knowledge, skills and attitudes to effectively counsel tobacco-using patients. Tobacco use is the number one preventable cause of disease and premature death in the U.S. This includes both oral and systemic diseases.

**Methods:** This program focused on simplified, brief interventions with tobacco users (such as "Ask," "Advise"

and "Refer" to cessation professionals), rather than on complex cessation counseling and pharmacotherapy. It also emphasized health promotion with non-users. A pretest/post-test survey used 14 questions with a convenience sample of 16 second year students with a 100% response rate.

**Results:** Contingency tables demonstrated increased TUI health promotion with non-users and brief cessation counseling with tobacco-users, while complex cessation counseling decreased. Reports of comfort and confidence in providing TUI were stable or slightly increased. Students reported intentions to consider, plan or provide TUI to at least 75% of their future patients. SPSS sign tests did not demonstrate statistical significance, most likely due to small sample size. Responses to 3 questions, addressing asking about tobacco use and time spent talking about tobacco, approached significance at .065 to .180. Eleven items had significance levels  $>.280$ .

**Conclusions:** This early study of the clinical TUI program indicated that it may have supported students' learning and provision of TUI for every patient. Simplified TUI programs during the formative education of dental hygienists may support their integration of TUI into the process of care that they provide with ease and consistency for their future patients.

## Professional Education And Development – New Program

### An Experiential Learning Model For Teaching Social Advocacy Education

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**Purpose/Goals:** Growing oral health disparities in vulnerable populations and increasing inequities in access to oral health care services are driving the need for change in oral health policy. In response the Dental Hygiene Degree Program at the University of Alberta provides an innovative curriculum to prepare graduates for the role of social advocate.

**Significance:** Education socializes dental hygienists for future role of advocate.

**Approach/Key Features:** This course simulates a realistic advocacy planning initiative where the class determines the advocacy issue. Each student participates in 1 of several advocacy planning committees: political action,

coalitions, message, communication and issues. Community experts act as mentors to guide students through coordinated activities specific to the individual committee responsibilities. Students work collaboratively with a high degree of communication to coordinate and synthesize their collective work toward the common advocacy goal. An experiential learning model based on concrete knowledge, reflection and active application is designed to move students' from passive dependent learners to motivated, autonomous and self-directed learners. Using this pedagogical approach, the course content not only encompasses the theory of advocacy planning and health policy development, it also leads students to a broader range of skills, including problem solving, critical thinking, negotiation, facilitation and team development.

**Evaluation:** Pre and post test survey results showed that by participating in this course students gained a greater understanding of the advocacy planning components and process, an increased belief that they can contribute to oral health policy change and greater confidence and willingness to be involved in future advocacy initiatives.

## Clinical Dental Hygiene Care – Original Research

### How Impactful Are Your Recommendations?

\* Wendy Bebey, RDH, BS; Sharon Efron, RDH, BS  
The Procter & Gamble Company

**Purpose:** To understand the effectiveness of dental professional manual toothbrush recommendations to their patients.

**Problem Statement:** Patients frequently look to the dental team to provide them with understanding about their unique dental health needs. The ability to effectively communicate evidence-based clinical recommendations is critical to the success of promoting a healthy lifestyle and preventing disease in patients.

**Methods:** The U.S. Nielsen Household Panel (HHP) Recommendation Analysis 2007–08 and the U.S. Usage and Recommendation Study 2008 were utilized to compare the recommendation habits and recall between dental professionals and patients. The HHP survey was fielded to 53,000 representative sample online and non-online households. Overall, 55,958 members from 38,428 households responded to the survey. The purchase data reflects consumer purchases from February 2007 through February 2008. The professional phone survey was taken from a nationally representative ran-

dom sample of 200 dentists and 150 dental hygienists, geographically balanced by U.S. Census divisions.

**Results:** The HHP survey indicated that 63.6% of respondents went to the dentist within the previous 12 months. Forty-seven percent of the recommendations that patients remembered came from a dental hygienist and 20.1% from both the dentist and the dental hygienist. Of those receiving a recommendation, 93% received a free toothbrush sample when they visited the office. Interestingly, only 47% recall receiving a recommendation for a toothbrush. Sixty-four percent of dental professionals believed they gave their patients a branded manual toothbrush recommendation but only 18% of patients recall being instructed that a certain brand of toothbrush is preferred.

**Conclusions:** The survey confirms that the majority of recommendations that patients remember come from their dental hygienist. While the data presented pertains to manual toothbrushes it has broader implications on the role of the dental hygienist in closing the gap between intended and recalled recommendations, especially when evidence-based treatment decisions are being communicated to patients. Funding for this study was provided by The Procter & Gamble Company.

### Oral Malodor –Comparison Of Subjective And Objective Measurements

\* Rebecca VanHorn, RDH, BA; Beth Jordan, RDH, BS  
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**Purpose:** To understand the strength of the relationship between subjective organoleptic and objective instrumental measures of oral malodor.

**Problem Statement:** While second-person grading is often considered the “gold standard” method for measuring oral malodor, it is highly subjective, making evaluation of available literature problematic. The addition of objective measurements of oral malodor should allow for more systematic interpretation of product efficacy.

**Methods:** This randomized and controlled crossover clinical trial compared the breath protection effectiveness of 0.454% stabilized stannous fluoride (SnF<sub>2</sub>) dentifrice to a 0.243% sodium fluoride (NaF) negative control dentifrice over 24 hours in 29 healthy adults. Subjects brushed twice daily, with breath quality evaluated at 1.5, 3, 8 and 24 hours after initial dosing by monitoring of volatile sulfur compounds (VSCs) using a halimeter and

second-person organoleptic grading. A washout of 2 to 3 days followed between treatment periods. The natural logarithm of total VSCs measured by a halimeter and the organoleptic assessments by a panel of 4 judges was analyzed using analysis of covariance. Pearson correlation coefficients were computed separately at each time point to measure the strength of the relationship between the organoleptic scores and the VSC levels.

**Results:** The SnF2 dentifrice provided significantly superior reductions in VSCs relative to the NaF negative control when measured via a halimeter and odor-judges ( $p < 0.05$ ). The Pearson correlation coefficients between the organoleptic scores and the VSC levels across all study evaluation time points were positive, ranging from 0.59 to 0.77, with an overall correlation of 0.88.

**Conclusions:** The result of the positive correlation between the halimeter and organoleptic data generated in the trial confirms the relationship which exists between an objective method of breath evaluation versus the subjective second person breath perception. The objective VSC measures allow for reliable assessment of product efficacy, which may be easily translated to a clinical setting. Funding for this study was provided by The Procter & Gamble Company.

## Enamel Fluoride Uptake And Antimicrobial Effectiveness Of An Herbal Fluoride Mouth Rinse

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Anne D. Haffajee, BDS; Tina Yaskell, BS  
The Forsyth Institute  
\*Connie Gregson, MS  
Natural Dentist, Inc.*

**Purpose:** The objectives of the study were to determine the Enamel Fluoride Uptake (EFU) of The Natural Dentist Anticavity Fluoride Rinse (TND) and to determine its antimicrobial effectiveness as measured by its Minimum Inhibitory Concentration (MIC) against predominant oral pathogens.

**Problem Statement:** Natural oral health products are alternatives if they demonstrate comparable or greater effectiveness as compared to conventional products.

**Methods:** For the EFU, human enamel specimens were prepared. Each sample was demineralized and pre-treatment fluoride and calcium contents were measured. A caries-like lesion was formed in each specimen, and the specimens were treated with the assigned mouth rinse (TND, ACT or Phos-Flur). Post-treatment specimens

were demineralized and the resulting solutions were analyzed for fluoride and calcium. For the MIC, an agar dilution method was used to test the agents against 44 oral bacteria. Serial dilutions of TND and Listerine were prepared. The media and the test agents were prepared into petri plates and inoculated with the cultured bacterial species. The MIC was interpreted as the lowest concentration of the agent that inhibited the growth of the test species.

**Results:** Fluoride uptake was calculated by subtracting the pre-treatment level of fluoride from the post-treatment level. A 1-way analysis of variance model indicated significantly greater EFU with TND and Phos-Flur as compared to ACT ( $p < 0.05$ ). Regarding the MIC, TND inhibited the growth of all 44 bacterial species tested. For several oral pathogens, TND had significantly lower MICs in comparison to Listerine.

**Conclusions:** The data from these in vitro studies indicate effectiveness with TND Anticavity Fluoride Rinse in terms of fluoride uptake and antimicrobial activity. Funding for this project supported by Natural Dentist, Inc.

## Dental Hygienists' Social Sensitivity Regarding Access To Dental Care Issues For The Underserved Population

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**Purpose:** This research project investigated the perception of dental hygienists' regarding the access to care issues and solutions of children and the aging population.

**Problem Statement:** Dental care is critical to the overall health and well-being for the population. The demand for dental services among the elderly to preserve their natural teeth has continued to increase, despite this population facing a limited income.

Children are included in the underserved population as the number of children without dental care available to them continues to grow. Barriers to care must be overcome to assist the underserved population receive dental treatment.

**Methods:** Seven dental hygienists participated in this study through qualitative face-to-face, 1-on-1 interviews with open ended questions. The randomly chosen participants included registered dental hygienists, dental hygiene educators, government employed dental hygienists and dental hygienists within the state association. Responses were coded for key words in context, ideas and concepts.

**Results:** The average of the participants practicing dental hygiene was 20.5 years. Each participant indicated that some type of service should be provided for the underserved population. Four participants responded that dental schools and public services should be responsible for the underserved population. Three participants responded that dental health professionals should volunteer time to provide care to the underserved population. Only one participant felt there was a social responsibility for oral health care professionals to provide care for the underserved population. The goal of all participants was to help people attain optimum oral health which in turns aids in optimum overall health.

**Conclusions:** The perception of participants in this research study was that of placing the responsibility of the underserved population on dental schools and public services for treatment rather than on dental hygienists. Additional research is necessary to add validity to this study.

## Bisphenol A Blood And Saliva Levels Prior To And After Dental Sealant Placement In Adults

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**Purpose:** The purpose of this study is to examine the presence of bisphenol A (BPA) in saliva and blood after placement of pit and fissure sealants in adults.

**Problem Statement:** Sealants are formed by reacting glycidyl methacrylate with BPA. BPA is a hormonally active, synthetic chemical that is part of a broad group of chemicals known as endocrine disrupting compounds, xenoestrogen, which mimic bioactivity of estrogen. Laboratory studies using rodents with BPA exposure as low as 2.5ug/kg body weight/day reveal increased fertility and mammary and prostate cancer. BPA leaches from a dental sealant if not completely polymerized and is released into the oral cavity as a degradation product.

**Methods:** Subjects were 30 adults, 18 to 40 years of age, of mixed gender and ethnicity. IRB approval (#05-070) was granted prior to study initiation. BPA was measured using a direct-competitive Enzyme Linked ImmunoSorbent Assay. Differences in BPA comparing low-dose (1 sealant) and high-dose (4 sealants) groups were examined at 1 hour prior, 1 hour post, 3 hours post and 24 hours after sealant placement using saliva samples. Blood

samples were collected 1 hour prior and 1 hour post sealant placement. Data was analyzed using a parametric, 2-way analysis of variance for repeated measures, 0.05 alpha level.

**Results and Conclusions:** BPA was detected in saliva of all subjects prior to sealant placement and ranged from 0.07–6.00 ng/ml. Salivary BPA levels peaked at the 3 hour period following placement and returned to baseline levels within 24 hours. BPA was significantly elevated at all post sealant placement time periods for both low-dose and high-dose sealants groups, with peak levels of 3.98 ng/ml and 9.08 ng/ml, respectively. BPA was not detected in serum samples after sealant placement. Detectable BPA concentrations at baseline signify exposure to BPA from sources other than sealants. Results from this study will assist practitioners in product selection and usage protocol. Funding for this project was obtained from the American Dental Hygienists' Association Institute for Oral Health.

## References

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## Comparison Of A Novel Interdental Brush To Dental Floss For Reduction Of Plaque And Bleeding In Sites Of Intact Interdental Papillae: A Randomized Controlled Clinical Trial

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**Purpose:** To compare the efficacy of interdental brush to dental floss for interproximal plaque and bleeding reduction in subjects with intact interdental papillae.

**Problem statement:** Periodontal disease is prevalent interproximally, yet compliance with dental floss is low because of lack of ability and motivation. The interdental brush is an easy to use, self-care aid, but is it effective for treating early disease when the papilla is intact?

**Methods:** Examiner-blinded, split-mouth, 3 month, randomized controlled trial comparing interdental brush to positive control and dental floss on premolars and molars in 32 healthy adults with intact, but bleeding interdental papillae. Silness and L oe plaque and Eastman bleeding indices conducted at weeks 0, 6 and 12. Subjects received nonsurgical debridement 2 weeks prior to baseline. Interdental brush size determined with Curaprox color coordinated probe. OHI at Weeks 0 and 6, modified Bass twice a day, flossing once a day and interdental brush inserted in/out once a day. All oral health products controlled. Subjects complete a 4-item questionnaire at week 12 to compare products ease of use, preference and provide comments.

**Preliminary Clinical Results:** One-way ANOVA. Statistical unit: interproximal site. The interdental brush and floss were not statistically different for plaque and bleeding scores at week 0 (n = 240 sites, p = 0.262; n = 240 sites, p = 0.243 respectively), week 6 (n = 162 sites, p = 0.739; n = 160 sites, p = 0.062 respectively) and at week 12 (n = 85 sites, p = 0.876; n = 86 sites, p = 0.215 respectively) with alpha at 0.05, df = 1.

**Conclusion:** Preliminary clinical results indicate that the interdental brush removes interproximal plaque and reduces bleeding as well as dental floss in subjects with intact interdental papillae. Subjects' qualitative feedback for the interdental aids will be determined at study completion. Study has received ethical approval from UBC Clinical Ethics Research Board (#H08-01078). Funding for this project was obtained through CFDHRE, BCD-HA, Entreprixe Dentalink Inc. (Curaprox Swiss) and the Faculty of Dentistry, UBC.

## Perceptions Of Individuals Who Frequently Vs. Occasionally Whiten Their Teeth

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**Purpose:** The objective of this study was to compare perceptions of a group who frequently whiten (FWG) their teeth to achieve the whitest shade possible, with a group who are satisfied with occasional whitening (OWG).

**Problem Statement:** There is not enough dialogue between patients and practitioners concerning expectations of whitening outcomes. Practitioners need to initiate this dialogue so that consensus on color shade can be reached.

**Methods:** Twenty individuals in each group were re-

cruited through e-mail from faculty, students and staff of a large university health sciences campus. Inclusion criteria for both groups included age 18 to 60, self-reported history of whitening and no history of dental industry employment for self/family. Inclusion in FWG also required a history of frequent whitening and teeth matching 1 of the initial 4 shades of the VITA Bleachedguide 3D-Master. A 30 minute, 2-part oral interview was conducted with all subjects, which consisted of a 43-item questionnaire exploring perceived values and attitudes about teeth and a photographic survey of 22 digitally retouched stock photographs depicting 11 individuals with both a lighter and darker dentition shade. Subjects were asked to estimate the age of the individual pictured, to evaluate the appropriateness of tooth color and to explain their answers. Responses were tallied and constant comparative analysis utilized for qualitative data.

**Results:** FWG is somewhat more likely than OWG to evaluate age as younger when teeth are lighter. Also, FWG is more likely to feel that brighter teeth are "just right" and darker teeth "too dark." OWG is somewhat more likely to assess that brighter teeth are "too light" than FWG. When asked what the appearance of one's teeth communicates to others, the most frequent answer from both groups was "overall health and well-being."

**Conclusion:** Differences in perceptions between individuals with varying whitening expectations can guide oral health care providers during consultation. Use of serially whitened photographs, such as those utilized in this study, can assist practitioners in initiating the necessary dialogue for reaching consensus on whitening expectations.

## Role Of Oral/Dental Procedures In Causing Infections Associated With Vascular Access Devices In Hemodialysis Patients

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**Purpose:** To identify the specific microorganisms responsible for infection associated with vascular access in patients undergoing hemodialysis; to determine the potential role of oral/dental procedures in causing infection associated with vascular access in these patients.

**Problem Statement:** Each year, approximately 40% of hemodialysis patients have an infection related to the dialysis access site, leading to significant morbidity. Conse-

quently, physicians or dentists often prescribe prophylactic antibiotics to prevent vascular access infection (VAI) in patients on hemodialysis undergoing invasive dental treatment. However, there is no evidence that dental procedures lead to VAI. Further, antibiotic prophylaxis may lead to allergic reactions, emergence of resistant species and increased health care costs. There is a pressing need for collecting additional data on whether oral microorganisms can lead to infections associated with vascular access in hemodialysis patients.

**Methods:** This IRB-approved retrospective study was conducted using an electronic medical record system. VAI data was collected on 218 patients receiving hemodialysis for various periods between Jan. 1, 1999 and Feb. 27, 2009. Diagnosis of VAI was confirmed by review of clinical notes and laboratory testing. A range of culture results were collected from blood, urine, sputum, catheter tips, fistula and/or graft sites. Specific microorganisms identified in association with each infection were recorded. Data was recorded and analyzed in an Excel database.

**Results:** Of the 218 patients, 103 (47.25%) had at least 1 VAI associated with their hemodialysis. The predominant microorganisms associated with the VAIs were staphylococcus and enterobacter species. In very few cases, organisms indigenous to the oral cavity were associated with VAIs.

**Conclusions:** Results suggest that oral microorganisms are rarely associated with VAI. Thus, routine oral manipulation does not have a significant role in causing such infections. Further, the data suggests that routine antibiotic prophylaxis for dental procedures may not be necessary.

## Clinical Dental Hygiene Care – New Program

### A Simplified Table To Identify Pediatric Dental Clients Needing Further Evaluation Of Blood Pressure

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**Purpose/Goals:** To create a tool to easily identify pediatric clients with elevated blood pressure (BP) who need referral for medical evaluation of BP.

**Significance:** In 2004, new guidelines (Fourth Report) were published regarding the diagnosis, evaluation and treatment of high blood pressure in children and adolescents. The guidelines recommend screening BP from ages 3 to 18 to be taken at all visits for health care, including dental appointments. The charts within the guidelines require distinguishing between 7 height percentiles to identify elevated BP. Seventy-four percent of pediatric hypertension is undiagnosed. Hypertension in childhood can lead to cardiovascular disease in adulthood. Providers cannot easily determine elevated values based on height percentiles. Tools and strategies need to be developed to aid health care practitioners in detecting pediatric clients who have BP above the normal limits.

**Approach/Key Features:** A simplified abnormal BP table to identify children and adolescents who need further medical evaluation of BP was developed. This table relies only on knowledge of the gender and age and is based on the Fourth Report. The simplification is done by taking the lower limit of the abnormal BP for a given gender and age, regardless of height, resulting in a single systolic and diastolic blood pressure. Any BP reading greater than or equal to the chart values are prehypertensive or hypertensive and should be medically evaluated. This table provides an opportunity to screen pediatric patients for elevated BP when a height measurement is not available.

**Evaluation:** This approach provides a simplified table for screening BP, with 100% sensitivity for identifying abnormal pediatric values. While 100% sensitive, this approach will produce some false positive results in children within the tallest height percentile. However, given the significant under-diagnosis of pediatric hypertension and the potential effects on cardiovascular health from chronic hypertension, we feel this is a positive trade off. No funding for this project was received.

## Technology – Original Research

### Course Management Systems: Implications For Hybrid Course Development

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**Purpose:** The purpose of this study was to examine whether faculty conceptions or misconceptions regarding the use of hybrid instruction differ between faculty

teaching in traditional classroom settings who utilize course management systems (CMS) and faculty teaching in traditional classroom settings who do not utilize CMS. In addition, this study examines whether faculty who are utilizing a CMS are more willing/and or likely to develop a hybrid course.

**Statement of the Problem:** Faculty misconceptions regarding hybrid instruction may prevent educators from utilizing new technologies in course development.

**Methods:** One-hundred and twenty-nine faculty at 4 independent institutions of higher education in New York State responded to an on-line survey. In addition to basic demographic information, the survey contained 14 conceptual questions regarding hybrid learning, which required either a true, false or no basis for knowing response. Ninety of the respondents taught in a traditional classroom setting. Forty-nine of those were teaching in traditional classroom settings utilized Course Management Systems.

**Results:** Data from this survey was analyzed by performing independent samples t-test, frequencies and cross tabulation. Data analysis indicated faculty who teach in traditional classroom settings utilizing CMS have less misconceptions in regard to hybrid learning than faculty who teach in traditional classroom settings who do not utilize CMS. More specifically, 53% of faculty who utilized a CMS responded correctly to the statement “teacher student interaction is difficult when using hybrid learning technology to deliver instruction,” as compared to only 29.3% correct responses by those who do not use a CMS. Similarly, in response to the statement “cheating in a hybrid course is a common threat to the quality of hybrid courses,” 29% of those who use a CMS answered incorrectly while 46% of those who do not use a CMS answered incorrectly. Eighty-nine percent of faculty who were utilizing a CMS responded positively to the question “In the future would you use hybrid learning to deliver instruction?”

**Conclusions:** Results of this study suggest institutions of higher learning should encourage faculty to utilize CMS as a transition to distance education. In addition, faculty development workshops designed to address the common misconceptions held by faculty in regard to hybrid learning may encourage more faculty to participate in this method of delivering course instruction.

## Clinical Assessment Of Remineralization From Fluoride Varnish Treatments

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**Purpose:** The purpose of this study was to determine the ability of a new fluorescence assessment instrument to detect the effect of a fluoride varnish on white spot lesions in a small group of children within a 6 month period.

**Problem Statement:** Traditional methods for detecting caries (visual, tactile and radiographic) cannot detect the early, non-cavitated stages of development. Once cavitation has been identified, lesion reversal is impossible. Consequently, there is a need to detect early stages of demineralization, because non-cavitated lesions are completely reversible.

**Methods:** Forty-eight children ages 7 to 17 participated in this study. All participants had 2 white spot lesions. Subjects were stratified by age and gender, and were randomly assigned to 2 groups that received a series of 4 weekly applications of either a fluoride or placebo varnish. The white spot lesions were examined clinically at baseline, 3 weeks, 3 and 6 months using ICDAS criteria and fluorescence measurements with QLF and an early prototype of a new instrument, FluoreCam. Change from baseline was calculated for each of the outcomes measured using the analysis of variance (ANOVA) model. Treatment comparisons were conducted by modeling these changes with a linear model including fixed effects for treatment, month and treatment-by-month interaction.

**Results:** None of the examination methods detected significant differences between groups in changes from baseline prior to 6 months. At 6 months, the results from ICDAS and QLF exams showed non-significant directional differences. However, a statistically significant difference ( $p < .05$ ) occurred between the fluoride group showing remineralization ( $-6.3$ ) and the placebo group showing demineralization ( $+30.9$ ) where  $p = 0.0498$ .

**Conclusions:** The use of the FluoreCam instrument permitted the detection of the ability of a fluoride varnish to remineralize incipient carious lesions in a small group of children within a 6 month test period. This investigation was funded by the NIH/NIDCR.



## An Analysis Of Student Performance Benchmarks In Dental Hygiene Via Distance Education

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**Purpose:** Currently, 3 graduate, 35 undergraduate and 12 dental hygiene degree completion programs in the U.S. are using varying forms of distance learning (DL) for course offerings. A 10 year, longitudinal examination considered student performance differences in a distance education (DE) dental hygiene program. The purpose of this research was to determine if there were differences in performance between learners taught in a traditional classroom compared to their counterparts taking classes through an alternative delivery system.

**Problem:** Relying heavily on DL for offering educational programs leaves an unanswered question: Is learner performance on standardized benchmark assessments impacted when using technology as a delivery system?

**Methods:** A longitudinal, ex post facto design was used. Two-hundred and sixty-six subject records were examined. Seventy-seven individuals were lost through attrition. One-hundred and eighty-nine records were used as the study sample. One-hundred and seventeen individuals were located face-to-face while 72 were at a distance. Independent variables include time and location, while dependent variables include course grades, grade point averages (GPAs) and the National Board of Dental Hygiene Examination (NBDHE). Three research questions were asked: 1) Were there statistically significant differences in learner performance on the National Board of Dental Hygiene Examination (NBDHE)? 2) Were there statistically significant differences in learner performance when considering GPAs? 3) Did statistically significant differences in performance exist relating to individual course grades? T-tests were used for data analysis in answering the research questions.

**Results:** From a cumulative perspective, no statistically significant differences were apparent for the NBDHE and GPAs. From a cumulative perspective, similar results were found for individual courses.

**Conclusion:** Interactive Television (ITV), the DL system examined, was considered effective for delivering education to learners if similar performance outcomes were the evaluation criteria.

## Technology – New Programs

### Gingivitis – Objective Measurement Utilizing Digital Imaging

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**Purpose:** This is an overview of a novel measurement instrument for assessing gingivitis with the potential to replace subjective examiner grading with objective grading. A clinical validation program was designed to quantify sources of variability and population definition pertinent to sample size determination and study design. Measurement validity in 3 critical areas was examined: natural disease history, active versus placebo and dose sensitivity. The use of a validated objective clinical measurement tool measuring gingivitis should be considered by dental hygienists when making evidence based decisions regarding product and treatment recommendations.

**Significance:** The Löe–Silness Gingivitis Index is the gold standard measurement for gingivitis clinical trials and the 1961 publication is the most cited paper in dentistry. Clinical trials using examiner grading are time consuming, expensive and unpredictable. Gingivitis image analysis utilizes a high-resolution camera for image capture and focuses on the facial surfaces of the 12 anterior teeth. The gingival color change is captured by assessing the red–green–blue quantification during analysis. The final data point reflects the change in color before and after intervention.

**Key Features:** Pictorial display of images from the natural history and active versus placebo validation exercises will demonstrate the usefulness of the objective measurement tool in research. Limitations concerning this measurement tool will be presented so the clinician can judge the usefulness of the data in subjects with gingivitis when critiquing the literature.

**Evaluation:** Gingivitis image analysis has been shown to correlate with the Gingival Index commonly used in research. In addition, large scale clinical testing confirms the usefulness of this measurement tool. The method is highly sensitive and the analysis has good discrimination power. The method allows for visual presentation of the data and, when used in clinical research, the cost and time is significantly reduced. Funding of this program was provided by The Procter & Gamble Company.

## Objective Grading Of Tooth Color Change

*\*Mary Lontchar, RDH, MA; Patricia Walters, RDH, MS*

*The Procter & Gamble Company*

**Purpose:** This is an overview of a novel tooth color measurement system that has been validated both clinically and instrumentally. The measurement system allows for more expedient testing of products that can be used in patients with intrinsically stained teeth. The system effectively measures both mild and severe stain, including fluorosis and tetracycline stain.

**Significance:** Application of digital imaging has been extensively reported in the literature for the measurement of tooth color. Digital imaging provides the lowest variability and is most sensitive to tooth color changes. The system conforms to an ASTM (American Society for Testing and Materials) standard.

**Key Features:** The images are obtained by a high-resolution digital camera and fixed lighting conditions. From each image a Munsell calibration standard L\*, a\* and b\* value is determined separately for each tooth and is defined as overall color change relative to white. Pictorial display of images before and after use of a whitening product demonstrates the usefulness of the objective measurement tool.

**Evaluation:** Digital Imaging is an objective method for assessing tooth color changes. The method allows for visual presentation of the data, research is quick and inexpensive to execute. The method has shown it is reproducible and repeatable from study to study and between research sites. The points of difference between subjective and objective grading are issues that the dental hygienist would consider when critically analyzing the literature and making evidence based decisions related to product and treatment recommendations. Funding for this project was supported by The Procter & Gamble Company.

## Objective Grading Of Plaque – Digital Image Analysis

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**Purpose:** This is a presentation of a novel plaque measurement tool which dimensions how a 32 site partial mouth plaque grading can replace the conventional 168 site whole mouth plaque grading routinely used in dental

research. The testing of products using the plaque measurement tool will enable the development of clinically meaningful technologies in a more efficient and less costly research program.

**Significance:** As an objective measure, digital plaque imaging analysis is used to assess plaque coverage before and after product use. A dental hygiene clinician will be able to use data generated from this objective measurement tool to make sound decisions before recommending products and determining treatment plans for their patients.

**Key Features:** The method involves plaque disclosure with a fluorescein dye followed by a digital image. Using UV illumination with standardized lighting conditions, the anterior facial tooth surface images are analyzed for total pixel area of teeth and plaque coverage. Pictorial display of images before and after tooth brushing and mouth rinse use, as well as data from a large cross-sectional study showing partial mouth plaque measurement compared to whole mouth plaque scores, will demonstrate the usefulness of the objective measurement tool.

**Evaluation:** Digital plaque imaging is an objective method for assessing plaque coverage. The method is highly sensitive and the analysis has good discrimination power. The method allows for visual presentation of the data, and the execution of the research is both efficient and less costly. The method has shown it is ideal for repeated measures and is reproducible and repeatable from study to study and between research sites. Funding for this project was supported by The Procter & Gamble Company.

## Translational Research In Oral Cancer – Original Research

### Pre-clinical Evaluation Of Genistein And Biochanin A Inhibition Of Fak In Oral Squamous Cell Carcinoma Cell Lines

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**Purpose:** The focal adhesion kinase (FAK) is an intracellular tyrosine kinase associated with the regulation of cell growth, migration and survival, and has been linked

to oral squamous cell carcinoma (OSCC). The purpose of the current study was to determine the effects of isoflavones on proliferation, invasion and decreases in expression of the FAK protein.

**Problem Statement:** The survival rate for patients with OSCC remains poor, despite advances in diagnosis and treatment. OSCC usually develops in areas of the epithelium exposed to carcinogens and likely results from the accumulation of genetic alterations, which lead to aberrant expression of many proteins involved in cell growth regulation. Molecular inhibition of 1 or several of these proteins may impede or delay the development of cancer.

**Methods:** We examined the effects of 2 isoflavones, namely genistein and biochanin A, on proliferation, inhibition of FAK and invasion in 2 human OSCC cell lines by MTT assay, Western blot analysis and invasion assay. The significance of differences between the control and treatment values will be determined by ANOVA followed by the post hoc Tukey test using KaleidaGraph (Synergy Software for Windows and Macintosh, Reading, PA).

**Results:** Preliminary results show that treatment with genistein and biochanin A induced decreases in survival of both OSCC cell lines in a dose-dependent manner. Both isoflavones caused decreases in protein expression of FAK and inhibition of invasion in a dose-related way.

**Conclusions:** Genistein and biochanin A have both anti-proliferative and anti-invasive effects in OSCC cell lines. These findings suggest that inhibition of FAK might be a novel treatment or preventive strategy in OSCC.

## Clinical Research/Behavioral Science – Original Research

### Participation In Clinical Research: Understanding Motivation And Attitudes

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**Purpose:** Understanding subjects' relative attitudes and motivation for participating in clinical trials may assist researchers in subject recruitment and retention activities.

**Problem Statement:** Therefore, this study explored research subject attitudes, satisfaction with participation,

reason for participation in research and issues related to subjects' awareness of informed consent as a function of demographics in a population of individuals currently enrolled in a dental clinical trial at a Midwestern academic institution.

**Methods:** Participants were asked to complete a voluntary questionnaire to elicit their level of agreement with 40 statements. Items were measured using a 5-point Likert response scale. One-hundred and sixty-seven individuals completed the questionnaire out of the 180 total participants.

**Results:** Subjects were predominantly female (66%). Seventy-four percent of subjects ranged in age from 30 to 59. Fifty-nine percent self-identified as white, 25% as African-American, 8% Latino and 6% other. Principal components analysis with varimax rotation was used to explore the underlying factor structure of the 40 items. Eleven factors were identified (eigenvalues > 1.0) and explained 71% of item variance. Factors included: study satisfaction, fate, social norms, pain, purpose, negative effects, free dental care, informed consent/study knowledge, financial issues, autonomy, health worries and need for dental research. Mean subscale scores were computed for subsequent comparisons. Women were more likely to report they understood their consented rights ( $p = .005$ ) than men, and they worried less about their health ( $p = .024$ ). African-Americans were more likely to report that fate guided their health ( $p = .0001$ ), as well as to report negative social norms about participating in research ( $p = .005$ ). Additionally, middle aged adults (45 to 59) are less likely to participate because they needed the money compared to younger and older groups ( $p = .025$ ).

**Conclusions:** These results suggest that motivation for participating in research differs among demographic groups and should be considered in the conduct of clinical research.